Bharati Vidyapeeth

(Deemed To Be University), Pune

(India)

***Accredited 'A++' Grade (2024) By NAAC ***
***'Category -I' University Status by UGC ***
*** 'A' Grade University Status by MHRD Govt. of India ***

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 114 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 underBV(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 theVision 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 throughDynamic 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, 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/Learnerin MOOCs.

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

1. iimb.ac.in
2. swayam.gov.in
3. edx.org
4. Coursera
5. harvardx.harvard.edu
6. Indira Gandhi National Open University (IGNOU)
7. National Council of Educational Research and Training (NCERT)

8. National Institute of Open Schooling (NIOS)
9. 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

The Academic Council at its 72nd meeting held on 25-2-2025 has resolved to REPEAL the condition related to the number of heads of passing required by the students to proceed to next year or subsequent years / semesters. In view of this, the students admitted can be permitted to take admission in the subsequent years / semesters irrespective of the number of subjects they have passed /cleared. However, the University reserves its right to admit the students in any of the semester / year depending on the fulfillment of level of knowledge required. These conditions are not applicable to programmes which are governed and have to abide by Council regulations. This will be effective from the Summer 2025 examinations and onwards.

[Refer Notification 1304 of University]

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 formulae

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 Grade :

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 grades 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:

- **Students who have earned a total of 40 credits by completing the first year (level 6) of two-year PG (level 6.5/7) of NCrF and, if exit, shall be awarded a postgraduate diploma.**
- Student or Learner is expected to write Two Research Papers and publish it in Peer Reviewed Journals.
- A Student /Learner can carry any number of backlog paper till Semester-IVprovided his/her academic term(s) is/are granted

XIV. Question Paper Patterns

for UniversityExamination

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

Title of the Course

Day: **Total Marks: 60**

Date: **Time: 03 Hours**

Instructions:

1. **Section I –Attempt any FIVE questions. Each question carries 08 Marks.**
2. **Section II-Attempt any TWO questions. Each question carries 10 Marks**

SECTION – I		**40 Marks**	
It should contain 06 questions covering the syllabus. ***Questions should be set uniformly from all the units.***		**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)**
Question	**Marks**	**CO**	**BL**
Q.1 ……	**(8 marks)**		
Q.2 ……	**(8 marks)**		
Q.3 ……	**(8 marks)**		
Q.4 ……	**(8 marks)**		
Q.5 ……	**(8 marks)**		
Q.6 Write **Short Notes** on ANY TWO a) b) c)	**(8 marks)**		
SECTION – II		**20 Marks**	

Question No.7 or the first Question of Section II is compulsory. This question should be based on case-study and would carry 10 marks. After this there should be 02 questions each of 10 Marks. Students have to attempt any one out of two questions. ***All these questions in this section should be designed to evaluate the higher levels of Bloom's Taxonomy viz.***		**CO**	**BL**
Create, Evaluate, Analyze, Apply.			
Q.7……..	**(10 marks)**		
Q.8……	**(10 marks)**		
Q.9……..	**(10 marks)**		

Note:

1. **Answers to section I and II should be written in the same answer book.**
2. **The question paper should be relevant to the set of course outcome.**
3. **Question Papers shall be prepared to incorporate varying levels of difficulty suchas:**
   i. **Must know – vital (60% weightage)**
   ii. **Should know – essential (20% weightage)**
   iii. **Could know – desirable (20% weightage)**
4. **The length of the question-reasonably feasible for an average student to answerwith in the stipulated time.**

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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	-	-	00	00
109	Open Course-I **	2	2			50	00
		32	**18**	**05**	**10**	**330**	**420**

*Student has to complete MOOCS-I compulsory [Please refer MOOCS guidelines as per point no. 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	Online	-	-	00	00
209	Open Course-II**	2	2			50	
		32	**19**	**05**	**10**	**290**	**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	-	-	00	00
309	Open Course-III **	2	2	-	-	50	00
		30	**19**	**05**	**04**	**410**	**340**

*Student has to complete MOOCS-III compulsory [Please refer MOOCS guidelines as per point no. 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	**04**	**02**	**-**	**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 studiedin 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 as 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 (ERD/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. Summary of the Syllabus Content

Sr. No	Syllabus Content	Remark (If Any)
1	**Total credit (114)** Credit structure in all semester as per AICTE Norms	
2	**Total Marks of Subjects- 2650** Marks & Credit distributed • Sem I - 750 (32) • Sem-II- 750 (32) • Sem-III-750(30) • Sem-IV-400 (20) • **Total -2650 (114)**	
3	It is mandatory to complete THREE MOOCs during MCA Course with 4 Credit each Total = 12 credit	MOOCS becomes Mandatory as per UGC and AICTE Norms.
4.	Total number of Specialization= 12 Each candidate has to select any two groups out of these	
5	Three Open courses one in each at Sem-I , Sem-II and Sem-III with three internal options for course selection	
6	Examination Pattern UE-100 MARKS (3 hours duration) convert to 60 marks. IE – 40 marks Ratio of UE:IE is 60:40 Total = 100	

As Per AICTE –Module – New Course Structure MCA CBCS -2022- 2023

Major Highlights

1. **Credit and Marks Structure**

   - ✓ I Year - 64 Credits (32 Credit + 32 Credit)
   - ✓ II Year - 50 Credits (30 Credit + 20 Credit)
   - ✓ **Total =114 Credit**
   - ✓ Total Marks- 2650 (I to IV Sem)
   - ✓ Structure – UE+IE, IA, (Open) and MOOCS

2. **Offering New Specialization -**
   Introduce New Additional Specialization & Develop Syllabus Structure = One(1)
   - ✓ Data Management

3. **Developed New Open subject Syllabus content = Twelve (12)**
   - ✓ Human Universal Values
   - ✓ Soft Skills
   - ✓ Foreign Language
   - ✓ Cyber security
   - ✓ Human Psychology at workplace
   - ✓ Digital Technology
   - ✓ Social Change in Technology
   - ✓ Water Management
   - ✓ Economics for IT Industry

4. **Introduction of MOOCS from Semester III Onwards- Compulsory (Three)**

5. **Examination pattern - 100 Marks (60-UE + 40-IE)**
   - ✓ Examination HOURS 3 Hrs

6. **Total No of Subjects offering (4 Semester) = 31**

Program Structure

AQAR Based Course structure – Course mapping and outcome base subjects

Sr.No.	MCA	No. of Subjects
1	Core Subjects	23
2	Electives Subjects (12 Elective * 2 Subjects = 24 Subjects) each for semester V& VI	24
3	Open Subjects	09
4	MOOCS	03
	TOTAL	**59**

Sr.No.	MCA	No. of Course
1	Employability Skill	8
2	Skill Development (Life Skill, Knowledge Skill, Personality Skill, Managerial Skill)	4

Sr.No.	Name of the Course	No. of Course
1	**Combination of Progrmme as per UGC AND AQAR (Core+ Elective + Open+ MOOCS) = 4 COMBINATION**	62
2	Core Course (Common Subject Sem - I to VIII)	23
3	Open Courses (Sem - I to VIII)	12
4	DSE - Discipline Specific Elective (12 Elective * 2)	24
5	Ability Enhancement Compulsory Course (Sem - I to VIII)	4
	Total Courses	**63**

XVIII. 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 formulae, 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- Sequence, 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-whileloop, 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	**8**	**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.	**9**	**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,	**9**	**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	**8**	**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,	**9**	**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	**9**	**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	**8**	**CO4**	Lectures with PPTs, Write NoSQL and Mongodb Documents	Compose and execute	Understand and calculate cost of project

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO**101.**1	3	2	-	-	-	-	-	-	-	-
CO**101.**2	-	2	-	-	-	-	-	-	-	-
CO**101.**3	-	-	3	-	-	3	-	-	-	-
CO**101.**4	-	-	-	2	-	-	-	-	-	-
CO**101.**5	-	-	2	-	-	-	-	-	-	-
CO**101.**6	-	-	2	-	-	-	-	-	-	-
CO**101.**7	-	-	-	-	2	-	-	-	-	-
CO**101.**8	-	-	2	2	-	-	-	-	-	-
CO**101.**9	-	-	-	-	-	-	-	-	2	-
CO**101.**10	-	-	-	-	-	-	-	-	-	2
CO	0.3	0.4	0.9	0.4	0.2	0.3	-	-	0.2	0.2
CO	0	0	1	0	0	0			0	0

1- Low , 2- Medium, 3- High, If no correlation, put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping
Internal Assessment Mapping

Parameter	Marks	CO1	CO2
Class Participation/ Attendance	10	5	5
periodic assessments for analytical and critical thinking abilities	5	2.5	2.5
coding challenges or assignments	5	2.5	2.5
Internal Exam	40	20	20
End Term (Univ)	60		

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Appendix:

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 and PO1 Mapped at 3	**Computational Knowledge** There is a high correlation (3) between CO1 (Remember the database concepts) and PO1 (Computational Knowledge) because understanding database concepts requires fundamental knowledge of computing fundamentals and mathematics.
CO2 and PO2 Mapped at 3	**(Problem Analysis)**: There is a medium correlation (2) between CO2 (Understand the concept of database and techniques for its management) and PO2 (Problem Analysis) because understanding database concepts is essential for analyzing problems related to database management.
CO3 and PO3 Mapped at 3	**(Design/Development of Solutions)** : There is a high correlation (3) between CO3 (Understand data security standards and methods) and PO3 (Design/Development of Solutions) because designing and implementing solutions for database security involves understanding security standards and methods
CO4 and PO4 Mapped at 3	**(Conduct research in Computing problems)** : There is a medium correlation (2) between CO4 (Understand the fundamentals of Distributed Database Systems) and PO4 (Conduct research in Computing problems) because understanding distributed database systems requires research-based knowledge and methods.
CO5 and PO5 Mapped at 3	**(Modern Tool Usage)** : There is a medium correlation (2) between CO5 (Design different data models at conceptual and logical levels and translate ER Diagrams to Relational Data Model) and PO5 (Modern Tool Usage) because designing data models often involves using modern tools for analysis and design.
CO6 and PO6 Mapped at 3	**(Professional Ethics)** There is a high correlation (3) between CO6 (Normalize the database) and PO6 (Professional Ethics) because maintaining ethical standards, such as data normalization, is essential in database management.
CO7 and PO7 Mapped at 3	**(Lifelong Learning)** : There is a medium correlation (2) between CO7 (Identify and study the file organization schemes for DBMS) and PO7 (Lifelong Learning)

	because understanding file organization schemes requires continuous learning and staying updated with advancements in the field.
CO8 and PO8 Mapped at 3	**(Management Domain)**: There is a medium correlation (2) between CO8 (State and Describe features for Concurrency and Recovery) and PO8 (Management Domain) because managing concurrency and recovery features in database systems involves project management skills.
CO9 and PO9 Mapped at 2	**(Communication Efficacy)** : There is a medium correlation (2) between CO9 (Convert the relational algebra statements to the SQL statements) and PO9 (Communication Efficacy) because effectively communicating SQL statements requires proficiency in verbal and non-verbal communication.
CO10 and PO10 Mapped at 2	**(Innovation and Entrepreneurship)** : There is a medium correlation (2) between CO10 (Design the queries using Relational Algebra) and PO10 (Innovation and Entrepreneurship) because designing efficient queries involves innovation and problem-solving skills, which are essential for entrepreneurship.

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)	**8**	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.	**9**	CO2	Lecture with PPTs	Understanding	End Term Internals Assignments Quiz
3	**Network Layer:** **Network Layer Design Issues;**	**9**	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	**9**	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.	**9**	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**	**9**	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	**8**	CO6	Lecture With PPTs, Demonstration	Evaluating And Understanding	End Term Internals Assignments Quiz

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO102.1	**3**	**1**	**-**	**1**	**-**	**1**	**1**	**-**	**-**	**-**
CO102.2	**2**	**2**	**2**	**-**	**3**	**-**	**3**	**-**	**2**	**1**
CO102.3	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**1**
CO102.4	**2**	**1**	**3**	**2**	**2**	**-**	**-**	**2**	**-**	**-**
CO102.5	**3**	**-**	**1**	**3**	**2**	**1**	**1**	**-**	**-**	**1**
CO102.6	**2**	**3**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
CO	**2.5**	**1.6**	**1.3**	**1.3**	**1.8**	**0.6**	**1.1**	**0.8**	**0.6**	**0.5**
CO	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**

1- Low , 2- Medium, 3- High, If no correlation, put '-'

(Rationale in Appendix)

Evaluation

External : 60%

Internals: 40%

Total :100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**5**	**1**	**1**	**1**	**0.5**	**0.5**	1
Quiz	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Assignments/ Projects	**5**	**1**	**1**	**1**	**1**	**0.5**	**0.5**
Internal Mid Term Exam	**20**	**3**	**4**	**3**	**4**	**2**	**4**
Internal	**40**	**07**	**08**	**07**	**7.5**	**04**	**6.5**
UniversityEnd Term Exam	**60**						

Attendance Policy

95-100%	**05 marks**
90-94%	04marks
85-89%	03 marks
80-84%	02 marks
75- 79%	01 marks

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

Appendix:

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Helps to rememberthe concept of computer network with its features with applying the knowledge of computing fundamentals
CO1 & PO2 Mapped at 1	Ability to identify thenetworking and use of topologies with its types.
CO1 & PO4 Mapped at 1	Ability tounderstand the network operating systems and how the networks are developed as per the need of the organization
CO1 & PO6 Mapped at 1	Helps to understand device sharing and use of various new network technologies
CO1 & PO7 Mapped at 1	Ability to learn the basic concepts of the computer network, its architecture and operation
CO2 & PO1 Mapped at 2	Understand the basic concepts to work with network terminology and also ability to understand methods and properties used in the implementation of network in an organization
CO2 & PO2 Mapped at 2	Ability to identify , analyze , formulate and provide the solution to the given problem
CO2 & PO3 Mapped at 2	Ability to learn the study in advanced networking courses.
CO2 & PO5 Mapped at 3	Ability to make use of modern tools, skills and techniques to analyze the problems, along with the design and development.
CO2 & PO7 Mapped at 3	Enhance knowledge to recognize the need for developing in continuous learning for recent trends in advanced networking with its techniques and specifications.
CO2 & PO9 Mapped at 2	Ability to learn Synchronous and Asynchronous Transmission, Multiplexing techniques in computer networking.
CO2 & PO10 Mapped at 1	Helps to understand therecent trends of networking.
CO3 & PO1 Mapped at 3	Applying the concept of network terminologies and also getexposer to advanced network technologies like MANET, WSN, and 4G..
CO3 & PO2 Mapped at 3	Ability toprovide the solution to the given problem by applying the concept of X.25, ISDN, Frame relay, ATM, Ethernet, Wireless LANs- (Wi-Fi)
CO3 & PO3 Mapped at 2	Helps to understand network layer design issuesand routingalgorithms.
CO3 & PO4 Mapped at 2	Ability to learn transport and application Support Protocols and implantation techniques.
CO3 & PO5 Mapped at 3	Helps to understand general principal of congestion control, congestion prevention polices used in network layer in computer network.
CO3 & PO6 Mapped at 2	Ability to learn and inculcate data encryption and data security terminology and analysed by using various methods.
CO3 & PO7 Mapped at 2	Enhance learning and practicing the concept of token passing in networking.
CO3 & PO8 Mapped at 2	Applying the use of innovative techniques likeBluetooth, Infrared, MANET, and sensornetworks using advance network skills.
CO3 & PO9	Ability to applying the skills like IP Addressing, Allocate Address Classes (A, B, C,

Mapped at 2	D, E), Broadcast address, Multicast address, Network Mask using network terminology.
CO3 & PO10 Mapped at 1	Ability to provide the environment to acquire the concept of sensor networks, itsapplications, design issues and requirements.
CO4 & PO1 Mapped at 2	Ability to use proper methods of mobile Ad-hoc networks likedestination-sequenced distance vector protocol, Ad-hoc On-Demand distance vector protocol.
CO4 & PO2 Mapped at 1	Applying fundamental knowledge of software engineering and network systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO4 & PO3 Mapped at 3	Ability to design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations
CO4 & PO4 Mapped at 2	Ability to design of experiments, analysis,evaluate and interpretation of data, and synthesis of the information to provide valid conclusions.
CO4 & PO5 Mapped at 2	Ability to design, development, testing and deployment, problems analysed by using modern tools.
CO4 & PO8 Mapped at 2	Ability to involve in projects development as individual or group to solve problems in various domains and environments using computational and networking skills.
CO5 & PO1 Mapped at 3	Helps to createwebsite development formats by using the concepts of computer networkmethodology.
CO5 & PO3 Mapped at 1	Ability to design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations
CO5 & PO4 Mapped at 3	Ability to design of experiments, analysis,evaluate and interpretation of data, and synthesis of the information to provide valid conclusions
CO5 & PO5 Mapped at 2	Helps to createthe domain name service by using modern tools in networking area.
CO5 & PO6 Mapped at 1	Helps to Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO5 & PO7 Mapped at 1	Helps to understand the structure of Internet through Client Sever,domain name for the business applications.
CO5 & PO10 Mapped at 1	Providing conducive environment for innovation and entrepreneurship leading to solutions
CO6& PO1 Mapped at 2	Ability to learnmobile telephone systems, various generations' mobile technology. Ability to design of experiments, analysis,evaluate and interpretation of mobile-IP and also IPv6 concept in networking which is adopted in organization
CO6& PO2 Mapped at 3	Helps to Learn and inculcate smart mobile facilities and variousapplications (Apps) installed on Mobile.
CO6& PO5 Mapped at 1	Helps to remember the concept of mobile sub netting and applying sub netting concept in computer networking.
CO6 & PO8 Mapped at 1	Ability to learninternet control protocol like ICMP, IGMP and implementation standards in various industries.

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. Java data types, variables, operators, expressions, type conversion and casting in Java. Control structures in java: if, if-else and switch	9	CO 1	Lecture with PPTs, Practicing programming problems	Understand, Apply, Analyze	Quiz, writing short answers

	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 Handling and user defined exceptions.	8	CO1	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers
4	**Inheritance and Polymorphism :** Concept and importance of inheritance, is-a	8	CO2, CO3	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers

	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.					
5	**Concurrent Programming:** Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods .	9	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 streams – DataInput and DataOutput Streams using BufferedReader, BufferedWriter. Making use of Object Streams for Serialization	9	CO5	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers

	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.	9	CO4	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO103.1	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO103.2	**3**	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO103.3	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO103.4	**3**	**2**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**
CO103.5	**3**		**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO.	**3**	**2.33**	**3**	**-**	**2.33**	**-**	**-**	**-**	**-**	**-**
CO	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

Evaluation

Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	**10**	**2**	**2**	**2**	**2**	**2**
Assignments/ Projects	**10**	**2**	**2**	**2**	**2**	**2**
Internal End Term Exam	**20**	**4**	**4**	**4**	**4**	**4**
Internal	**40**	**8**	**8**	**8**	**8**	**8**
End Term (Univ)	**60**					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	The student develops ability to develop different programming constructs for given problem and to design a solution.
CO1 & PO2 Mapped at 3	Writing programs develops skills of the student to analyze the problem and apply programming skills to develop solution for the given problem.
CO1 & PO3 Mapped at 3	Develops ability of the student to design and develop solutions to given problem.
CO2 & PO1 Mapped at 3	Learning a new programming paradigm, develops ability to of the student to design solution considering new concepts.
CO2 & PO3 Mapped at 3	While thinking of a solution for the given problem, the solution is to be designed with different paradigm, and learn to evaluate the solution.
CO2 & PO5 Mapped at 2	All latest languages are OOP languages and using those effectively one need to understand basic concepts used in OOP languages, and it keeps student updated.
CO3& PO1 Mapped at 3	Thinking with OOP is the base for developing any solution for the given problem.
CO3 & PO2 Mapped at 2	The course is designed to develop ability of the student to analyze the problem and design the solution by applying OOP techniques.
CO3& PO3 Mapped at 3	The objective of the course is to developability of student to design and develop OOP solution for the given problem.
CO3& PO5 Mapped at 2	OOP platform is all time preferred by industry due to its advantages, and student need to know about their implementation.
CO4 & PO1 Mapped at 3	Different java collections help to manage application data efficiently, and hence develops skills of the student to make proper selection of collection and apply it for the problem under study.
CO4 & PO2 Mapped at 2	For selecting and applying proper java collection needs to understand their advantages and disadvantages, and at the same time need to analyze the problem critically.
CO4 & PO3 Mapped at 3	The critical analysis of problem help in developing solution and evaluate it, at the same time to add more efficiency different java collections may be used.
CO4 & PO5 Mapped at 3	Java collections and utility classes helps student to understand latest technology used in industry.
CO5& PO1 Mapped at 3	One need to understand and apply knowledge of Streams in java for input and output of data, which need to be applied for solution to the problem.
CO5 & PO3 Mapped at 3	While designing solution one need to plan for proper input and output design based on the knowledge of various input output streams used in java.

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** :	8	CO 1	Lecture with Ppts		Case Study , Newspaper

	Concept of central tendency of statistical data, Statistical averages, characteristics 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 andPercentiles (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			Case Study Psychometric Tools	Apply (Analyse)	Article End Term: Applied Questions
3	**Moments, Skewness and Kurtosis** : Concept of Raw and central moments, Formulae for ungrouped and grouped data (only	9	CO 2	Lecture with PPTs Case Study	Analyse	Case Study with Presentations End Term Exams: Case based

	first four moments), relation between central and raw moments upto fourth order. (without 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					Questions/Applied Questions
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	9	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.	9	CO3	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied
6	**Time Series:** Meaning and utility ,	9	CO4	Lectures with PPTs	Evaluate	Activity End Term:

	Components of time series , Additive and multiplicative models , Methods of estimating trend : moving average method, least squares method and exponential smoothing method(with graph and interpretation)			Flip Classroom		Theory Applied
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	8	CO4			

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO104.1	**3**	**3**	**3**	**3**	**3**	**0**	**3**	**3**	**0**	**0**
CO104.2	**3**	**3**	**2**	**3**	**-**	**0**	**2**	**3**	**0**	**0**
CO104.3	**3**	**1**	**2**	**1**	**-**	**0**	**1**	**3**	**0**	**0**
CO104.4	**3**	**-**	**-**	**3**	**1**	**0**	**1**	**3**	**0**	**0**
CO.	**3**	**1.75**	**1.75**	**2.5**	**1**	**0**	**1.75**	**3**	**0**	**0**
CO	**3**	**2**	**2**	**2**	**1**	**0**	**2**	**3**	**0**	**0**

1- Low, 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)

Evaluation

Internals: 40%

Externals: 60%
Total: 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Live project – club activity	**10**	**3**	**2**	**2**	**3**
Assignments/ Projects	**10**	**3**	**2**	**3**	**2**
Internal End Term Exam	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Internal	**40**	**11**	**9**	**10**	**10**
End Term (Univ)	**60**				

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Remembering the definitions of concepts of computing fundamentals, mathematics and given domain to design appropriate models for industrial data security. Hence it is highly correlated.
CO1 & PO 2 Mapped at 3	Remembering fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the appropriate models for industrial data security. Hence it is highly correlated.
CO1 & PO 3 Mapped at 3	Remembering fundamental knowledge for design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations. Hence it is highly correlated.
CO1 & PO 4 Mapped at 3	Using research-based knowledge and research methods including design of experiments, analysis and interpretation of data in data management and industrial data security. Hence it is highly correlated. Hence it is highly correlated.
CO1 & PO5 Mapped at 3	Remembering concepts for making modern tools for delivering milestones like problem analysis, design, development, testing and deployment in data management and industrial data security. Hence it is highly correlated.
CO1 & PO6 Mapped at 0	Remembering the definitions of concepts and learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world is not correlated with the data management and industrial data security.
CO1& PO7 Mapped at 3	Remembering the definitions of concepts through continuous professional development in the field of industrial data security and practice it through self-motivated, independent learning. Hence it is highly correlated.

CO1& PO8 Mapped at 3	Remembering the definitions of concepts can helpful for project development as individual or group to solve problems in various domains and environments using computational and management Hence it is slightly correlated.
CO1& PO9 Mapped at 0	Remembering the definitions of concepts is not related to demonstration efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO1& PO10 Mapped at 0	Remembering the definitions is not related to providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO2& PO1 Mapped at 3	Understanding the concept of Statistics and their methods for its data analytics, data engineering is useful for applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements. Hence it is highly correlated.
CO2& PO 2 Mapped at 3	Understanding the concept of Statistics and their methods for its data analytics, data engineering is used for aapplying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem. Hence it is highly correlated.
CO2& PO 3 Mapped at 3	Understanding the concept of Statistics and their methods for its data analytics, data engineering is useful for designing and evaluates solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations. Hence it is highly correlated
CO2& PO 4 Mapped at 3	Understanding the concept of Statistics and their methods for its data analytics, data engineering is useful for using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Hence it is highly correlated
CO2& PO5 Mapped at 3	Understanding the concept of Statistics and their methods for its data analytics, data engineering is useful for using of modern tools for delivering milestones like problem analysis, design, development, testing and deployment. Hence it is highly correlated
CO2& PO6 Mapped at 0	Understanding the concept of Statistics and their methods for its data analytics, data engineering is not correlated with learning and inculcates professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO2& PO7 Mapped at 2	Understanding the concept of Statistics and their methods for its data analytics, data engineering is useful for continuous professional development and practices it through self-motivated, independent learning. Hence it is slightly correlated
CO2& PO8 Mapped at 3	Understanding the concept of Statistics and their methods for its data analytics, data engineering is useful for Involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills. Hence it is highly correlated
CO2& PO9 Mapped at 0	Understanding the concept of Statistics and their methods for its data analytics, data engineering is not correlated with ddemonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO2& PO10 Mapped at 0	Understanding the concept of Statistics and their methods for its data analytics, data engineering is not correlated with providing conducive environment for

	innovation and entrepreneurship leading to solutions for betterment of society
CO3& PO1 Mapped at 3	Data engineering and their conceptis useful for applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements. Hence it is highly correlated.
CO3& PO 2 Mapped at 3	Data engineering and their conceptis useful for applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem. Hence it is highly correlated.
CO3& PO 3 Mapped at 3	Data engineering and their concept is useful for making design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations. Hence it is highly correlated.
CO3& PO 4 Mapped at 3	Data engineering and their conceptare useful for getting research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Hence it is highly correlated.
CO3& PO5 Mapped at 3	Data engineering and their concept are required for making modern tools for delivering milestones like problem analysis, design, development, testing and deployment. Hence it is highly correlated.
CO3& PO6 Mapped at 0	Data engineering and their conceptare not related with learn and inculcate professional ethics, cyber regulations, professionalresponsibilities and norms of professional computing world.
CO3& PO7 Mapped at 1	Data engineering and their concept are slightly correlated for acknowledging the need for continuous professional development and practice it through self-motivated, independent learning
CO3& PO8 Mapped at 3	Data engineering and their concept are iinvolving in projects development as individual or group to solve problems in various domains and environments using computational and management skills. Hence it is highly correlated.
CO3& PO9 Mapped at 0	Data engineering and their concept are not correlated to ddemonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO3& PO10 Mapped at 0	Data engineering and their conceptare not correlated to provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO4& PO1 Mapped at 3	Identifying and study the data foranalytics purpose are used to design appropriate models for a given problem and/or requirements. Hence it is highly correlated.
CO4& PO 2 Mapped at 3	Identifying and study the data foranalytics purpose providing the solution to given problem. Hence it is highly correlated.
CO4& PO 3 Mapped at 3	Identifying and study the data foranalytics purpose is useful for ddesigning and evaluating solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations. Hence it is highly correlated.
CO4& PO 4 Mapped at 3	Identify and study the data foranalytics purpose means 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. Hence it is highly correlated.
CO4& PO5	Identify using modern tools for delivering milestones like problem analysis,

Mapped at 3	design, development, testing and deployment. Hence it is highly correlated.
CO4& PO6 Mapped at 0	Identifying and study the data foranalytics purpose is not correlated with learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO4& PO7 Mapped at 1	Identify and study the data foranalytics purpose is slightly correlated with aacknowledge the need for continuous professional development and practice it through self-motivated, independent learning.
CO4& PO8 Mapped at 3	Identify and study the data foranalytics purposeinvolving in projects development as individual or group to solve problems in various domains and environments using computational and management skills. Hence it is highly correlated.
CO4& PO9 Mapped at 0	Identify and study the data foranalytics purpose is not correlated with ddemonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO4& PO10 Mapped at 1	Identify and study the data foranalytics purpose is slightly related to provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.

Programme:MCACBCS– RevisedSyllabusw.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
I	**105**	**MANAGEMENT CONCEPTS AND APPLICATIONS**	
	Prepared By	Dr. A.B.Nadaf	
Type	**Credits**	**Evaluation**	**Marks**
MDC	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: Students 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	09	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	09	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	09	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	08	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.	07	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	09	CO4	Classroom Sessions	Apply the knowledge gained so far	Case Study, End Term

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10
CO105.1	-	-	-	-	-	01	-	02	-	-
CO105.2	-	-	-	-	-		02	-	-	-
CO105.3	-	02	-	-	-	-	-	-	-	-
CO105.4	-	-	-	-	-	-	-	02	-	-
CO105.5	-	-	-	-	-	-	-	-	-	02
CO	-	0.4	-	-	-	0.25	0.4	0.8.	-	0.4
CO	-	0	-	-	-	0	0	1	-	

1- Low , 2- Medium, 3- High, If no correlation,put '-'

Evaluation

Internal: 40%

External Assessment: 60%

Total-100%

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Test	05	05	00	00	00	00
Attendance	15	03	03	03	03	03
Prelims	15	03	03	03	03	03
Assignments	05	01	01	01	01	01
Internal (40marks)	40	12	07	07	07	07
End Term (To be converted into 60 marks Univ)	60					

Reference Books:

Sr.No.	NameoftheAuthor	Title ofthe Book	Year Edition	Publisher Company
1	L M Prasad	Principles of Management	2018	Sultan Chand Publications
2	TRamaswamy	Principles of management	2015	Himalaya Publications
3	Richard Daft	New Era of Management	2017	South Western Sangage Learning
4.	Michael J Shaw	E Commerce and the DigitalEconomy	2020	Ess Ess Publications

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO6 mapped at 01	To achieve CO1, instructional methods might include case studies, real-life examples, and practical applications of management concepts. For PO6, a combination of lectures, discussions, and perhaps guest lectures from industry professionals could be beneficial
CO1 & PO8 mapped at 2	Students should be given opportunities to apply both computational and management skills in a project setting, simulating real-world scenarios. This could involve problem-solving, decision-making, and the application of theoretical knowledge in a practical context
C02 and PO7 mapped at 2	By combining real-life case studies with ERP utilization in the context of management functions, and emphasizing the importance of continuous professional

	development through self-motivated learning, students can gain practical skills and a proactive approach to career growth.
CO3 & PO2 mapped at 02	It helps students develop a comprehensive understanding and practical skills in fact-finding for e-commerce environments and applying fundamental knowledge in software engineering and systems domains for problem-solving.
CO4 & PO8 mapped at 2	By combining advanced fact-finding techniques and performance evaluation with practical project development in various domains, students can not only enhance their analytical skills but also apply computational and management skills in real-world scenarios. This approach prepares them for the dynamic challenges they may encounter in their future professional endeavors.
CO5 & PO10 mapped at 02	By aligning the objectives for fact-finding, project development, solution creation, and fostering innovation and entrepreneurship, students can develop a well-rounded skill set and mindset for addressing real-world challenges and contributing to societal betterment.

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,	**8**	**CO2,CO3, CO6**	Lecture with Ppts, Discussion	Understand	Discussion

	removing table, Creating Tables with 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	**6**	**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.	**6**	**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	**6**	**CO3,CO5**	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.	**6**	**CO3,CO5**	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.	**6**	**CO3,CO5**	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,CO4**	Lectures with PPTs, Write NoSQL and Mongodb Documents	Compose and execute	Practical Assignments And Practice

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO106.1	3	-	-	-	2	-	-	-	-	-
CO106.2	-	3	3	3	-	-	-	-	-	-
CO106.3	-	2	3	-	-	-	-	-	-	-
CO106.4	-	-	-	3	2	-	-	-	-	-
CO106.5	-	-	3	-	2	-	-	-	-	-
CO106.6	2	2	-	-	-	-	-	-	-	-
CO	0.83	1.11	1.4	1	1	-	-	-	-	-
CO	1	1	1	1	1	-	-	-	-	-

1- Low , 2- Medium, 3- High, If no correlation, put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2
Class Participation/ Attendance	10	5	5
periodic assessments for analytical and critical thinking abilities	5	2.5	2.5

coding challenges or assignments	5	2.5	2.5
Practical assignments	40	20	20
End Term (Univ)	60		

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1& PO1 Mapped at 3	It has a high correlation (level 3) with PO1 (Computational Knowledge) because understanding and utilizing different operators require a strong foundation in computational concepts.
CO1& PO5 Mapped at 2	It has a medium correlation (level 2) with PO5 (Modern Tool Usage) because using various operators often involves modern tools for query execution and testing.
CO2& PO2 Mapped at 3	It has a high correlation (level 3) with PO2 (Problem Analysis) because understanding the theoretical and physical aspects of databases involves analyzing problems and identifying solutions.
CO2 & PO3 Mapped at 3	It has a high correlation (level 3) with PO3 (Design/Development of Solutions) because implementing RDBMS concepts through Oracle requires designing and evaluating solutions.
CO3 & PO2 Mapped at 2	It has a medium correlation (level 2) with PO2 (Problem Analysis) because implementing RDBMS concepts involves analyzing requirements.
CO3 & PO3 Mapped at 3	It has a high correlation (level 3) with PO3 (Design/Development of Solutions) because it directly involves designing and implementing solutions using Oracle technologies.
CO4 & PO4 Mapped at 3	It has a high correlation (level 3) with PO4 (Conduct research in Computing problems) because observing query performance involves analyzing and interpreting data.
CO4& PO5 Mapped at 2	It has a medium correlation (level 2) with PO5 (Modern Tool Usage) because testing query performance requires modern tools for monitoring and optimization.
CO5 & PO3 Mapped at 3	It has a high correlation (level 3) with PO3 (Design/Development of Solutions) because testing results involve evaluating solutions and processes.
CO5 & PO5 Mapped at 2	It has a medium correlation (level 2) with PO5 (Modern Tool Usage) because testing involves the use of modern tools for verification.
CO6 & PO1,PO2 Mapped at 2	It has a medium correlation (level 2) with PO1 (Computational Knowledge) and PO2 (Problem Analysis) because constructing queries requires computational knowledge and problem analysis skills.

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**
DSC	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)	7	CO 1	Lecture with PPTs, Practicing programming problems	Understand, Apply, Analyze	Quiz, testing programming skills through practical test.
2	**Class and Object Concepts**	7	CO2, CO3	PPTs, Practicing	Understand, Analyze,	Quiz, testing programming

	- Wring a class, creating objects and using it - Using constructors to initialize object - Programs to demonstrate paramete passing - Making use of acces modifiers			programming problems	Apply	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	7	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	7	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 and inter	7	CO1	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.

	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	5	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	5	CO4	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO107.1	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO107.2	**3**	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO107.3	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO107.4	**3**	**2**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**
CO107.5	**3**		**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO.	**3**	**2.33**	**3**	**-**	**2.33**	**-**	**-**	**-**	**-**	**-**

CO	**3**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	**10**	**2**	**2**	**2**	**2**	**2**
Assignments/ Projects	**10**	**2**	**2**	**2**	**2**	**2**
Internal End Term Exam	**20**	**4**	**4**	**4**	**4**	**4**
Internal	**40**	**8**	**8**	**8**	**8**	**8**
End Term (Univ)	**60**					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	The student develops ability to develop different programming constructs for given problem and to design a solution.
CO1 & PO2 Mapped at 3	Writing programs develops skills of the student to analyze the problem and apply programming skills to develop solution for the given problem.
CO1 & PO3 Mapped at 3	Develops ability of the student to design and develop solutions to given problem.
CO2 & PO1 Mapped at 3	Learning a new programming paradigm, develops ability to of the student to design solution considering new concepts.
CO2 & PO3 Mapped at 3	While thinking of a solution for the given problem, the solution is to be designed with different paradigm, and learn to evaluate the solution.
CO2 & PO5 Mapped at 2	All latest languages are OOP languages and using those effectively one need to understand basic concepts used in OOP languages, and it keeps student updated.
CO3& PO1 Mapped at 3	Thinking with OOP is the base for developing any solution for the given problem.
CO3 & PO2 Mapped at 2	The course is designed to develop ability of the student to analyze the problem and design the solution by applying OOP techniques.
CO3& PO3 Mapped at 3	The objective of the course is to develop ability of student to design and develop OOP solution for the given problem.
CO3& PO5 Mapped at 2	OOP platform is all time preferred by industry due to its advantages, and student need to know about their implementation.
CO4 & PO1 Mapped at 3	Different java collections help to manage application data efficiently, and hence develops skills of the student to make proper selection of collection and apply it for the problem under study.
CO4 & PO2 Mapped at 2	For selecting and applying proper java collection needs to understand their advantages and disadvantages, and at the same time need to analyze the problem critically.

CO4 & PO3 Mapped at 3	The critical analysis of problem help in developing solution and evaluate it, at the same time to add more efficiency different java collections may be used.
CO4 & PO5 Mapped at 3	Java collections and utility classes helps student to understand latest technology used in industry.
CO5& PO1 Mapped at 3	One need to understand and apply knowledge of Streams in java for input and output of data, which need to be applied for solution to the problem.
CO5 & PO3 Mapped at 3	While designing solution one need to plan for proper input and output design based on the knowledge of various input output streams used in java.

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
I	**109**	**Universal Human Values**	
	Prepared By	Dr. Deepali Gala	
Type	**Credits**	**Evaluation**	**Marks**
VBC	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.	7	CO1, CO2	As per individual faculty discretion	Remembering	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 -	8	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.	8	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.	7	CO4, CO5	As per individual faculty discretion	Analyse & Create	As per individual faculty discretion

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO109.1	-	-	-	-	-	**2**	-	-	**2**	-
CO109.2	-	-	-	-	-	-	-	-	-	-

CO109.3	-	-	-	-	-	-	-	-	-	-
CO109.4	-	-	-	-	-	3	-	-	-	-
CO109.5	-	-	-	-	-	2	-	-	3	-
CO109.6	-	-	-	-	-	-	3	-	-	-
CO	-	-	-	-	-	1.1	3	-	0.8	-
CO	-	-	-	-	-	1	3	-	1	-

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)

Evaluation

Internals: 100%

Externals: 0%

Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Live project – club activity	**10**			**5**			**5**
Case study discussion	**20**		**5**		**5**	**5**	**5**
Assignments/ Projects	**10**	**2**	**2**	**2**	**2**	**2**	
Internal	**50**	**4**	**9**	**9**	**9**	**8**	**11**

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Appendix:

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO6 Mapped at 2	Provides the groundwork for the development of professional ethics and in creatinga bridge between the broader understanding of human values and the specific ethical considerations within the professional computing world.
CO1 & PO9 Mapped at 2	It is crucial to recognize that an understanding of human values, introduced canplay a significant role in shaping ethical communication practices, which alignswith the broader objectives of professional communication outlined in the program outcome.
CO4 & PO6 Mapped at 3	Implies that ethical considerations are essential not only in the professional application of computing skills but also in the research domain.
CO5 & PO6 Mapped at 2	The responsible and ethical use of modern tools is an integral part of professional ethics in the computing field. While focusing on the practical aspects of tool usage,is influenced by the ethical principles.
CO5 & PO9 Mapped at 3	Effective communication is crucial when using modern tools in computing. Clear communication through reports and documentation enhances collaboration and understanding among team members during different development milestones.

CO6 & PO7 Mapped at 3	The connection lies in the aspect of lifelong learning and continuous development.It suggests the development of a harmonious environment, which may include fostering a culture of learning and growth. This aligns with the emphasis on continuous professional development.

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
I	**109**	**Cyber Security**	
	Prepared By	Dr.Shabnam Mane	
Type	**Credits**	**Evaluation**	**Marks**
AEC	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	7	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,	8	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	7	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	8	CO1	Lectures with PPTs Group Activity Case Study	Apply (Analyse)	Group Activity End Term Exam: Short case and situation based questions

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO109.1	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**1**
CO109.2	**3**	**3**	**3**	**3**	**3**	**3**	**1**	**3**	**2**	**2**
CO109.3	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
CO	**3**	**3**	**2.66**	**3**	**3**	**2.66**	**1.66**	**2**	**1.66**	**1.66**
CO	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)

Evaluation

Internals: 100%

Externals: 0%

Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3
Class Participation/ Attendance	**10**	**3**	**4**	**3**
Live Case study – club activity	**10**	**3**	**4**	**3**
Assignments	**10**	**3**	**4**	**3**
Internal End Term Exam	**20**	**5**	**10**	**5**
Internal	**50**	**14**	**22**	**14**
End Term (Univ)	**-**			

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	By combining knowledge of computing fundamentals and mathematics, you can design and implement effective encryption models that address the specific requirements of a given problem or domain. Continuous learning and staying updated on the latest advancements in cryptography are also essential for maintaining the security of systems over time.
CO1 & PO2 Mapped at 3	By combining a strong foundation in encryption concepts with solid software engineering practices, you can effectively analyze problems and provide secure solutions across various systems domains.
CO1 & PO3 Mapped at 3	By integrating encryption techniques into system design while considering societal values and industry expectations, students can create solutions that not only meet technical requirements but also align with ethical considerations and legal standards.
CO1 & PO4 Mapped at 3	Research-based knowledge and methods to gain deeper insights into encryption techniques, contributing to the advancement of the field and the development of more secure systems
CO1 & PO5 Mapped at 3.	Integrating Moderntools throughout the SDLC streamlines the development process and also contributes to a more secure and robust encryption implementation. It enables collaboration, automation, and continuous improvement, aligning with modern software engineering practices.
CO1 & PO6 Mapped at 3	By aligning encryption techniques with professional ethics, cyber regulations, and responsibilities in the computing world, you contribute to a secure and ethical digital environment. Balancing technical expertise with ethical considerations is essential for building trust and maintaining the integrity of the computing profession.
CO1 & PO7 Mapped at 2	By consistently engaging in self-motivated, independent learning, you not only enhance your understanding of encryption techniques but also develop a proactive approach to continuous professional development. The dynamic field of cryptography requires a commitment to staying current, and self-driven learning is a key component of achieving that goal.
CO1 & PO8 Mapped at 1	By combining computational skills with effective project management and problem-solving abilities, you can leverage encryption techniques to develop impactful projects that address real-world challenges across diverse domains and environments. This hands-on approach allows for practical application, skill development, and meaningful contributions to the field of encryption

CO1 & PO9 Mapped at 1	By demonstrating efficacy in both verbal and non-verbal means of communication, you not only convey your understanding of encryption techniques effectively but also make this complex computing knowledge accessible to a broader audience. This skill is essential for sharing insights, collaborating with diverse stakeholders, and fostering a shared understanding of encryption concepts in various professional settings
CO1 & PO10 Mapped at 1	Fostering an environment for innovation and entrepreneurship requires a collaborative effort from multiple stakeholders, including government, businesses, educational institutions, and the community. By creating a supportive ecosystem that values creativity, diversity, and social impact, you can inspire and enable innovators to develop solutions for the betterment of society.
CO2 & PO1 Mapped at 3	By integrating knowledge of computing fundamentals, mathematics, and the specific domain, you can design robust cryptographic models that enhance security in computer forensics and cybersecurity. The ability to apply these principles to real-world problems is crucial for building secure systems and protecting sensitive information.
CO2 & PO2 Mapped at 3	Understanding cryptography and its significance in computer forensics and cybersecurity involves applying fundamental knowledge in software engineering andthe systems domain. This integration ensures the development of secure systems, the effective implementation of cryptographic techniques, and the continuous improvement of security measures in response to evolving threats.
CO2 & PO3 Mapped at 3	Understanding cryptography and its importance in computer forensics and cybersecurity involves designing and evaluating solutions that not only meet technical needs but also consider societal values and industry expectations. By incorporating ethical considerations, complying with standards, and ensuring user-friendly interfaces, cryptographic solutions can contribute to a secure and ethical digital environment. Continuous improvement and adaptation to emerging threats are essential for maintaining the effectiveness of cryptographic measures over time.
CO2 & PO4 Mapped at 3	Understanding cryptography involves in-depth research-based knowledge and the application of research methods. By designing experiments, analyzing and interpreting data, and synthesizing information, valid conclusions can be drawn regarding the effectiveness, weaknesses, and usability of cryptographic techniques in computer forensics and cybersecurity. This research-driven approach ensures that cryptographic solutions are not only theoretically sound but also practical and effective in real-world scenarios.
CO2 & PO5 Mapped at 3	Understanding cryptography and its importance in computer forensics and cybersecurity requires the use of modern tools throughout the software development lifecycle. From problem analysis to deployment, leveraging tools for threat modeling, cryptographic design, secure coding, testing, and deployment ensures the robustness and effectiveness of cryptographic solutions. This integration enhances efficiency, accuracy, and security in the development and deployment of cryptographic systems.
CO2 & PO6 Mapped at 3	Understanding cryptography's importance in computer forensics and cybersecurity involves aligning practices with professional ethics, cyber regulations, and the norms of the professional computing world. Adhering to confidentiality, integrity, and authenticity principles, along with compliancewith data protection laws, demonstrates a commitment to ethical conduct in the use of cryptographic techniques.

CO2 & PO7 Mapped at 1	By consistently engaging in self-motivated, independent learning, you not only enhance your understanding of encryption techniques but also develop a proactive approach to continuous professional development.
CO2 & PO8 Mapped at 3	incorporating cryptographic principles into projects, along with strong computational and management skills, enhances the security posture of systems, protects sensitive information, and ensures the integrity of digital assets across various domains and environments.
CO2 & PO9 Mapped at 2	An effective integration of cryptography into computer forensics and cybersecurity requires not only technical proficiency but also strong communication skills. The ability to convey complex computing concepts verbally and through written documentation is essential for ensuring that security measures are well-implemented, understood, and maintained across diverse audiences and stakeholders.
CO2 & PO10 Mapped at 2	By intertwining the importance of cryptography in computer forensics and cybersecurity with a conducive environment for innovation and entrepreneurship, it becomes possible to develop cutting-edge solutions that not only secure digital systems but also contribute to the overall betterment of society
CO3 & PO1 Mapped at 3	Applying knowledge of computing fundamentals, mathematics, and the specific domain is essential for designing robust models and strategies to protect against cyber threats and enhance overall cybersecurity posture.
CO3& PO2 Mapped at 3	Applying fundamental knowledge of software engineering and the systems domain is essential for identifying, analyzing, and providing solutions to cybercrime. By integrating security measures into the development process and maintaining a proactive stance, organizations can enhance their resilience against cyber threats
CO3 & PO3 Mapped at 2	By integrating Design and evaluate solutions for specified set of needs into the design and evaluation of cybersecurity solutions, organizations can developrobust systems that not only address specific needs but also align with societal values and industry expectations. This holistic approach enhances the overall effectiveness and ethical standing of cybersecurity initiatives
CO3 & PO4 Mapped at 3	By integrating research-based knowledge and methodologies into the identification and response to cybercrime, organizations can draw valid conclusions, enhance their security postures, and stay ahead of evolving threats. This approach fosters a proactive and informed cybersecurity stance,

	contributing to more effective defense mechanisms and incident response strategies
CO3 & PO5 Mapped at 3	Incorporating modern tools at each stage of the software development and cybersecurity processes enhances efficiency, accuracy, and the overall security posture of systems. These tools contribute to the timely delivery of milestones, from problem analysis and design to development, testing, and deployment, while effectively addressing cybersecurity challenges.
CO3 & PO6 Mapped at 2	Identifying cybercrime and taking action involves a comprehensiveunderstanding of professional ethics, adherence to cyber regulations, fulfilling professional responsibilities, and embracing the norms of the professional computing world. Integrating ethical considerations into education, training, and professional development is crucial for fostering a culture of responsible and ethical behavior in the cybersecurity field.
CO3 & PO7 Mapped at 2	Continuous professional development is crucial in the field of cybersecurity, where the threat landscape is constantly evolving. Acknowledging the need for ongoing learning and self-motivated exploration ensures that cybersecurity professionals remain well-equipped to identify cybercrime and take effective action against emerging threats.
CO3 & PO8 Mapped at 2	By contributing to threat intelligence, incident response, security audits, and engaging in diverse projects, individuals or groups can play a key role in identifying, preventing, and mitigating cybercrime across various domains and environments. This approach fosters continuous learning and practical application of skills to address evolving challenges in the cybersecurity landscape.
CO3 & PO9 Mapped at 2	Clear communication through reports, design documentation, presentations, and collaborative discussions enhances the understanding of complex computing concepts and facilitates successful responses to cybersecurity challenges.
CO3 & PO10 Mapped at 2	By establishing innovation hubs, supporting startups, fostering cross-disciplinary collaboration, and promoting socially responsible entrepreneurship, organizations can contribute to the development of impactful solutions for the betterment of society.

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
I	**109**	**Soft Skills**	
	Prepared By	Dr. Amarja Nargunde	
Type	**Credits**	**Evaluation**	**Marks**
AEC	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	7	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	8	CO1	Lectures, Videos	Understand	Assignment &Class Exercises Evaluation
3	**Presentation Skills** Objectives , Types of	7	CO1,CO2	Lectures, Videos,	Create	PPT making and

	presentations, factors to be considered while preparing presentation , creating a Presentation, delivering a Presentation, attending a Presentation , body Language and etiquettes			Practical of making Presentation		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.	8	CO1	Lectures, Videos, Practical of task time management	Understand and Apply	Class Exercises Evaluation

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO109.1	**-**	**-**	**2**	**-**	**-**	**1**	**2**	**2**	**3**	**1**
CO109.2	**-**	**-**	**1**	**-**	**1**	**1**	**2**	**1**	**3**	**1**
CO	**-**	**-**	**1.5**	**-**	**1**	**1**	**2**	**1.5**	**3**	**1**
CO	**-**	**-**	**2**	**-**	**1**	**1**	**2**	**2**	**3**	**1**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)

Evaluation

Internals: 100%

Externals: -

Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2
Class Participation/ Attendance	**25**	**10**	**15**

Assignments/ Projects	**10**	**5**	**5**
Internal End Term Exam	**15**	**7.5**	**7.5**
Internal	**50**	**22.5**	**27.5**
End Term (Univ)			

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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**		

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO 3 Mapped at 2	To familiarise students about the various soft skills&Design/Development of Solutions: Design and evaluate solutions, systems, modules and processes for specified set of needs withappropriate consideration of societal values and industry expectations. – **Moderate Correlation** is found between CO and PO
CO1 & PO6 Mapped at 1	To familiarise students about the various soft skills&Professional Ethics: Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world. – **Low Correlation** is found between CO and PO
CO1 & PO7 Mapped at 2	To familiarise students about the various soft skills &LifelongLearning: Acknowledge the need for continuous professionaldevelopment and practice it through self-motivated, independent learning.- **Moderate Correlation** is found between CO and PO
CO1 & PO8 Mapped at 2	To familiarise students about the various soft skills &Management Domain: Involving in projects development as individual or group tosolve problems in various domains and environments using computational and management skills. – **Moderate Correlation** is found between CO and PO
CO1 & PO9 Mapped at 3	To familiarise students about the various soft skills &Communication Efficacy: Demonstrate efficacy in verbal and non-verbal means of communicationlike reports, design documentation and presentations to elaborate about complex computing. – **High Correlation** is found between CO and PO
CO1 & PO10 Mapped at 1	To familiarise students about the various soft skills &Innovation and Entrepreneurship: Provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society. – **Low** **Correlation** is found between CO and PO
CO2 & PO3 Mapped at 1	To boost students' communication and presentation skills &Design/Development of Solutions: Design and evaluate solutions,systems, modules and processes for specified set of needs withappropriate consideration of societal values and industry expectations. - **Low Correlation** is found between CO and PO
CO2& PO5	To boost students' communication and presentation skills&Modern Tool Usage: Use

Mapped at 1	of modern tools for delivering milestones like problem analysis, design, development, testing and deployment. - **Low Correlation** is found between CO andPO
CO2& PO6 Mapped at 1	To boost students' communication and presentation skills&Professional Ethics: Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world. - **Low Correlation** is found between CO and PO
CO2& PO7 Mapped at 2	To boost students' communication and presentation skills&Lifelong Learning: Acknowledge the need for continuous professionaldevelopment and practice it through self-motivated, independent learning. – **Moderate Correlation** is found between CO and PO
CO2& PO8 Mapped at 1	To boost students' communication and presentation skills&Management Domain: Involving in projects development as individual or group tosolve problems in various domains and environments using computational and management skills. - **Low Correlation** is found between CO and PO
CO2& PO9 Mapped at 3	To boost students' communication and presentation skills&Communication Efficacy: Demonstrate efficacy in verbal and non-verbal means of communicationlike reports, design documentation and presentations to elaborate about complex computing. – **High Correlation** is found between CO and PO
CO2& PO10 Mapped at 1	To boost students' communication and presentation skills&Innovation and Entrepreneurship: Provide conducive environment for innovation andentrepreneurship leading to solutions for betterment of society. - **Low Correlation** is found between CO and PO

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	10	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 UML Diagrams Iterative Development with RUP and Phases of RUP	10	CO2,CO3	Classroom Sessions	Understand	Case Study Discussion, Class Test' End Term Class Assignment

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	08	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	09	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	07	CO5	Classroom Sessions	Apply the knowledge gained so far	End Term

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**
CO201.1	01	01	01	-	-	-	-	-	-	-
CO201.2	01	03	01	-	-	-	-	-	-	-
CO201.3	-	02	-	-	-	-	-	-	-	-
CO201.4	-	-	03	-	-	-	-	02	-	-
CO201.5	-	03	02	01	-	-	-	-	-	-
CO	0.4	1.8	1.4	0.2	-	-	-	0.4		
CO	0	2	1	0	-	-	-	00		00

1- Low , 2- Medium, 3- High, If no correlation,put '-'

Evaluation

Internal 40%

External Assessment 60%
Total-100%

Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Test	05	05	00	00	00	00
Attendance	15	03	03	03	03	03
Prelims	15	03	03	03	03	03
Assignments	05	01	01	01	01	01
Internal (40marks)	40	12	07	07	07	07

End Term (Univ.)	60					

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 1	CO1 provides the practical steps, and PO1 complements this by introducing a more theoretical and conceptual aspect related to mathematical and domain knowledge.
CO1 & PO 2 Mapped at 1	CO1 focuses on the theoretical understanding and awareness of the software development process, while PO2 builds upon this foundation by requiring students to apply their knowledge in a practical context. In other words, CO1 introduces the steps and concepts, and PO2 expects students to apply these concepts to real-world problems in software engineering and systems domains.
CO1 & PO 3 Mapped at 1	CO1 provides the foundational knowledge about the software development process, and PO3 builds upon this foundation by emphasizing the design and evaluation of solutions with a broader perspective that includes societal values and industry expectations. CO1 serves as the base understanding, and PO3 extends this knowledge towards a more comprehensive and context-aware application of software engineering principles.
CO2 & PO 1 Mapped at 1	CO2 provides the input (user requirements), and PO1 focuses on the subsequent steps of applying this input to create effective software solutions.
CO2 & PO 2 Mapped at 1	CO2 contributes to the early stages of problem understanding, and PO2 extends this understanding into a broader context of solution formulation and application of software engineering principles.
CO2&PO3 Mapped at 3	. CO2 contributes to the early stages of problem understanding, and PO3 extends this understanding into a broader context of solution design and evaluation, incorporating ethical and societal considerations.

CO3 & PO2 Mapped at 2	CO3 contributes a specific set of skills related to object-oriented design and modeling, while PO2 encompasses a more comprehensive set of skills and knowledge required for software engineering problem-solving
CO4& PO3 Mapped at 3	CO4 provides a crucial skillset in requirements analysis, and PO3 extends this understanding into the broader perspective of designing solutions with consideration for ethical, societal, and industrial aspects.
CO4 & PO8 Mapped at 2	CO4 serves as a precursor to the broader, hands-on application emphasized in PO8.
CO5 & PO 2 Mapped at 3	CO5 focuses on the specific skills related to analyzing and designing software, while PO2 encompasses a more comprehensive set of skills and knowledge required for software engineering problem-solving. CO5 serves as a specific application area within the broader context of PO2.
CO5 & PO3 Mapped at 2	CO5 provides specific skills related to analyzing and designing software, while PO3 encompasses a more comprehensive set of skills and knowledge required for designing solutions with consideration for ethical, societal, and industrial aspects.
CO5 & PO4 mapped at 1	CO5 contributes to the practical skills in software analysis and design, and PO4 contributes to the research-oriented skills and methods.

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	08	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.	08	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.	08	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)	08	CO2	Lecture/ Practical Case Activity	Apply	Case Presentation Activity End Term: Theory Applied
6	**Application Development** Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.	09	CO6	Lectures with PPTs Flip Classroom	Create	Activity, Presentation End Term: 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)	09	CO5	Group Activity	Evaluate	Activity, Presentation Group discussion EndTerm :Theory Applied

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO202.1	2	3	1	1	3	-	-	1	-	-
CO202.2	1	1	2	3	3	-	1	3	2	2
CO202.3	-	2	3	3	3	1	-	2	-	-
CO202.4	1	-	1	3	2	1	-	1	-	1
CO202.5	-	3	-	2	2	1	-	1	2	3
CO202.6	2	2	1	2	3	2	2	2	3	3
CO	1	1.83	1.33	2.33	2.66	0.83	0.5	1.66	1.16	1.5
CO	1	2	1	2	3	1	1	2	1	1

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	10	1.6	1.6	1.6	1.6	1.6	1.6
Live project – club activity	5	-	-	1	1	2	1
Case study discussion	10	1.6	1.6	1.6	1.6	1.6	1.6
Assignments/ Projects	5				2.3		3.5
Internal End Term Exam	10			2.5	2.5	2.5	2.5
Internal	40	3.2	3.2	6.7	9	7.7	10.2
End Term (Univ)	60						

Attendance Policy

95-100%	10 marks
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

Reference Books

Sr.No.	Name of the Author	Title of the Book	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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Students with computational knowledge and the ability to apply that knowledge to design appropriate models for given problems or requirements.
CO1 & PO 2 Mapped at3	The focus is on preparing students to apply their knowledge effectively in real-world scenarios, emphasizing both theoretical foundations and practical skills.
CO1 & PO 3 Mapped at 3	The focus is on integrating theoretical knowledge with practical design considerations, preparing students for real-world challenges in the field.

CO1 & PO 4 Mapped at 1	The curriculum aims to lay the groundwork for students to understand and engage in research activities related to computing problems, with a specific focus on flexible and scalable infrastructures.
CO1 & PO5 Mapped at 3	It aims to ensure that students not only have theoretical knowledge but also practical proficiency in using a variety of modern tools throughout the infrastructure development lifecycle. The focus is on preparing students to be adept at leveraging tools to deliver high-quality solutions in the field of flexible and scalable infrastructures.
CO1 & PO8 Mapped at 1	Introduce students to the basics of project development, emphasizing the application of computational and management skills. The focus is on providing a foundational understanding of how these skills can be utilized in solving problems related to flexible and scalable infrastructures within various domains.
CO2 & PO2 Mapped at 1	To establish a foundational understanding of problem analysis skills within the context of software engineering and systems domains. The focus is on building essential problem-solving capabilities that students can further develop as they progress in their studies and careers.
CO2& PO3 Mapped at 2	It aims to enhance students' design and evaluation skills in the context of developing high-performance applications. The focus is on providing a deeper understanding of advanced principles, societal considerations, and industry expectations, preparing students for more complex problem-solving scenarios.
CO2& PO4 Mapped at 3	Advanced research skills, empirical studies, critical analysis, and interdisciplinary approaches, preparing students for research-oriented roles in academia or industry.
CO2& PO5 Mapped at 3	Students are focused on mastering tools, adopting automation practices, and preparing to meet the industry's demands for efficient and effective tool usage.
CO2& PO7 Mapped at 1	It aims to instill an awareness of the importance of lifelong learning and encourage students to start developing the mindset for continuous professional development.
CO2& PO8 Mapped at 3	It suggests a high level of proficiency in involving students in projects' development individually or as a group to solve problems in various domains and environments using computational and management skills.
CO2& PO9 Mapped at 3	To prepare students for advanced communication challenges in the field of high-performance applications. The focus is on developing a mastery of communication skills, both written and verbal, to convey complex computing concepts with precision and effectiveness.
CO2& PO10 Mapped at2	Foster an environment where students can explore innovation and entrepreneurship opportunities related to high-performance applications. The focus is on developing an understanding of the entrepreneurial process and encouraging students to contribute solutions that benefit society.
CO3 & PO2 Mapped at 2	Applying fundamental knowledge of software engineering and various systems domains to design and evaluate solutions, systems, modules, and processes for specified needs.
CO3 & PO3 Mapped at3	A high level of proficiency in designing and evaluating solutions, systems, modules, and processes for specified needs, with appropriate consideration of societal values and industry expectations.
CO3 & PO4 Mapped at3	Conducting research in computing problems related to the reduction of implementation and maintenance costs.
CO4& PO4 Mapped at 3	Develop advanced research skills in students, specifically focusing on conducting case studies and research related to the market practices of cloud computing. The emphasis is on in-depth analysis, synthesis of information, and effective communication of research findings in the context of cloud computing in the market.
CO4 & PO5 Mapped at2	It indicates a moderate level of proficiency in using modern tools for delivering milestones like problem analysis, design, development, testing, and deployment within the context of understanding the practice of cloud computing in the market.
CO5& PO2 Mapped at3	Applying fundamental knowledge of software engineering and various systems domains to design and evaluate solutions, systems, modules, and processes for specified needs, particularly in the context of cost-wise solutions.
CO5& PO10 Mapped at3	It indicates a high level of proficiency in providing a conducive environment for innovation and entrepreneurship that leads to solutions for the betterment of society, specifically in the context of comparison of cost-wise solutions.
CO6& PO5 Mapped at 3	Using modern tools for delivering milestones like problem analysis, design, development, testing, and deployment, specifically within the context of creating a flexible and scalable infrastructure.
CO6& PO9 Mapped at3	It indicates a high level of proficiency in demonstrating efficacy in verbal and non-verbal means of communication, specifically in the context of creating a flexible and scalable infrastructure.

CO6& PO10 Mapped at 3	Provides a conducive environment for innovation and entrepreneurship leading to solutions for the betterment of society, specifically in the context of creating a flexible and scalable infrastructure.

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, passing objects and collections in function, understanding recursive functions, writing and	8	CO 1	Lecture with Ppts	Understand	Short Answers

	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	9	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)	9	CO2,CO3	Lecture with Ppts	Understand	Short Answers
6	**Trees** Concepts of tress and Binary Trees, Defining binary tree as ADT, Implementing Binary Trees, Tree Traversal Algorithms	9	CO3,CO4	Lecture with Ppts	Understand	Short Answers

	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	CO3,CO4	Lecture with Ppts	Understand	Short Answers

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO203.1	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO203.2	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO203.3	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO203.4	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO.	**2**	**2**	**0.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO	**2**	**2**	**1**		**-**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/	**10**	**2.5**	**2.5**	**2.5**	**2.5**

Attendance					
Assignments/ Projects	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Internal End Term Exam	**20**	**5.5**	**5.5**	**4.5**	**4.5**
Internal	**40**	**10.5**	**10.5**	**9.5**	**9.5**
End Term (Univ)	**60**				

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Understand Python syntax and semantics and apply Python flow control and functions, libraries as computing fundamentals,

CO1 & PO 2 Mapped at 2	Understand Python Programs using core data structures like Lists in order to analyze, identify, formulate and provide the solution to given problem.
CO2& PO 1 Mapped at 2	Understand Python syntax and semantics and apply Python flow control and functions, for computing fundamentals, to design appropriate models for a given problem and/or requirements.
CO2& PO 2 Mapped at 2	Understand Python syntax and semantics and apply Python flow control and functions in order to analyze, identify, formulate and provide the solution to given problem.
CO3& PO 1 Mapped at 2	Understand and apply Linked list, Tree, Searching, Sorting todesign appropriate models for a given problem and/or requirements.
CO3& PO 2 Mapped at 2	Understand and apply Linked list, Tree, Searching, Sortingin order to analyze, identify, formulate and provide the solution to given problem.
CO4& PO1 Mapped at 2	Apply the concepts of Object-Oriented Programming for Python to design appropriate models for a given problem and/or requirements.
CO4& PO2 Mapped at 2	Apply the concepts of Object-Oriented Programming for Pythonin order to analyze, identify, formulate and provide the solution to given problem.
CO4& PO3 Mapped at 2	Apply the concepts of Object-Oriented Programming for Pythonto Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration and industry expectations.

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. OLAP Operations, OLAP Models.	8	CO 2,CO3	Lecture with Ppts Case Study	Apply (Analyse)	Case Study , Examples discussion Mid Term: Applied Questions
3	**Data Preprocessing** Need, Objectives and Techniques of data preprocessing.	10	CO1,CO4	Lecture with PPTs Demonstration	Analyse	Case Study discussion

	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.			on ML tool		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 of clustering methods-Partitioning Method, Hierarchical Method, Density-based Method, Grid-Based Method, Model-Based Method, Constraint-based	8	CO6	Lectures with PPTs Flip Classroom ,Examples ,Demonstration on ML Tool	Evaluate	Class test End Term: Theory Applied

	Method Partitioning Methods: K-Means and K-Medoids					

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO204.1	2	-		-	-	-	-	-	-	-
CO204.2	2	-	2	-	-	-	-	-	-	-
CO204.3	2	2	3	-	-	-	-	-	-	-
CO204.4	2	-	-	3	2	3	-	-	-	-
CO204.5	2	2	-	3	-	2	-	-	-	-
CO204.6	2	3	-	2	3	3	-	-	-	-
CO	2	1.16	0.83	1.33	0.83	1.33	-	-	-	-
CO	2	2	1	1	1	1	-	-	-	-

1- Low, 2- Medium, 3- High, If no correlation, put '-'

(Rationale in Appendix)

Evaluation

1. Internal Assessment – 40%
2. University Examination – 60%

Total: 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**05**	**2**	**1**	**1**	**1**		
Assignments / Research paper activity	**05**		**2.5**	**2.5**			
Class Test	**05**					**2.5**	**2.5**
Internal Mid Term Exam	**12.5**	**3.5**	**4.5**	**4.5**			
Internal End Term Exam	**12.5**				**3.5**	**4.5**	**4.5**
Internal	**40**	5.5	8	8	4.5	7	7
End Term (Univ)	**60**						

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks

85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks
Below 75-65	5 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Applyknowledgeofcomputingfundamentals,mathematics and given domain to design appropriate models for a given problem and/orrequirements. Remembering Basic concepts of database and business intelligence, database technology.
CO2 & PO 1 Mapped at 2	Creating multi-dimensional data models using star, snowflake and fact constellation schemas. Basic concepts of Data mart and data warehouse.
CO3& PO 1 Mapped at 2	Understand the components, architecture and other important tools of data warehousing and data mining. Relate the characteristics of data warehousing for data sample.
CO4 & PO 1 Mapped at 2	Apply the techniques of clustering, classification, association and other data mining algorithms to real world data .collect data sample apply preprocessing techniques on data sample and design model with the help of data mining techniques.
CO5 & PO1 Mapped at 2	Gather and analyze large sets of data to gain useful information using data mining techniques. Apply an appropriate techniques and compare the analytical results design model for business problem statement.

CO6 & PO1 Mapped at 2	Producing and interpreting quantitative analysis using various data mining algorithms. Extracting the results and compare outcome interpret the results. Design an appropriate model for data sample and problem requirements.
CO2 & PO3 Mapped at 2	Designandevaluatesolutions,systems,modulesandprocesses for specified set of needs with appropriate consideration of societal values andindustryexpectations. Creating multi-dimensional data models using star, snowflake and fact constellation schemas for problem statement.
CO3 & PO2 Mapped at 2	Apply fundamental knowledge of software engineering and varioussystems domain in order to analyze, identify, formulate and provide the solution to givenproblem. Understand the components, architecture and other important tools of data warehousing and data mining
CO3 & PO4 Mapped at 3	Understand the components, architecture and other important tools of data warehousing and data mining. Useresearch-basedknowledgeandresearch methods including design of experiments, analysis and interpretation of data, andsynthesisof theinformation toprovide valid conclusions
CO4 & PO4 Mapped at 3	Apply the techniques of clustering, classification, association and other data mining algorithms to real world data Useresearch-basedknowledgeandresearch methods including design of experiments, analysis and interpretation of data, andsynthesisof theinformation toprovide valid conclusions
CO4& PO5 Mapped at - 2	Apply the techniques of clustering, classification, association and other data mining algorithms to real world data Use of modern toolsfor deliveringmilestoneslike problemanalysis,design, development, testing and deployment.
CO4& PO6 Mapped at 3	Apply the techniques of clustering, classification, association and other data mining algorithms to real world data Learnandinculcateprofessionalethics,cyberregulations,professionalresponsibilities and normsof professional computingworld
CO5 & PO2 Mapped at 3	Apply fundamental knowledge of software engineering and varioussystems domain in order to analyze, identify, formulate and provide the solution to givenproblem.Gather and analyze large sets of data to gain useful information using data mining techniques.
CO5 & PO4 Mapped at 3	Gather and analyze large sets of data to gain useful information using data mining techniques. Useresearch-basedknowledgeandresearch methods including design of experiments, analysis and interpretation of data, andsynthesisof theinformation toprovide valid conclusions
CO5 & PO6 Mapped at 2	Gather and analyze large sets of data to gain useful information using data mining techniques. Learnandinculcateprofessionalethics,cyberregulations,professionalresponsibilities and normsof professional computingworld
CO6 & PO2 Mapped at 3	Producing and interpreting quantitative analysis using various data mining algorithms. Apply fundamental knowledge of software engineering and varioussystems domain in order to analyze, identify, formulate and provide the solution to givenproblem and interpret the results.
CO6 & PO4 Mapped at - 2	Producing and interpreting quantitative analysis using various data mining algorithms using machine learning tool. Useresearch-basedknowledgeandresearch methods including design of experiments, analysis and interpretation of data, andsynthesisof theinformation toprovide valid conclusions
CO6 & PO5 Mapped at 3	Producing and interpreting quantitative analysis using various data mining algorithms. Use of modern tools as ML toolfor deliveringmilestoneslike problemanalysis,design, development, testing and deployment
CO6 & PO6 Mapped at 3	Using Machine learning tool Producing and interpreting quantitative analysis using various data mining algorithms. Learnandinculcateprofessionalethics,cyberregulations,professionalresponsibilities and normsof professional computingworld

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)	8	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	12	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	8	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	8	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,	8	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	8	CO4, CO6	Lectures with PPTs Demonstration in Computer LAB	Evaluate	Practical Assignments, Exams: Case based Questions/Applied Questions

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO205.1	2	2	-	-	2	-	-	-	1	-
CO205.2	2	2	-	-	1	-	-	-	2	-
CO205.3	2	-	2	-	2	-	2	-	1	-
CO205.4	1	2	2	-	1	-	2	-	2	-
CO205.5	2	1	2	-	2	-	2	-	1	-
CO205.6	1	2	1	-	1	-	2	-	2	-

CO	1.66	1.5	1.16	-	1.5	-	1.33	-	1.5	-
CO	**2**	2	1	-	2	-	1	-	2	-

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**10**	**2**	**2**	**1**	**1**	**2**	**2**
Live project – club activity	**5**	**-**	**1**	**1**	**2**	**-**	**1**
Case study discussion	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Assignments/ Projects	**5**	**-**	**1**	**1**	**2**	**-**	**1**
Internal End Term Exam	**20**	**4**	**2**	**2**	**4**	**4**	**4**
Internal	**40**	**6**	**6**	**5**	**9**	**6**	**8**
End Term (Univ)	**60**						

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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, Jsp, XML and Ajax,	1thedition	Dreamtech Press

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Helps students understand basic concepts of internet technologies, providing a foundation for computational knowledge.
CO1 & PO 2 Mapped at 2	Identifying and remembering web supporting concepts aids in problem analysis.
CO1 & PO 3 Mapped at 3	Understanding basics of internet technologies contributes to designing appropriate solutions.
CO1 & PO 5 Mapped at 2	Learning about internet basics includes exposure to modern tools used in web development.
CO1 & PO7 Mapped at 1	Learning about internet basics fosters an understanding of the importance of continuous learning.
CO2 & PO9 Mapped at 3	Demonstrating efficacy in verbal and non-verbal communication is essential for presenting technical concepts.
CO2 & PO1 Mapped at 3	Understanding definitions of technologies like HAML, JavaScript, etc., contributes to computational knowledge.
CO2 & PO 2 Mapped at 2	Remembering definitions and understanding basic concepts supports problem analysis.
CO2 & PO 3 Mapped at 3	Understanding definitions and basic concepts supports the design and development of solutions.
CO2 & PO 5 Mapped at 2	Understanding definitions and concepts includes familiarity with modern tools.
CO2 & PO7 Mapped at 1	Remembering definitions and concepts reinforces the importance of lifelong learning.
CO3 & PO1 Mapped at 3	Thorough knowledge of HTML and JavaScript enhances computational knowledge.
CO3 & PO 2 Mapped at 2	Thorough knowledge of HTML and JavaScript facilitates problem analysis.
CO3 & PO 3 Mapped at 3	Thorough knowledge of HTML and JavaScript aids in designing and developing solutions.
CO3 & PO 5 Mapped at 2	Working with HTML, JavaScript, and CSS involves using modern tools.
CO3 & PO7 Mapped at 1	Working with evolving technologies like HTML and JavaScript emphasizes the need for lifelong learning.
CO4 & PO1 Mapped at 3	Relating real-life problems to JavaScript solutions requires computational thinking.
CO4 & PO 2 Mapped at 2	Analyzing and solving real-life problems requires problem analysis skills.
CO4 & PO 3 Mapped at 3	Relating real-life problems to JavaScript solutions involves designing and developing solutions.
CO4 & PO 5 Mapped at 2	Using JavaScript constructs for problem-solving requires familiarity with modern tools.
CO4 & PO7 Mapped at 1	Analyzing and solving real-life problems requires continuous learning.
CO5 & PO1 Mapped at 3	Using JavaScript constructs for problem-solving reinforces computational knowledge.
CO5 & PO 2	Using JavaScript constructs for problem-solving reinforces problem analysis skills.

Mapped at 2	
CO5 & PO 3 Mapped at 3	Using JavaScript constructs for problem-solving reinforces solution design and development.
CO5 & PO 5 Mapped at 2	Using JavaScript constructs for problem-solving reinforces the importance of lifelong learning.
CO6 & PO1 Mapped at 3	Designing forms for real-life requirements involves applying computational knowledge.
CO6 & PO 2 Mapped at 2	Designing forms for real-life requirements involves problem analysis.
CO6 & PO 3 Mapped at 3	Designing forms for real-life requirements involves designing and developing solutions.
CO6 & PO 5 Mapped at 2	Designing forms for real-life requirements involves using modern tools.
CO6 & PO7 Mapped at 1	Designing forms for real-life requirements involves continuous learning.
CO6 & PO9 Mapped at 3	Verbal and non-verbal communication skills are necessary for effective communication of technical concepts.

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	7	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	7	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	7	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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO206.1	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO206.2	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO206.3	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

CO206.4	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO.	**2**	**2**	**0.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO	**2**	**2**	**1**		**-**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Assignments/ Projects	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Internal End Term Exam	**20**	**5.5**	**5.5**	**4.5**	**4.5**
Internal	**40**	**10.5**	**10.5**	**9.5**	**9.5**
End Term (Univ)	**60**				

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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 Da Structures & Algorithm Using Python: Programming Interview		

Online Resources

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

MOOCs:

ResourcesNo.	Website address
1	NPTEL
2	UDEMY

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Application of the knowledge of management theories and practices to solve business problems is possible only if managers understand individual and Team behavior
CO1 & PO 2 Mapped at 2	Individual and team behavior concepts would be delivered through case studies and projects to foster analytical and critical thinking abilities for data-based decision making but is possible to a limited extent.
CO1 & PO 3 Mapped at 3	Helps to understand how individuals and teams within organizations learn and cope with change to be productive
CO1 & PO 4 Mapped at 2	Understand the expected individual and team behavior and communicate in the business world globally is important but economic legal and ethical aspects of business are not very relevant to CO 1 hence the alignment of Co1 to PO 1is moderate .
CO1 & PO5 Mapped at 1	Understand the expected individual and team behavior in business world can lead to Read, write, and contribute to Business literature is aligned very low as writing and contributing to business literature is not a necessary outcome
CO1 & PO6 Mapped at 3	Understand the expected individual and team behavior in business world and PO 6 are highly aligned as CO 1 delineates the ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.
CO2 & PO1 Mapped at 3	Leadership for entrepreneurs / corporate / managers is possible only if managers apply the knowledge of management theories and practices to solve business problems. So highly aligned.
CO2 & PO2 Mapped at 3	Entrepreneurs / corporate / managers as leaders need to Foster analytical and critical thinking abilities for data-based decision making
CO2 & PO3 Mapped at 2	Entrepreneurs / corporate / managers as leaders need to Learn new technologies with ease and be productive at all times
CO2 & PO4 Mapped at 3	Highly aligned as The awareness of applicable leadership qualities for entrepreneurs / corporate / managers results in the ability to understand, analyze and communicate global, economic, legal and ethical aspects of business.
CO2 & PO5 Mapped at -	The awareness of applicable leadership qualities for Entrepreneurs / corporate / managers as leaders do not require to necessarily Read, write, and contribute to Business literature. No allignment
CO2 & PO6 Mapped at 3	Leadership qualities an essential for entrepreneurs / corporate / managers to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment. So highly alligned.
CO3 & PO1 Mapped at 3	To develop and inculcate motivational concepts only when the application of the knowledge of management theories and practices to solve business problems is possible only when skills are developed and motivational concepts are inculcated
CO3 & PO2 Mapped at 1	Foster analytical and critical thinking abilities for data-based decision making Motivational concepts and skills can be inculcated to foster analytical and critical thinking abilities through case studies and projects for data based decision making to a limited extent hence the alignment is low.
CO3 & PO3	

Mapped at 2	Learning new technologies to be productive is possible only if students are motivated to develop new skills but since it depends on many other variables the alignment is moderate
CO3 & PO4 Mapped at 1	Ability to understand, analyze and communicate global, economic, legal and ethical aspects of business is weakly aligned with develop skills and inculcate motivational concepts
CO3 & PO5 Mapped at -	Read, write, and contribute to Business literature is not aligned with developing skills and inculcate motivational concepts.
CO3 & PO6 Mapped at 3	Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment is only possible by skill development and inculcating motivating others
CO4 & PO1 Mapped at 3	Apply the knowledge of management theories and practices to solve cross cultural issues are very important hence highly aligned.
CO4 & PO2 Mapped at -	To be aware of individual, cultural difficulties of organizations and to be able to master over them and analytical and critical thinking abilities for data-based decision making Are not alligned
CO4 & PO3 Mapped at -	To be aware of individual, cultural difficulties of organizations and to be able to master over them is not alligned with Learn new technologies with ease and be productive at all times
CO4 & PO4 Mapped at 3	Cultural issues are important to understand, analyze and communicate global, economic, legal and ethical aspects of business.
CO4 & PO5 Mapped at 1	To be aware of individual, cultural difficulties of organizations and to be able to master over them and Read, write, and contribute to Business literature are nottotally aligned as CO 4 will ensure reading and writing ability but whether they will contribute to business literature is doubtful.
CO4 & PO6 Mapped at 3	Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment is possible only when cultural aspects are taken into consideration

Semester	Course Code	Course Title	
II	**209**	**Foreign Language**	
Type	**Credits**	**Evaluation**	**Marks**
AEC	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**
AEC	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.	6	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)	6	CO1	Lecture with PPTs	Understand	Quiz, writing short answers, topic presentations
3	**Types of Digital Technology:** Artificial Intelligence (AI): Introduction, Applications,	6	CO1, CO2, CO3	Lectures with PPTs,	Understand, Apply	Presentations, Quiz, writing short answers

	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	6	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	6	CO1, CO2	PPTs,	Understand, Analyze, Apply	Quiz, writing short answers, Topic Presentations

PO-CO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO209.1	-	-	**2**	**3**	**3**	**1**	-	-	**2**	**2**
CO209.2	-	**3**	**2**	**2**	**3**	-	-	-	-	**2**
CO209.3	-	**3**	**2**	**2**	**3**	-	-	-	-	**2**
CO.	-	**2**	**2**	**2.33**	**3**	**0.33**	-	-	**0.66**	**2**
CO	-	**2**	**2**	**2**	**3**	**0**	-	-	**1**	**2**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Externals: 0%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3
Class Participation/ Attendance	**15**	**5**	**5**	**5**

Assignments/ Projects	**15**	**5**	**5**	**5**
Internal End Term Exam	**20**	**6.67**	**6.67**	**6.67**
Internal	**50**	**16.67**	**16.67**	**16.67**
End Term (Univ)				

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Chris Woodford	Digital Technology	2006	Chelsea House Publications
2	Ertel, W.	Introduction to Artificial Intelligence.	2018	Springer International Publishing
3	Dua, D. A., Ayub, U.	Beginning with Machine Learning: The Ultimate Introduction to Machine Learning, Deep Learning, Scikit-learn, and TensorFlow	2023	BPB Publications

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO3 Mapped at 2	Understanding of concepts of digital technology helps to design and develop solution to be used for education purpose.
CO1 & PO4 Mapped at 3	As a developing field, to design and develop any application using digital technology research is to be conducted which is possible after understanding concepts terms of digital technology.
CO1 & PO5 Mapped at 3	Under digital technology different modern tools are used which helps in handling various tasks efficiently.
CO1 & PO6 Mapped at 3	Designing and developing digital application using latest technologies like AI, should be developed considering professional ethics.
CO1 & PO9 Mapped at 2	Digital technology applications are developed for people who does not have any computer background, and need to communicate properly with direct and indirect users of application.
CO1& PO10 Mapped at 3	Knowledge about the latest updates in digital technology promotes innovative research in the field which supports interdisciplinary approach and leads to development of entrepreneurship.
CO2& PO2 Mapped at 3	For applying the technology to a specific problem, it need to be analyzed critically and then only the solution can be designed.
CO2& PO3 Mapped at 3	For designing the application for a specific problem, it needs to be analyzed and evaluated critically.
CO2 & PO4 Mapped at 2	For applying digital technology in teaching learning process, research based knowledgeis used helping to design solution effectively.
CO2 & PO5 Mapped at 3	Digital technology application for teaching-learning process modern tools can help for effective development of solution.
CO2 & PO10 Mapped at 2	Application of digital technology for teaching-learning process promotes innovation.
CO3 & PO2 Mapped at 3	Knowledge about various applications of digital technology helps in analyzing the problem while thinking of designing solution for a selected field.
CO3 & PO3 Mapped at 3	Knowledge about various applications of digital technology helps in designing and developing solution for the given problem.
CO3 & PO4 Mapped at 3	Knowledge of Role of digital technology promotes research in various fields.
CO3 & PO5 Mapped at 3	While designing and developing digital technology solution for the selected field, the analysis is to be done using modern tools, which helps in building an effective solution.
CO3 & PO10 Mapped at 2	For promoting innovations in various fields for implementing of digital technology one need to understand various roles of digital technology.

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**
MDC	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	6	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	9	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.	7	CO2	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short case and situation based questions

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO209.1	-	-	-	-	-	-	-	3	-	-
CO209.2	-	-	-	-	-	3	-	-	3	-
CO	-	-	-	-	-	1.5	-	1.5	1.5	-
CO	-	-	-	-	-	2	-	2	2	-

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2
Class Participation/ Attendance	10	5	5
Live project – club activity	15	7	8
Case study discussion	10	5	5
Assignments/ Projects	15	8	7
Internal	50	25	25
End Term Exam (Uni.)	-	-	-

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO8 Mapped at 3	Understanding human behavior is crucial in managerial functions as it helps in effective team management, conflict resolution, and overall project success.
CO2& PO 6 Mapped at3	Understanding human psychology and relationships is important for adhering to professional ethics and norms
CO2& PO 9 Mapped at 3	Effective communication often involves understanding human psychology and relationships to convey complex computing concepts accurately.

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	7	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.	**9**	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	**9**	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	**9**	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	**9**	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	**9**	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	**8**	CO4 CO5 CO6	Lecture with PPT, Can be covered along with patterns applicability	Analyze, Evaluate and Create	Assignment Submission

PO-CO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO7	PO8	PO9	PO10
CO301.1	1	3	3		1	-		2	
CO301.2	1	2	3		3	-		2	
CO301.3	1	3	2		3	2		1	
CO301.4	1	3	3	2	3	1		2	
CO301.5	1	3	3	3	2	2			
CO301.6	**1**	**3**	**3**		**2**	**1**		**1**	
CO	1	2.83	2.83	0.83	2.33	1	0	1.33	0
CO	1	3	3	1	2	1	0	1	0

1- Low, 2- Medium, 3- High, If no correlation, put '-'
(Rationale in Appendix)

Evaluation
Internal: 40%
External: 60%
Total: 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	5	1	1	1	1	1
Class Test 1	5	2.5	2.5			
Class Test 2)	5	-	-	2.5	2.5	
Assignment/Case study discussion	5	1	1	1	1	1
Internal Mid term	10	1.5	1.5	2	2	3

Internal End Term Exam	10	1.5	1.5	2	2	3
Internal	40					
End Term (Uni.)	60					

Attendance Policy

Attendance	**Marks**
90-100%	**5 marks**
80-89%	4 marks
75-79%	3 marks

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/

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 1	Identify the Intent and structure/framework of a given design pattern requires basic computational knowledge.
CO1 & PO2 Mapped at 3	Identify the Intent and structure/framework of a given design pattern requires strong knowledge of problem analysis.
CO1 & PO3 Mapped at 3	Identify the Intent and structure/framework of a given design pattern requires strong knowledge of design and development of solutions.
CO1 & PO9 Mapped at 2	Identify the Intent and structure/framework will helps in communication in a team.
CO2 & PO1 Mapped at 1	Able to describe the applicability and role of participants for a design patterns is weakly correlates to computational knowledge.
CO2 & PO2 Mapped at 2	Able to describe the applicability and role of participants for a design patterns is moderately correlates to problem analysis.
CO2 & PO3 Mapped at 3	Able to describe the applicability and role of participants for a design patterns is highly correlates to computational knowledge.
CO2 & PO9 Mapped at 2	Able to describe the applicability and role of participants for a design patterns is moderately correlates communication efficacy.
CO3 & PO1 Mapped at 1	Suggest and apply a design pattern for the given problem is weakly correlates to computational knowledge
CO3 & PO2 Mapped at 1	Suggest and apply a design pattern for the given problem is moderately correlates to problem analysis
CO3 & PO3 Mapped at 3	Suggest and apply a design pattern for the given problem is strongly correlates to design and development of solutions
CO3 & PO9 Mapped at 1	Suggest and apply a design pattern for the given problem is weakly correlates with communication efficacy.
CO4 & PO1 Mapped at 1	Analyze the applicability of using design patterns for a given problem is weakly correlates to computational knowledge.
CO4 & PO2 Mapped at 3	Analyze the applicability of using design patterns for a given problem requires strong knowledge of problem analysis.
CO4 & PO3 Mapped at 3	Analyze the applicability of using design patterns for a given problem requires strong knowledge of design/development of solutions.
CO4 & PO4 Mapped at 1	Analyze the applicability of using design patterns for a given problem sometimes helps in researching computing problems
CO4 & PO9 Mapped at 2	Analyze the applicability of using design patterns for a given problem is moderately helps in communication in a team
CO5& PO1 Mapped at 1	Able to evaluate and assess the design pattern that are appropriate for a given problem is weakly correlates to computational knowledge.
CO5& PO2 Mapped at 3	Able to evaluate and assess the design pattern that are appropriate for a given problem is moderately correlates to problem analysis.
CO5& PO3 Mapped at 3	Able to evaluate and assess the design pattern that are appropriate for a given problem is strongly requires knowledge of design/development of solutions.
CO5& PO4, Mapped at 4	Able to evaluate and assess the design pattern that are appropriate for a given problem is strongly leads to conducting research.
CO6& PO1 Mapped at 1	Creating software design using design patterns that are scalable, robust and maintainable is weakly correlates to basic computational knowledge.
CO6& PO2	Creating software design using design patterns that are scalable, robust and

Mapped at 3	maintainable is moderately correlates to problem analysis.
CO6& PO3 Mapped at 3	Creating software design using design patterns that are scalable, robust and maintainable is strongly correlates to design/development of solutions.
CO6& PO9 Mapped at 1	Creating software design using design patterns that are scalable, robust and maintainable is weakly correlates is weakly correlates to communication efficacy.

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	7	CO2	Lecture with Ppts	Analyse	Short Answers

	Programs, Additional Problems. 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	8	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.	7	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	7	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	9	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					

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO302.1	2	2	-	-	-	-	-	-	-	-
CO302.2	2	2	-	-	-	-	-	-	-	-
CO304.3	2	2	2	-	-	-	-	-	-	-
CO304.4	2	2	2	2	-	-	-	-	-	-
CO.	2	2	1	0.5	-	-	-	-	-	-
CO	2	2	1	1	-	-	-	-	-	-

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	10	2.5	2.5	2.5	2.5
Assignments/ Projects	10		2	3	5
Internal End Term Exam	20	5.5	5.5	4.5	4.5
Internal	40	8	10	10	12
End Term (Univ)	60				

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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		

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1Mapped at 2	Understand and apply fundamentals of Artificial intelligence (AI) for a given problem and/or requirements.
CO1 & PO 2 Mapped at 2	Understand and apply fundamentals of Artificial intelligence to analyze, identify, formulate and provide the solution to given problem.
CO2 & PO 1 Mapped at 2	Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation, and learning and to design appropriate models for a given

	problem and/or requirements.
CO2 & PO 2 Mapped at 2	Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation, and learning to analyze, identify, formulate and provide the solution to given problem.
CO3 & PO1 Mapped at 2	Apply AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models, to design appropriate models for a given problem and/or requirements.
CO3 & PO2 Mapped at 2	Apply AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models, identify, formulate and provide the solution to given problem.
CO3 & PO3 Mapped at 2	Apply AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models, to Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO4 & PO1 Mapped at 2	Demonstrate use of concept for developing applications using Numpy and Pandas, to design appropriate models for a given problem and/or requirements.
CO4 & PO2 Mapped at 2	Demonstrate use of concept for developing applications using Numpy and Pandas to identify, formulate and provide the solution to given problem.
CO4& PO3 Mapped at 2	Demonstrate use of concept for developing applications using Numpy and Pandas, to Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO4 & PO4 Mapped at 2	Demonstrate use of concept for developing applications using Numpy and Pandas, for research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

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 of Organization , How	7	CO 1	Lecture with Ppts Quiz	**Remembering**	Quiz End Term Internals:Short Answers

	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.	9	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 software	9	CO 2	Lecture with PPTs Case Study	**Understanding**	End Term Exam: Short case and situation based questions

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.	9	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,	9	CO5	Lectures with PPTs Group Activity Case Study	**Evaluating**	Group Activity End Term Exam: Short case and situation based questions
6	**Information security regulations.** (Company regulations including	8	CO6	Lectures with PPTs	**Creating**	Group Activity

	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	9	CO6	Lectures with PPTs Group Activity Case Study	**Creating**	Group Activity End Term Exam: Short case and situation based questions

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO303.1	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**

CO303.2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**
CO303.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**
CO303.4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
CO303.5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**
CO303.6	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
CO.	**3**	**3**	**3**	**3**	**3**	**2.5**	**2.33**	**2**	**2**	**2**
CO	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Live Case study – club activity	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Assignments	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Internal End Term Exam	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Internal	**40**	**8**	**8**	**8**	**8**	**4**	**4**
End Term (Univ)	**60**						

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks

80-84%	7 marks
75- 79%	6 marks

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.

MOOC:

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Systematical application of computing fundamentals, mathematics, and software engineering principles to design appropriate models for a given problem while ensuring a robust and well-structured solution.
CO1& PO2 Mapped at 3	By integrating fundamental principles and practices, you can approach problem-solving in software engineering systematically and create robust,maintainable, and scalable solutions.
CO1 & PO3 Mapped at 3	By incorporating **Design/Development of Solutions** and considerations, you can design and evaluate solutions that not only meet technical requirements but also align with societal values and industry expectations, creating more holistic and sustainable outcomes.

CO1 & PO4 Mapped at 3	By integrating research-based knowledge and methods into the software development and engineering process, you can ensure that conclusions are based on sound evidence and contribute meaningfully to the advancement of knowledge in the field. This approach promotes a data- driven and evidence-based decision-making process in software-related research and development efforts.
CO1 & PO5 Mapped at 3	By integrating **Modern** tools and concepts into each milestone of the software development life cycle, teams can streamline processes, improvecollaboration, and ensure the efficient delivery of high-quality software solutions. It's essential to choose tools that align with the specific needs and workflows of the development team and project.
CO1 & PO6 Mapped at 2	By combining professional ethics, software developers and engineers can contribute to a positive and responsible computing environment, fosteringtrust among users, clients, and fellow professionals. Integrating theseethical considerations with basic software development concepts creates afoundation for sustainable and ethically sound practices in the computing world.
CO1 & PO7 Mapped at 2	By aligning **Lifelong Learning** concepts with the practice of continuous professional development, software developers and engineers can cultivate a mindset of ongoing learning and adaptation. Recognizing the value of independent, self-motivated learning ensures that individuals stay relevant in the dynamic field of software development.
CO1 & PO8 Mapped at 2	By applying fundamental principles in solving real-world problems. This hands-on approach enhances learning and retention of software development and engineering concepts in practical scenarios.
CO1 & PO9 Mapped at 2	By aligning effective communication skills with basic concepts, individuals in software development and engineering can not only conveyinformation clearly but also create a collaborative and positive workenvironment. These skills contribute to better understanding, improved teamwork, and the retention of crucial information within the development and engineering community.
CO1 & PO10 Mapped at 2	By incorporating **Innovation and Entrepreneurship** into the environment, innovation and entrepreneurship can flourish in software development and engineering. This approach encourages a dynamic and adaptive mindset, fostering the creation of solutions that not only meet technical requirements but also contribute positively to society.
CO2 & PO1 Mapped at 3	Remembering and reinforcing basic concepts will help students grasp the intricacies of Information, Characteristics, Levels of Information, Information Security Measures, and the Information Testing Life Cycle effectively.
CO2 & PO1 Mapped at 3	By intertwining software engineering and information management concepts, students will gain a holistic understanding of how to analyze, design, and implement solutions that effectively manage information while considering security measures and the information testing life cycle.
CO2 & PO3 Mapped at 3	Students will develop a well-rounded understanding of how to create systems that not only meet technical needs but also align with societal values and industry expectations. This approach prepares them for responsible and ethical contributions to the field of information

	technology.
CO2 & PO4 Mapped at 3	By integrating research-based knowledge and methods with foundational information concepts, students will not only understand the theoretical aspects of information but also gain practical skills in experimental design, data analysis, and drawing valid conclusions. This approach prepares them for evidence-based decision-making and problem-solving in the field of information technology.
CO2 & PO5 Mapped at 3	By integrating modern tools into the learning process, students will not only understand the theoretical aspects of information but also gain practical experience using tools that are widely adopted in the industry. This approach prepares them for a seamless transition into professional environments where these tools play a crucial role in the software development life cycle.
CO2 & PO6 Mapped at 3	By integrating professional ethics, cyber regulations, and responsibilities with foundational information concepts, students will develop a holistic understanding of their roles and responsibilities in the computing industry. This approach not only prepares them for ethical decision- making but also instills a sense of responsibility and awareness of the broader professional computing landscape.
CO2 & PO7 Mapped at 3	By integrating the concept of continuous professional development with foundational information concepts, students will understand that the field is ever-evolving, requiring a commitment to ongoing learning. This approach prepares them for a career where adaptability, curiosity, and a proactive approach to skill development are essential for success in the dynamic field of information technology.
CO2 & PO8 Mapped at 2	By integrating project development with foundational informationconcepts, students gain practical experience in applying theircomputational and management skills to solve real-world problems. This approach prepares them for the dynamic challenges they will face in their careers, ensuring they understand the importance of information considerations at every stage of project development.
CO2 & PO9 Mapped at 2	By integrating communication skills with foundational information concepts, students will not only understand the theoretical aspects of information management but also learn how to effectively convey complex ideas to diverse audiences. This approach prepares them for professional scenarios where clear communication is crucial for successful collaboration, project management, and conveying informationsecurity measures and testing life cycle stages accurately.
CO2 & PO10 Mapped at 2	By integrating innovation and entrepreneurship with foundational information concepts, students will understand the practical application of information in addressing societal challenges. This approach not only prepares them for careers where innovative thinking is valued but also emphasizes the importance of considering information characteristics andsecurity measures in creating solutions for the betterment of society.
CO3 & PO1 Mapped at 3	By integrating computing fundamentals, mathematical modeling, and domain-specific knowledge in designing models for information security and cybersecurity, students will develop a well-rounded understanding of how to address complex security challenges. This approach prepares them to design effective and comprehensive models that contribute to the development of secure systems in various domains.

CO3& PO2 Mapped at 3	By integrating fundamental knowledge of software engineering and systems domains with the specific focus on information security measures, cybersecurity, network security, and scanning tools, students will gain a comprehensive understanding of how to analyze, identify, formulate, and provide solutions to security challenges in various domains. This approach prepares them for addressing real-world security concerns using a holistic and systematic approach.
CO3 & PO3 Mapped at 3	By integrating the design and evaluation process with a consideration of societal values and industry expectations, students will develop a holistic understanding of how to create secure, ethical, and impactful solutions. This approach prepares them to navigate the complexities of the information security landscape, ensuring that their designs align withboth societal and industry needs.
CO3 & PO4 Mapped at 3	By integrating research-based knowledge and methods with a focus on information security, cybersecurity, and the evaluation of various tools, students will develop a strong foundation in applying systematic approaches to analyze, interpret, and draw valid conclusions in the field. This approach prepares them for contributing valuable insights and innovations to the ever-evolving landscape of information security.
CO3 & PO5 Mapped at 3	By integrating modern tools into each milestone of the software development life cycle with a specific focus on security, students will be well-equipped to deliver secure and resilient systems. This approach ensures that they not only understand theoretical concepts but also gain practical experience in using the tools that are widely adopted in the industry for information security and cybersecurity.
CO3 & PO6 Mapped at 3	By integrating professional ethics, cyber regulations, and responsibilities into the curriculum, students will not only have a thorough knowledge of information security and cybersecurity but will also be well-prepared to navigate the ethical and legal aspects of the professional computing world. This approach ensures that they develop a strong foundation in responsible and ethical practices throughout their careers.
CO3 & PO7 Mapped at 3	By integrating continuous professional development and self-motivated, independent learning into the curriculum, students will develop a mindsetthat values lifelong learning. This approach prepares them to adapt to the ever-changing landscape of information security and cybersecurity, ensuring that they remain well-informed and capable of addressing emerging challenges throughout their professional careers.
CO3 & PO8 Mapped at 2	By involving students in project development that spans various domains and environments, integrating computational and management skills, and emphasizing cybersecurity measures, students will gain practical experience in addressing real-world challenges. This approach not only enhances their technical skills but also prepares them to be well-rounded professionals capable of navigating the complexities of information security in diverse project scenarios.
CO3 & PO9 Mapped at 2	By integrating effective communication skills into the curriculum, students will not only excel in conveying complex computing concepts related to information security but will also be well-prepared to communicate their ideas in a professional and impactful manner in various professional settings.

CO3 & PO10 Mapped at 2	By providing a conducive environment for innovation and entrepreneurship in the realm of information security, students will not only gain a deep understanding of security measures but will also developthe skills and mindset necessary to contribute positively to societal betterment through their entrepreneurial ventures. This approach aligns technical knowledge with a broader perspective on how innovative solutions can positively impact society.
CO4 & PO1 Mapped at 3	By integrating computing fundamentals, mathematical modeling, and domain-specific considerations, students will be well-equipped to design robust models for measuring information security risks. This approach, coupled with a scientific mindset, ensures that students can effectively contribute to overcoming information security challenges using systematic and validated methods.
CO4 & PO2 Mapped at 3	By integrating software engineering fundamentals and various systems domain knowledge, students will be well-prepared to analyze, identify, formulate, and provide scientific solutions for measuring and mitigating information security risks. This approach ensures that the solutions developed align with best practices in software engineering while addressing the unique challenges presented by different systems domains
CO4 & PO3 Mapped at 3	By emphasizing the alignment of information security solutions withsocietal values and industry expectations, students will develop a holistic understanding of their role in creating secure and ethically responsible systems. This approach ensures that the design and evaluation of solutions not only meet technical requirements but also contribute positively to societal well-being
CO4 & PO4 Mapped at 3	By integrating research-based knowledge and methodologies into thecurriculum, students will be equipped with the skills to systematically measure, analyze, and mitigate information security risks using scientific and proper methods. This approach ensures that their conclusions are based on sound research principles, contributing to advancements in the field of information security
CO4 & PO5 Mapped at 3	By integrating modern tools throughout the software development lifecycle and emphasizing their application in information security, students gain practical skills in using technology to measure and mitigate security risks. This approach ensures that they are well-prepared to address contemporary challenges in information security using scientific and proper methods.
CO4 & PO6 Mapped at 2	By integrating professional ethics, cyber regulations, and an understanding of professional responsibilities into the curriculum, students will develop a comprehensive perspective on information security. This approach ensures that their actions and security measures align with ethical standards, legal requirements, and the norms of the professional computing world.
CO4 & PO7 Mapped at 2	By integrating continuous professional development and self-motivated learning into the curriculum, students will develop a proactive approachto staying current in the field of information security. This approach ensures that they are well-prepared to measure and address evolving risks through scientific and proper methods, demonstrating
CO4 & PO8	By instilling a commitment to continuous professional development and

Mapped at 2	self-motivated learning, students will be better equipped to measure information security risks using the latest methodologies and scientific approaches. This approach ensures that they stay relevant in the rapidly evolving field of information security
CO4 & PO9 Mapped at 2	By integrating communication skills development into the curriculum, students will not only be proficient in measuring information security risks using scientific methods but will also be adept at conveying these findings through effective verbal and non-verbal communication. This approach ensures that security professionals can effectively communicatecomplex concepts to diverse audiences, fostering better collaboration and understanding.
CO4 & PO10 Mapped at 2	By creating an environment that fosters innovation and entrepreneurship, students will be motivated to explore creative solutions for measuring information security risks and overcoming challenges. This approach not only enhances their scientific and technical skills but also instills a sense of social responsibility, contributing to the betterment of society through innovative information security solutions.
CO5 & PO1 Mapped at 3	By integrating the application of computing fundamentals, mathematics, and domain-specific knowledge into the design of security models, students will be well-equipped to select proper methods for protecting information and making organizations foolproof against various information threats. This approach ensures a holistic understanding of information security principles and their practical application in real-world scenarios.
CO5 & PO2 Mapped at 3	By integrating fundamental knowledge in software engineering with domain-specific expertise, students can effectively analyze, identify, formulate, and implement solutions to information security challenges. This approach ensures that they are equipped to select proper methods to protect information and make organizations foolproof against a diverse range of information threats.
CO5 & PO3 Mapped at 3	By integrating societal values and industry expectations into the design and evaluation process, students will develop a comprehensive understanding of the broader impact of information security solutions. This approach ensures that they not only select proper methods to protect information but also contribute to the development of systems that align with ethical standards and meet industry expectations
CO5 & PO4 Mapped at 3	By integrating research-based knowledge and methods into the curriculum, students will develop the skills needed to select proper methods for protecting information based on evidence and research findings. This approach ensures that information security measures are not only theoretically sound but also grounded in practical and empirical insights.
CO5 & PO5 Mapped at 3	By integrating modern tools into the educational curriculum, students willnot only learn to deliver milestones effectively but also develop the skills to select proper methods for protecting information based on real-world scenarios and security insights provided by these tools. This approach ensures that security measures are implemented seamlessly and align withthe dynamic nature of information threats.
CO5 & PO6	By integrating professional ethics, cyber regulations, and responsibilities

Mapped at 3	into the educational framework, students will develop a holisticunderstanding of the ethical considerations influencing the selection of protective methods. This approach ensures that information security measures align with legal requirements, professional norms, and ethical standards, contributing to the overall resilience of the organization against various information threats
CO5 & PO7 Mapped at 2	By embedding the acknowledgment of continuous professional development and the practice of self-motivated, independent learning into the educational experience, students will be better equipped to select the most suitable information protection methods. This approach ensures thatsecurity measures are not only effective against current threats but also adaptable to future challenges through a commitment to ongoing learning and skill development.
CO5 & PO8 Mapped at 2	By intertwining project development with computational and management skills, and emphasizing the integration of security considerations, students will not only enhance their ability to solve diverse problems but also contribute to making organizations foolproof against information threats. This approach ensures that the skills acquired through project experiences are directly applicable to real-world challenges in securing information within different domains.
CO5 & PO9 Mapped at 2	By emphasizing effective communication skills in various modes and aligning them with the articulation of security measures, students will be better equipped to convey the importance and impact of selected information protection methods. This approach ensures that the communication of security strategies is not only clear but also contributes to making the organization foolproof against information threats.
CO5 & PO10 Mapped at 2	By integrating innovation and entrepreneurship into the educational environment and emphasizing the integration of information security,students will not only contribute to the betterment of society but also understand the importance of selecting proper methods to protect information in the process. This approach ensures that innovative solutions are developed ethically, securely, and with a long-term focus on organizational resilience against information threats.
CO6 & PO1 Mapped at 3	By aligning the application of computing fundamentals, mathematics, anddomain knowledge with the design of models and procedures for data protection, students will develop a holistic understanding of securinginformation. This approach ensures that the protection methods are not only technically sound but also contextually relevant, contributing toeffective safeguarding of important data across all levels of an organization
CO6 & PO2 Mapped at 3	By integrating fundamental knowledge in software engineering and systems domains with the design of procedures for data protection, students will gain a comprehensive skill set. This approach ensures that they not only analyze and provide solutions to complex problems but alsopossess the capability to design effective procedures that protect important data across various levels of organizational systems
CO6 & PO3	By intertwining the consideration of societal values and industryexpectations in the design and evaluation process, students will not only

Mapped at 3	develop effective solutions but also create procedures that align with ethical, societal, and industry standards for protecting important data atall levels. This approach ensures that the designed solutions are not only technically sound but also socially responsible and compliant with industry norms.
CO6 & PO4 Mapped at 3	By integrating research-based knowledge and methods into the design of procedures for data protection, students will not only create informed and effective security measures but also contribute to advancing the field withevidence-based practices. This approach ensures that the designed procedures are not arbitrary but grounded in a thorough understanding of security challenges supported by rigorous research.
CO6 & PO5 Mapped at 3	By emphasizing research-based knowledge and methods, educational programs not only equip students with practical skills but also instill a mindset that values evidence, critical thinking, and adaptability— qualities essential in the fast-paced and ever-changing landscape of information security. This approach ensures that the next generation of cybersecurity professionals is well-prepared to address the evolving challenges in the field.
CO6 & PO6 Mapped at 3	By intertwining the learning of professional ethics, cyber regulations, responsibilities, and professional norms with the design of data protectionprocedures, students not only develop technical skills but also cultivate a strong ethical foundation. This approach ensures that the designed procedures align with legal frameworks, industry standards, and ethical principles, promoting responsible and accountable practices in the professional computing world.
CO6 & PO7 Mapped at 2	By fostering a culture of continuous professional development and self- motivated, independent learning, students will be better equipped to design procedures for protecting data and information at all levels. This approach ensures that their knowledge remains current, relevant, and adaptable to the ever-changing landscape of cybersecurity, contributing to the development of effective and resilient data protection strategies.
CO6 & PO8 Mapped at 2	By linking project development experiences to the design of data protection procedures, students not only enhance their technical skills but also recognize the practical application of security considerations in real- world scenarios. This approach ensures that the skills developed through project involvement are transferrable and contribute to the creation of effective and comprehensive data protection strategies.
CO6 & PO9 Mapped at 2	By intertwining the development of communication skills with the designand creation of data protection procedures, students not only conveytechnical knowledge but also ensure that their security measures are understood, accepted, and implemented successfully. This approach enhances their ability to bridge the gap between complex computing concepts and practical, actionable data protection strategies.
CO6 & PO10 Mapped at 2	By integrating an environment that nurtures innovation and entrepreneurship with the design of data protection procedures, students not only develop technical skills but also contribute to solutions that address societal needs. This approach fosters a holistic understanding of the role of technology in societal betterment and equips students to make a positive impact through their innovative approaches to data security.

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	5	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals: Short Answers

	testing, Levels of testing, The "V" Concept of testing					
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	10	CO 5	Case Study With case tool	Analyze / Evaluate	Case study Presentation Activity End Term: Practical Applied Questions

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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO306.1	2	2	-	-	-	-	-	-	-	-
CO 306.2	-	-	2	-	2	-	-	-	-	-
CO 306.3	-	-	-	2	-	-	-	2	-	-
CO 306.4	-	-	2	-	-	-	-	-	2	-
CO 306.5	2	-	-	-	-	2	-	-	-	-
CO	0.8	0.4	0.8	0.2	0.4	0.4	0	0.4	0.4	0
CO	1	0	1	0	0	0	0	0	0	0

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 40%
Externals: 60%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	10	2	2	2	2	2
Case study discussion	10	2	2	2	2	2

Assignments/ Projects	**10**	**2**	**2**	**2**	**2**	**2**
Internal End Term Exam	**10**	**2**	**2**	**2**	**2**	**2**
Internal	**40**	**8**	**8**	**8**	**8**	**8**
End Term (Univ)	**60**					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1,2 Mapped at 2,2	Program objective 1 and 2 ,To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional are mapped with course outcome mapped at 2 and 2.
CO2& PO 3,PO5 Mapped at 2,2	Program objective to apply fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem are mapped at 2,2
CO3& PO4,8 Mapped at 2,2	Program objective to 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 are mapped at 2, 2
CO4& PO3,9 Mapped at 2,2	Program objective todesign and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations mapped at 2,2.
CO5& PO1,PO6 Mapped at2,2	Program objective to **:** Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world are mapped at 2,2

Semester	CourseCode	CourseTitle	
III	**309**	**Social Change in Technology**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
MDC	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	8	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	8	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,	6	CO1	Lecture with PPTs, Guest	Understand, Analyze, Apply	Quiz, writing short answers

	technology & work/business, Role of ICT 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, emailand social media in society.			Lectures 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	8	CO2	Lectures PPTs, Guest Lectures Cyber Experts	Understand, Analyze, Apply	Quiz, writing short answers

PO-CO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**3**	**--**	**2**	**3**	**2**	**-**	**2**	**2**	**2**	**2**
CO2	**--**	**2**	**2**	**--**	**2**	**3**	**2**	**2**	**2**	**--**
CO	**1.5**	**1**	**2**	**1.5**	**2**	**1.5**	**2**	**2**	**2**	**0.5**
CO	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)

Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2

Class Participation/ Attendance	**10**	5	5
Assignments/ Projects	**10**	5	5
Internal End Term Exam	**20**	**10**	**10**
Case Study	**10**	**5**	**5**
Internal	**50**		
End Term (Uni.)			

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

PO1 &CO1 Mapped at 3	Application of knowledge of computing fundamentals and mathematics to understand the impact of technology on social change
PO2&CO2 Mapped at 2	Use of skills in problem analysis, drawn from software engineering principles, to critically evaluate the ethical and societal implications of technological innovation.
PO3&CO1 CO 2 Mapped at 2	Understanding the impact of technology on social change (CO1) and critically evaluating the ethical and societal implications of technological innovation (CO2)
PO4&CO1 Mapped at 3	Use research-based knowledge and methodologies to investigate the impact of technology on social change
PO5&CO1 CO 2 Mapped at 2	Understanding the impact of technology on social change (CO1) and critically evaluating the ethical and societal implications of technological innovation (CO2).
PO6&CO 2 Mapped at 3	Consideration of professional ethics, cyber regulations, and norms of the professional computing world.
PO7&CO1 CO 2 Mapped at 2	Need for continuous professional development aligns with both understanding the impact of technology on social change (CO1) and critically evaluating the ethical and societal implications of technological innovation (CO2).
PO8&CO1 CO 2 Mapped at 2	Understanding the impact of technology on social change (CO1) and critically evaluating the ethical and societal implications of technological innovation (CO2)
PO9&CO1 CO 2 Mapped at 2	Understanding the impact of technology on social change (CO1) and critically evaluating the ethical and societal implications of technological innovation (CO2
PO10&CO1 Mapped at 2	Providing a conducive environment for innovation and entrepreneurship aligns with understanding the impact of technology on social change

Semester	CourseCode	CourseTitle	
III	309	Water Management	
	Prepared By		
Type	Credits	Evaluation	Marks
VBC	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.	8	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	7	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 aspects, Analysis, Models for impact prediction and	8	CO1	PPTs, Guest Lectures by Environment Experts on water management	Understand, Analyze, Apply	Quiz, writing short answers

	evaluation, Adaptive Integrated Policies, Post Planning and management Issues					
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.	7	CO2	Lecture PPTs, Visit to catchment areas Lakes Water Haversting	Understand, Analyze, Apply	Quiz, writing short answers

PO-CO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO309.1	**3**	**2**	**-**	**2**	**-**	**-**	**2**	**-**	**2**	**-**
CO309.2	**--**	**-**	**3**	**-**	**3**	**3**	**2**	**-**	2	**2**
CO	**1.5**	**1**	**1.5**	**1**	**1.5**	**1.5**	**2**	**-**	2	**1**
CO	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**-**	2	**1**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2
Class Participation/ Attendance	**10**	**5**	5

Assignments/ Projects	**10**	**5**	5
Internal End Term Exam	**20**	**10**	**10**
Case Study	**10**	**5**	**5**
Internal	**50**		
End Term (Uni.)			

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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	

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	To apply computational knowledge, including fundamentals of computing and mathematics, to understand the principles and challenges inherent in water management.
CO1 & PO2 Mapped at 2	Problem analysis, to analyze the complexities of water management.
CO2& PO3 Mapped at 3	Students to utilize abilities in designing and evaluating solutions, systems, and processes to develop effective strategies for sustainable water management.
CO1& PO4 Mapped at 3	Usage of research-based knowledge and methodologies to conduct research on computing problems related to water management.
CO2 & PO5 Mapped at 2	Implement and evaluate sustainable water management strategies efficiently.
CO2& PO6 Mapped at 3	To adopt professional ethics, including considerations of societal values and norms
CO1 CO 2& PO 7 Mapped at 2	Proper understanding the principles and challenges of water management (CO1) and applying effective strategies for sustainable water management (CO2)..
CO1, CO 2& PO9 Mapped at 2	Effective communication skills are crucial for elaborating on complex computing concepts related to water management (CO1) and for conveying strategies and solutions for sustainable water management (CO2).
CO2& PO10 Mapped at 2	Students will explore innovative approaches and entrepreneurial opportunities to develop solutions aimed at improving water management practices for the betterment of society.

Semester	Course Code	Course Title	
III	309	Economics for IT Industry	
	Prepared By		
Type	Credits	Evaluation	Marks
MDC	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	8	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	7	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	8	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	7	CO1, CO2	Lectures Case Study on current issues and government policies	Understand, Analyze, Apply	Quiz, writing short answers

PO-CO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**-**	**-**	**2**	**3**	**2**	**3**	2	2	2	2
CO2	**3**	**2**	**-**	**-**	**2**	**3**	2	2	2	**-**
CO	**1.5**	**1**	**1**	**1.5**	**2**	**3**	2	2	2	1
CO	**2**	**1**	**1**	**2**	**2**	**3**	2	2	2	1

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals100 %

Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2
Class Participation/	**10**	**5**	5

Attendance			
Assignments/ Projects	**10**	**5**	5
Internal End Term Exam	**20**	**10**	**10**
Case Study	**10**	**5**	**5**
Internal	**50**		
End Term (Uni.)			

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

PO1 &CO2 Mapped at 3	Students to utilize their knowledge of computing fundamentals and mathematics to analyze economic data, evaluate financial metrics, and apply economic models to IT decision-making processes.
PO2&CO1 Mapped at 2	to identify economic challenges and opportunities within the IT industry.
PO3&CO1 Mapped at 3	By understanding the economic principles shaping the IT industry, they will develop solutions that align with economic drivers such as profitability, efficiency, and sustainability
PO4&CO1 Mapped at 3	To analyze economic trends, conduct market research, and synthesize information to understand the economic principles influencing IT markets
PO5&CO1 CO 2 Mapped at 2	To understanding the economic principles shaping the IT industry (CO1) and applying economic analysis to IT decision-making (CO2). Students will use computational tools and software applications to analyze economic data, model economic scenarios
PO6&CO1 CO 2 Mapped at 3	To understandthe economic principles shaping the IT industry (CO1) and applying economic analysis to IT decision-making (CO2), students will need to consider professional ethics, including integrity, transparency, and accountability
PO7&CO1 CO 2 Mapped at 3	Understanding the need for continuous professional development aligns with both understanding the economic principles shaping the IT industry (CO1) and applying economic analysis to IT decision-making (CO2).
PO8&CO1 CO 2 Mapped at 2	To understandthe economic principles shaping the IT industry (CO1) and applying economic analysis to IT decision-making (CO2), students will engage in project development and management activities to solve economic problems in various IT domains
PO9&CO1 Mapped at 2	Effective communication skills are crucial for both understanding the economic principles shaping the IT industry (CO1) and applying economic analysis to IT decision-making (CO2).
PO10&CO1 Mapped at 2	Providing a conducive environment for innovation and entrepreneurship aligns with understanding the economic principles shaping the IT industry

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-01(A)**	**Virtualization**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- TocreateDynamicandEffectiveBusinessProfessionalsandLeaders.
- Totransformtheindividualstocatertotheneedsofthesocietyandcontributeto Nation building
- Todevelopentrepreneurstoregisterdifferentaspectsoftheirbusinessunderremedialindividualand teambehavior.
- ToimproveOrganizationalBehaviorbyhavingasoundknowledgeofculturaldifferences.

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 2	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	06	CO4	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	06	CO5	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	CO6	Lecture with Ppts/practical's/ CASE STUDIES	Apply (Analyse)	Case Presentation Activity End Term: Theory Applied

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	-	-	-	-	**3**	-	-	**2**	-
CO2	**1**	**1**	-	**2**	**2**	-	**2**	-	-	-
CO3	**1**	**1**	**1**	-	**2**	-	**2**	-	-	**2**
CO4	-	-	-	-	**2**	**2**	**2**	**1**	-	**3**
CO5	-	-	**1**	-	-	**2**	-	**1**	**2**	-
CO6	**1**	**1**	**2**	-	**2**	-	-	-	**3**	**2**

CO.	**0.5**	**0.5**	**0.66**	**0.33**	**1.33**	**1.16**	**1**	**0.33**	**1.16**	**1.16**
CO	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**1**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Externals:
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**10**	**2**	**2**	**-**	**4**	**2**	**-**
Live project – club activity	**10**	**-**	**-**	**3**	**2**	**2**	**3**
Case study discussion	**10**	**-**	**-**	**3**	**2**	**3**	**2**
Assignments/ Projects	**10**	**2**	**2**	**2**	**2**	**-**	**2**
Internal End Term Exam	**60**	**10**	**10**	**10**	**10**	**10**	**10**
Internal	**100**	**14**	**14**	**18**	**20**	**17**	**17**
End Term (Univ)							

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks

80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO6 Mapped at 3	Applying professional ethics, cyber regulations, professional responsibilities, and norms of the professional computing world in the context of providing flexible and scalable infrastructures as per user requirements.
CO1 & PO 9 Mapped at 2	Demonstrating efficacy in verbal and non-verbal means of communication, particularly in the context of providing flexible and scalable infrastructures as per user requirements.
CO2& PO1 Mapped at 1	Applying knowledge of computing fundamentals, mathematics, and the given domain to design appropriate models for a given problem and/or requirements, particularly in the context of understanding the components of virtualization.

CO2& PO2 Mapped at 1	Apply fundamental knowledge of software engineering and various systems domains to analyze, identify, formulate, and provide solutions to problems, particularly in the context of understanding the components of virtualization.
CO2& PO4 Mapped at 2	Conducting research in computing problems, particularly in the context of understanding the components of virtualization.
CO2& PO5 Mapped at 2	Using modern tools for delivering milestones like problem analysis, design, development, testing, and deployment, particularly in the context of understanding the components of virtualization.
CO2 & PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing it through self-motivated, independent learning, particularly in the context of understanding the components of virtualization.
CO3& PO1 Mapped at 1	Applying knowledge of computing fundamentals, mathematics, and the given domain to design appropriate models for a given problem and/or requirements, particularly in the context of carrying out practicals through virtualization.
CO3& PO2 Mapped at 1	Applying fundamental knowledge of software engineering and various systems domains to analyze, identify, formulate, and provide solutions, particularly in the context of carrying out practicals through virtualization.
CO3& PO3 Mapped at 1	Designing and evaluating solutions, systems, modules, and processes for specified needs, particularly in the context of carrying out practicals through virtualization.
CO3& PO5 Mapped at 2	Using modern tools for delivering milestones like problem analysis, design, development, testing, and deployment, particularly in the context of carrying out practicals through virtualization.
CO3 & PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing it through self-motivated, independent learning, particularly in the context of carrying out practicals through virtualization.
CO3 & PO10 Mapped at 2	Provides a conducive environment for innovation and entrepreneurship leading to solutions for the betterment of society, particularly in the context of carrying out practicals through virtualization.
CO4 & PO5 Mapped at 2	To provide students with a moderate level of proficiency in using modern tools to analyze, understand, and extract insights from case studies related to cloud computing practices in the market. The focus is on practical application, ensuring that students gain hands-on experience with tools throughout the various milestones of cloud computing projects.
CO4 & PO6 Mapped at 2	Learning and inculcating professional ethics, cyber regulations, professional responsibilities, and norms of the professional computing world, particularly in the context of understanding more about the practice of cloud computing in the market.
CO4 & PO10 Mapped at 3	Providing a conducive environment for innovation and entrepreneurship leading to solutions for the betterment of society, particularly in the context of understanding more about the practice of cloud computing in the market.
CO5& PO3 Mapped at 1	Focuses is on introducing students to basic principles, tools, and practices related to cost considerations in the context of solution design, setting the stage for more advanced exploration in subsequent levels of the curriculum.
CO5 & PO6 Mapped at 2	Develop students' ethical reasoning and professional conduct specifically within the domain of comparing cost-wise solutions and selecting the best solution for organizational problems. The focus is on ensuring that students understand and apply ethical principles in the decision-making process related to solution evaluation and selection.
CO5 & PO9	Focuses on ensuring that students can communicate complex computing issues

Mapped at 2	clearly, both in written documentation and verbal presentations, contributing to effective decision-making processes.
CO6 & PO1 Mapped at 1	Establish a foundational connection between creating flexible and scalable infrastructure and the application of fundamental computing knowledge.
CO6 & PO2 Mapped at 1	Applying fundamental knowledge of software engineering and various systems domains to analyze, identify, formulate, and provide solutions to a given problem. This alignment is particularly focused on creating flexible and scalable infrastructure suitable to the organizational need.
CO6 & PO3 Mapped at 2	Provide individual with a moderate level of proficiency in designing flexible and scalable infrastructure while considering societal values and industry expectations.
CO6 & PO5 Mapped at 2	Focuses on practical application and hands-on experience, ensuring that students develop the necessary skills to effectively use tools throughout the various milestones of infrastructure development.
CO6 & PO9 Mapped at 3	Prepares individuals to communicate with precision, clarity, and professionalism, meeting the expectations of various stakeholders in the professional computing world.
CO6 & PO10 Mapped at 2	Focuses on fostering a mindset that values innovation, ethical considerations, and the societal impact of technological solutions, contributing to the betterment of society.

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-01(B)**	**Amazon Web Services**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- TocreateDynamicandEffectiveBusinessProfessionalsandLeaders.
- Totransformtheindividualstocatertotheneedsofthesocietyandcontributeto Nation 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 problemsuggested 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	**CloudComputing 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	8	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	8	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	8	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	8	CO1	Lecture with Ppts/practical's	Evaluate	Group Activity End Term Exam: Short case and situation based questions

	IAM User, IAM Policy and 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	04	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	04	CO5, CO6	Lecture with Ppts/practical's/ CASE STUDIES	Apply (Analyse)	Case Presentation Activity

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**1**	**2**	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**2**
CO2	**1**	**1**	**-**	**1**	**2**	**1**	**2**	**-**	**-**	**2**
CO3	**1**	**-**		**2**	**2**	**1**	**1**	**-**	**2**	**3**
CO4	**2**	**1**	**-**	**3**	**2**	**2**	**1**	**1**	**-**	**2**
CO5	**-**	**3**	**1**	**2**	**-**	**3**	**2**	**1**	**2**	**3**
CO6	**2**	**2**	**3**	**-**	**3**	**2**	**1**	**2**	**2**	**3**
CO.	**1.16**	**1.5**	**1**	**1.5**	**1.66**	**1.5**	**1.5**	**0.66**	**1**	**2.5**
CO	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**3**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**10**	**2**	**2**	**2**	**2**	**2**	**-**
Live project – club activity	**10**	**-**	**-**	**4**			**6**
Case study discussion	**10**	**2**	**2**	**2**	**2**	**2**	**-**
Assignments/ Projects	**10**	**-**	**-**	**2**	**2**	**2**	**4**
Internal End Term Exam	**60**	**10**	**10**	**10**	**20**	**10**	**-**
Internal	**100**	**14**	**14**	**20**	**26**	**16**	**10**
End Term (Univ)							

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 1	Applying knowledge of computing fundamentals, mathematics, and the given domain to design appropriate models for a given problem and/or requirements. This alignment is particularly focused on providing flexible and scalable infrastructures as per user requirements.
CO1 & PO 2 Mapped at 2	Focuses on enhancing students' ability to understand user requirements, identify challenges, and formulate effective solutions within the context of software engineering and systems domain principles.
CO1 & PO 3 Mapped at 2	Designing and evaluating solutions, systems, modules, and processes for a specified set of needs with appropriate consideration of societal values and industry expectations.
CO1 & PO 4 Mapped at 1	Applying research-based knowledge and research methods, including the design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
CO1 & PO5 Mapped at 1	Introducing students to basic tools and providing them with initial hands-on experience, preparing them for more advanced tool usage in subsequent levels

CO1 & PO6 Mapped at 3	Prepares an individual to navigate ethical challenges and make responsible decisions in the dynamic field of computing.
CO1& PO7 Mapped at 2	Encouraging self-motivated learning and independent exploration in the context of providing flexible and scalable infrastructures. Students are guided to recognize the importance of staying informed about advancements in their field and taking proactive steps towards continuous improvement.
CO1& PO10 Mapped at 2	Suggests a moderate level of proficiency in providing a conducive environment for innovation and entrepreneurship leading to solutions for the betterment of society in the context of providing flexible and scalable infrastructures as per user requirements.
CO2& PO1 Mapped at 1	Applying knowledge of computing fundamentals, mathematics, and the given domain to design appropriate models for a given problem and/or requirements. This alignment is focused on understanding the components of virtualization in the context of providing flexible and scalable infrastructures as per user requirements.
CO2& PO2 Mapped at 1	Provides an individual with a solid grounding in the analytical aspects of virtualization, setting the stage for more advanced problem-solving in subsequent levels
CO2& PO4 Mapped at 1	Understanding the components of virtualization in the context of providing flexible and scalable infrastructures as per user requirements.
CO2& PO5 Mapped at2	Prepares individual to work efficiently and effectively in virtualized environments, leveraging tools that enhance problem-solving and project delivery.
CO2& PO6 Mapped at2	Applying professional ethics, cyber regulations, professional responsibilities, and norms of the professional computing world in the context of understanding the components of virtualization for providing flexible and scalable infrastructures.
CO2& PO7 Mapped at2	Encouraging self-motivated learning and independent exploration in the context of understanding the components of virtualization. Individuals are guided to recognize the importance of staying informed about advancements in their field and taking proactive steps towards continuous improvement.
CO2& PO10 Mapped at 2	Focuses is on instilling an entrepreneurial mindset, exploring creative solutions, and understanding the societal impact of innovative virtualization design. Students are guided to recognize the potential for positive change through their work in the computing field.
CO3 & PO1 Mapped at 1	Establish a foundational connection between carrying out practical activities through virtualization and applying fundamental computing knowledge. The focus is on providing students with a solid grounding in both theoretical concepts and hands-on experience in virtualized environments, laying the groundwork for more advanced exploration
CO3 & PO3 Mapped at3	Designing and evaluating solutions in the context of practical activities through virtualization.Incorporating advanced design principles, considering societal values, and aligning with industry expectations to create impactful virtualized systems. Students are encouraged to think critically about the societal implications of their designs and to strive for excellence in meeting industry standards.
CO3 & PO4 Mapped at2	Introducing research methods, emphasizing data analysis, and encouraging students to apply research-based knowledge in their practical activities. This level of alignment prepares students for more advanced research activities
CO3& PO5 Mapped at2	Hands-on experience with tools relevant to problem analysis, design, development, testing, and deployment, preparing students for effective tool usage in real-world

	scenarios.
CO3& PO6 Mapped at1	Introducing ethical considerations, fostering awareness of regulations, and promoting responsible behavior in virtualization projects. This foundational level sets the stage for deeper exploration and application of ethical principles
CO3& PO7 Mapped at1	Focuses is on introducing the concept of lifelong learning, fostering a proactive attitude toward staying updated, and laying the groundwork for a mindset of continuous improvement in the rapidly evolving field of virtualization.
CO3& PO9 Mapped at2	Communicating effectively about complex computing topics within the context of carrying out practical activities through virtualization. Both verbal and non-verbal communication skills, with an emphasis on clear articulation, documentation, presentation techniques, and collaboration within virtualization teams.
CO3& PO10 Mapped at3	To be aware of individual, cultural difficulties of organizations and to be able to master over them and Read, write, and contribute to Business literature are nottotally aligned as CO 4 will ensure reading and writing ability but whether they will contribute to business literature is doubtful.
CO4& PO1 Mapped at2	Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment is possible only when cultural aspects are taken into consideration
CO4 & PO2 Mapped at 1	Understanding of research methods, problem analysis, and the application of fundamental knowledge in the context of conducting research for virtualization projects.Introducing students to the basics of research-based knowledge and methods, providing them with the skills to analyze problems and formulate solutions in virtualization scenarios
CO4& PO4 Mapped at 3	Advanced research methods, complex experiment design, sophisticated data analysis techniques, and the synthesis of information to contribute valuable insights to the field. This level of alignment prepares students for advanced research roles and positions them to make meaningful contributions to the virtualization domain.
CO4 & PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing self-motivated, independent learning in the context of conducting research in computing problems related to virtualization.
CO4 & PO8 Mapped at 1	Introducing students to collaborative project development, both individually and in groups, within the context of solving problems in various domains related to virtualization. This foundational level sets the stage for more advanced project management and problem-solving activities
CO4 & PO9 Mapped at 2	Refining communication skills through advanced verbal presentations, comprehensive reports, interactive design reviews, and client-facing scenarios. This level of alignment prepares students for more advanced communication challenges
CO4 & PO10 Mapped at 3	Creating a conducive environment for innovation and entrepreneurship within the context of conducting research in computing problems related to virtualization.Promoting innovative thinking, assessing societal impact, collaborating with industry partners, and preparing students for entrepreneurial endeavors in the virtualization domain.
CO5& PO2 Mapped at 3	Advanced tool integration in problem analysis, design, development, testing, and deployment phases & prepares students to leverage cutting-edge tools effectively for comprehensive problem-solving in software engineering projects.
CO5 & PO3 Mapped at 1	Introducing basic tools relevant to solution design, development, testing, and deployment. Prepares students for more advanced tool usage in subsequent levels of the curriculum, particularly in the context of designing and evaluating solutions, systems, modules, and processes.

CO5 & PO4 Mapped at 2	Integrating research-oriented tools, utilizing tools for experimental design and data analysis, and emphasizing tool-supported documentation of research methodology. This level of alignment prepares students for more advanced applications of tools in computing research
CO5 & PO6 Mapped at 3	instilling a deep understanding of ethical considerations in tool selection, compliance with regulations, and responsible tool utilization within the context of the professional computing environment. This level of alignment prepares students to navigate the ethical complexities associated with modern tool usage in their future professional roles.
CO5 & PO7 Mapped at 2	providing opportunities for self-motivated and independent learning in mastering tools, ensuring that students are equipped to adapt to new tools and technologies throughout their professional careers.
CO6 & PO1 Mapped at 2	Creating a conducive environment for innovation and entrepreneurship, specifically within the context of applying computational knowledge to design models for societal betterment.
CO6 & PO2 Mapped at 2	Creating a conducive environment for innovation and entrepreneurship, specifically within the context of applying software engineering principles to analyze problems and formulate solutions.
CO6 & PO3 Mapped at 3	Integrating advanced design methodologies, fostering entrepreneurial considerations in solution evaluation, and emphasizing strategic planning for innovative solutions with a focus on societal betterment.Prepares students for leadership roles in the development of innovative solutions that address both societal needs and entrepreneurial opportunities.
CO6 & PO5 Mapped at 3	Provides individuals with a high level of proficiency in creating a conducive environment for innovation and entrepreneurship, specifically within the context of using modern tools for problem analysis, design, development, testing, and deployment. Integrating tools seamlessly into the entrepreneurial process, enhancing efficiency, and supporting various aspects of the innovation lifecycle.
CO6 & PO7 Mapped at 1	Introducing these concepts, the goal is to create awareness and encourage a mindset that values lifelong learning for sustained success in entrepreneurial ventures.
CO6 & PO8 Mapped at 2	Integrating these skills to develop innovative solutions and effectively manage entrepreneurial ventures. This level of alignment prepares students to contribute to entrepreneurial projects by leveraging a combination of computational and management expertise.
CO6 & PO9 Mapped at 2	Equip students with a moderate level of proficiency in creating a conducive environment for innovation and entrepreneurship, particularly focusing on effective communication.
CO6 & PO10 Mapped at 3	Involves strategic integration, a holistic understanding of innovation ecosystems, and a focus on societal impact assessment in entrepreneurial ventures. The goal is to prepare students for leadership roles in driving positive societal change through innovative and entrepreneurial initiatives.

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

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	-	-	3	2	-	-	-	-	-
CO2	3	3	-	3	2	-	2	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-
CO4	-	-	-	3	-	-	2	-	-	-
CO5	-	-	3	-	2	-	-	-	-	-
CO.	**1.2**	**0.6**	**0.6**	**2.4**	**1.2**	**-**	**0.8**			
CO	**1**	**1**	**1**	**2**	**1**	**-**	**1**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation put '-'

Evaluation

Internals: 100%
Externals: 0%
Total : 100%

Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	20	4	4	4	4	4
Assignments/ Projects	10	2	2	2	2	2
Test	10	2	2	2	2	2
Internal	40	8	8	8	8	8
Internals	100					
End Term (Univ)						

Attendance Policy

95-100%	10 marks
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Appendix:

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 mapped at 3	CO1 aligns with PO1 by emphasizing the understanding and application of mathematical foundations and computing knowledge in the context of implementing concepts in R.
CO2 & PO1 mapped at 3	CO2 aligns with PO1 by emphasizing the understanding and application of mathematical foundations and computing knowledge in the context of data concepts and statistical techniques.
CO2 & PO2 mapped at 3	O2 aligns with PO2 by emphasizing the understanding of data and statistical techniques as part of the skills needed for problem analysis in computing.
CO1 & PO4 mapped at 3	CO1 aligns with PO4 by emphasizing the ability to conduct investigations through the implementation and experimentation with concepts in the context of the R programming language.
CO2 & PO4 mapped at 3	CO2 aligns with PO4 by emphasizing the understanding and application of data concepts and statistical techniques as part of the skills needed for conducting investigations into complex computing problems.
CO3 & PO4 mapped at 3	CO3 aligns with PO4 by emphasizing the ability to conduct investigations through the design, prediction, and interpretation of data behaviors in the context of complex computing problems.
CO4 & PO4 mapped at 3	CO4 aligns with PO4 by emphasizing the ability to conduct investigations through the analysis and study of data sets and historical data in the context of complex computing problems.

CO1 & PO5 mapped at 2	CO1 aligns with PO5 by emphasizing the ability to use modern computing tools, specifically the R programming language, for implementing concepts and solutions in the context of data analysis and statistical modeling.
CO2 & PO5 mapped at 2	CO2 aligns with PO5 by emphasizing the ability to understand and apply data concepts and statistical techniques using modern computing tools for innovative software solutions.
CO5 & PO5 mapped at 2	CO5 aligns with PO5 by emphasizing the ability to use modern computing tools, specifically the R programming language, for converting historical data into a prediction model and contributing to innovative software solutions.
CO2 & PO7 mapped at 2	CO2 aligns with PO7 by emphasizing the understanding of data concepts and statistical techniques as part of the skills needed for continuous learning in the computing profession.
CO4 & PO7 mapped at 2	CO4 aligns with PO7 by emphasizing the ability to engage in continuous learning, particularly in the context of analyzing datasets and studying historical data in the computing profession.

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 Performance, Holdout	5	CO 2 CO 3	Problem Illustration	Apply (Analyze)	Problems and its Solution

	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**	10	CO 5	Software	Evaluate	Problems

	Iris Data set ,Loan Data set, Titanic survival Data set ,Share Market Data set, Covide -19 Data set etc		CO 6	Demonstration and use of R Language		and its Solution

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	-	-	-	-	-	-	-	-
CO2	-	2	2	-	-	-	-	-	-	-
CO3	2	-	-	-	3	-	-	-	-	-
CO4	-	-	2	3	3	-	2	-	-	-
CO5	-	1	-	-	3	-	-	-	-	-
CO6	1	-	2	-	2	-	-	-	-	-
CO.	**1.0**	**0.83**	**1**	**0.5**	**1.83**	**-**	**0.33**	**-**	**-**	**-**
CO	**1**	**1**	**1**	**1**	**2**	**-**	**0**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation put '-'

Evaluation

Internals: 100%
Externals: 0%
Total : 100%

Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	20	4	4	3	3	3	3
Assignments/ Projects	10	2	2	2	2	1	1
Test	10	2	2	2	1	1	2
Internal	40	6	6	8	6	6	8
Internals	100						

End Term (Univ)							

Attendance Policy

95-100%	10 marks
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 mapped at 3	Course Outcome 1 (CO1) emphasizes understanding and applying mathematical foundation and computing, aligning well with the broader Computational Knowledge goal (PO1).
CO1& PO2 mapped at 2	While CO1 involves programming skills, it has a moderate alignment with Problem Analysis (PO2), possibly because it may not explicitly focus on problem analysis but contributes to it indirectly.
CO2 & PO2 mapped at 2	CO2, focusing on understanding data science fundamentals, aligns moderately with Problem Analysis (PO2) as it contributes to the identification and analysis of computing problems.
CO3 & PO1 mapped at 2	Designing different models (CO3) has a moderate alignment with Computational Knowledge (PO1), suggesting that model design involves applying mathematical and computing knowledge.
CO3& PO5 mapped at 3	CO3 aligns well with Modern Tool Usage (PO5) as it emphasizes the application of emerging technologies in designing and implementing models.
CO4 & PO3	Analyzing data sets and comparing models (CO4) moderately aligns with the

mapped at 2	goal of Design/Development of Solutions (PO3), indicating a connection to proposing integrated solutions.
CO4 & PO4 mapped at 3	CO4 strongly aligns with Conduct Investigations of Complex Computing Problems (PO4), as it involves conducting experiments, interpreting data, and drawing conclusions.
CO4 & PO5 mapped at 3	CO4 aligns strongly with Modern Tool Usage (PO5) since analyzing data sets involves selecting and using modern computing tools and techniques.
CO4 & PO7 mapped at 2	Conducting investigations (CO4) moderately aligns with Life-long Learning (PO7), suggesting that engaging in investigative activities contributes to continuous learning.
CO5 & PO2 mapped at 1	CO5 has a weak alignment with Problem Analysis (PO2), possibly because it is more focused on the application of analysis rather than problem identification.
CO5 & PO5 mapped at 3	CO5 strongly aligns with Modern Tool Usage (PO5) as it involves converting analysis into modern approaches, emphasizing the use of contemporary tools and techniques.
CO6 & PO1 mapped at 1	Writing R/Python code for analysis (CO6) has a weak alignment with Computational Knowledge (PO1), possibly because it is more about practical coding skills than theoretical understanding.
CO6 & PO3 mapped at 2	CO6 moderately aligns with Design/Development of Solutions (PO3), indicating a connection between coding skills and proposing integrated solutions.
CO6 & PO5 mapped at 2	CO6 moderately aligns with Modern Tool Usage (PO5) since coding skills are essential for using modern computing tools.

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	07	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	07	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	07	CO3	Lecture with Ppts	Comprehens 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	Comprehens 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	06	**CO5**	Lecture with Ppts	Learning How to setup Linux Environments	presentation

Text Books Textbook:

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)

Course Outcome (Cos)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1: Understand the basic concepts and philosophy of the Linux operating system.	3	1	3	1	3	3	3	-	1	-
CO2: Gain proficiency in using various applications of the open-source office suite, including word processing, spreadsheet management, presentation creation, and desktop database usage.	3	3	3	-	3	2	1	1	3	-
CO3: Acquire a comprehensive understanding of shell scripting using bash and other shell environments.	3	3	3	2	3	-	3	-	1	-
CO4: Explore routine activities in system administration and utilize shell commands and administrative tools for system management.	-	3	3	3	3	3	-	3	-	-
CO5: Learn to manage user accounts, provide user support, and automate system tasks such as system initialization, startup, shutdown, and task scheduling.	-	-	3	2	3	2	3	-	3	-

1- Low , 2- Medium, 3- High, If no correlation, put '-'

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

Evaluation: Internals: 100%

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	
Class Participation/ Attendance	05	1	1	1	1		1
Class Test 1	15	2.5	2.5				
Class Test 2	15	-	-	2.5	2.5		
Assignment/Case study discussion	15	1	1	1	1		1
Internal Mid term	25	1.5	1.5	2	2		3
Internal End Term Exam	25	1.5	1.5	2	2		3
Internals Total	100						
End Term Exam(Uni.)							

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 1:	**Understanding the basic concepts and philosophy of the Linux operating system aligns with the requirement of applying knowledge of computing fundamentals (including operating systems) to design appropriate models for given problems or requirements. Mastery of Linux concepts enables students to effectively utilize computing fundamentals in practical scenarios, thus contributing to their ability to design appropriate solutions.**
CO2 & PO5 Mapped at 5	Proficiency in using various applications of the open-source office suite requires the use of modern tools for delivering milestones like problem analysis, design, development, testing, and deployment. As students gain proficiency in office suite applications, they are inherently

	learning to utilize modern tools effectively, aligning with the program outcome of modern tool usage.
CO3 & PO3 Mapped at 1:	Acquiring a comprehensive understanding of shell scripting aligns with the program outcome of applying knowledge of computing fundamentals to design appropriate solutions. Shell scripting involves utilizing computing fundamentals to design scripts that automate tasks or solve specific problems, thus contributing to the broader outcome of designing solutions.
CO4 & PO2 Mapped at 2	Exploring routine activities in system administration and utilizing shell commands and administrative tools for system management requires the application of fundamental knowledge of software engineering and various systems domains to analyze, identify, formulate, and provide solutions to system management problems. Understanding system administration aligns with the program outcome of problem analysis.
CO5 & PO8:	Mapped at 8: Learning to manage user accounts, provide user support, and automate system tasks requires involvement in projects to solve problems in various domains and environments using computational and management skills. Effectively managing user accounts and automating system tasks involves project development and the application of computational and management skills, aligning with the program outcome of involvement in project development.

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
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 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	06	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 NFS: network file sharing & resource 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	06	CO1 CO2	Lecture with Ppts	Understand And Apply to Setup YUM Server	Presentations
3	Setup And Manage Web Server 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 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	05	CO3 CO4	Lecture with Ppts	Learn Mastrer Slave Booting Up Process	Class test and presentation
5	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 case of processes. Inter Process Communication Introduction to IPC, Pipe, FIFO, Shared Memory, Advantages and Disadvantages of various IPC mechanisms, Application of IPC	06	CO4	Lecture with Ppts	Comprehens ve knowledge of Linux Architecture	Mid Term presentation
6	Working with Signals and Threads 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	07	CO1 CO2	Lecture with Ppts	Underrstandi ng and Learning Thread and Synchronizat ion	presentation
7	Linux Networking 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	07	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

CO PO Mapping

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1: Understand the fundamentals of networking, including the OSI model and IP addressing (IPv4 and IPv6).	3	3	3	-	3	3	1	-	1	1
CO2: Configure network file sharing using NFS and manage a YUM server for package management.	1	3	-	3	-	2	1	3	1	-
CO3: Configure and manage a web server using Apache, including setting up multiple sites and configurations	1	3	3	-	3	2	-	3	-	-
CO4: Understand the booting process of Linux and the initialization process.	3	3	3	-	3	-	-	2	1	1
CO5: Explore inter-process communication (IPC) mechanisms and implement synchronization mechanisms.	3	3	3	-	3	3	1	1	2	1
CO	2.2	3	2.4	0.6	2.4	2	0.6	1.8	1	0.6
CO	2	3	2	1	2	2	1	2	1	1

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

Evaluation: Internals: 100%

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	
Class Participation/ Attendance	05	1	1	1	1		1
Class Test 1	15	2.5	2.5				
Class Test 2	15	-	-	2.5	2.5		
Assignment/Case study discussion	15	1	1	1	1		1
Internal Mid term	25	1.5	1.5	2	2		3
Internal End Term Exam	25	1.5	1.5	2	2		3
Internals	100						

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 1	: Understanding the fundamentals of networking, including the OSI model and IP addressing, requires applying knowledge of computing fundamentals, mathematics, and the given domain of networking concepts. This aligns with the program outcome of applying computational knowledge to design appropriate models for given problems or requirements. Mastery of networking fundamentals enables students to design appropriate network models to address specific networking challenges.
CO2 & PO8 Mapped at 8	: Configuring network file sharing and resource sharing across Linux environments involves involvement in project development to solve problems using computational and management skills. This aligns with the program outcome of involvement in project development, where students utilize their computational skills to configure and manage network services to meet specified needs.
CO3 & PO3 Mapped at 3	: Configuring and managing a web server using Apache involves designing and evaluating solutions for specified needs, considering societal values and industry expectations. Effective configuration and management of web servers require students to design appropriate systems and processes to meet the requirements of hosting multiple sites, aligning with the program outcome of designing and evaluating solutions.
CO4 & PO2 Mapped at 2:	Understanding the booting process of Linux and the initialization process requires applying fundamental knowledge of software engineering and systems domains to

	analyze and identify the stages of the boot process. This aligns with the program outcome of problem analysis, where students apply their knowledge to analyze and provide solutions to system-related problems.
CO5 & PO4: Mapped at 4:	Exploring inter-process communication mechanisms and implementing synchronization mechanisms involve conducting research in computing problems. Students use research-based knowledge and methods to analyze the advantages and disadvantages of different IPC mechanisms and to implement synchronization mechanisms effectively, aligning with the program outcome of conducting research in computing problems.
CO6 & PO6 Mapped at 6	: Understanding the booting process of Linux and managing IPC mechanisms and synchronization mechanisms require students to learn and adhere to professional ethics and norms in the computing world. This aligns with the program outcome of learning and inculcating professional ethics, as students must ensure the secure and ethical operation of system processes.
CO7 & PO7: Mapped at 7	: Understanding the booting process of Linux and managing IPC mechanisms and synchronization mechanisms require students to acknowledge the need for continuous professional development. As technology evolves, students must engage in self-motivated, independent learning to stay updated with the latest advancements in system initialization and process management. This aligns with the program outcome of acknowledging the need for continuous professional development.

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	5	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	5	CO 2	Lecture with Ppts	Apply	Short Answers/ Programs

	Perl – Loops : while loop , until loop, for loop, For each loop do 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()	7	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	8	CO 1	Lecture with Ppts	Apply	Short Answers

	Report Header Number of Lines on a Page, Define a Report 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	5	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 ,	7	CO 4	Lecture with Ppts	Creating	Long Answers/ Programs

	Default Auto loading, Destructors and Garbage Collection, Object Oriented Perl Example					

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO 2	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO 3	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO 4	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO.	**2**	**2**	**0.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Assignments/ Projects	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Internal End Term Exam	**20**	**5.5**	**5.5**	**4.5**	**4.5**
Internal	**40**	**10.5**	**10.5**	**9.5**	**9.5**

Internals	**100**				
End Term (Uni)					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Understand Perl features and understand Perl Data structures.
CO1 & PO 2 Mapped at 2	Understand and creating Perl Programs using basic features of Perl to analyse, identify, formulate and provide the solution to given problem on Data types and Variables
CO2 & PO 1 Mapped at 2	Understand Perl syntax and apply Perl control statements and functions to design appropriate models for a given problem.
CO2 & PO 2 Mapped at 2	Understand Perl syntax and apply Perl control statements and functions to analyse, identify, formulate and provide the solution to given problem using Control statements and looping statements.
CO3 & PO 1 Mapped at 2	Understand the various operators in Perl, Date formats todesign appropriate models for a given problem and/or requirements.
CO3 & PO 2 Mapped at 2	Understand and apply operators, Date formats and functions in Perlto analyse, identify, formulate and provide the solution to given problem.
CO4 & PO1 Mapped at 2	Apply the concepts of Sub-routine, regular expression in Perl to design appropriate models for a given problem and/or requirements.
CO4 & PO2 Mapped at 2	Apply the concepts of Sub-routine , regular expression in Perl to analyze, identify, formulate and provide the solution to given problem.
CO4 & PO3 Mapped at 2	Apply the concepts of File I/O in Perl scripting to Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration and industry expectations.

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.	5	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.	6	CO 2	Lecture with Ppts	Apply	Short Answers/ Programs
3	**ConditionalLoops,MethodsandBlocks** IfStatement,Usingcasestatement,usingloops,creatingand calling method,makinguseof Scope, working with Blocks	6	CO 3	Lecture with Ppts	Understand	Short Answers/ Programs

4	**Classes** creatingaclass,creatinganobject DataEncapsulation,DataAbstraction,Polymorphism, Inheritance	8	CO 1	Lecture with Ppts	Apply	Short Answers
5	**Objects** UnderstandingRuby'sobjectAccess,overridingmethod,creatingclassvariables,creatingclass methods,creatingModules	5	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	**Building Simple Rails Applications** Accessing data user provides, using rails short cuts for HTML controls ,working with models,tying controls to models, initializing data in controls, storing data in sessions	7	CO 4	Lecture with Ppts	Creating	Long Answers/ Programs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO 1	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO 2	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO 3	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO 4	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO.	**2**	**2**	**0.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Assignments/ Projects	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Internal End Term Exam	**20**	**5.5**	**5.5**	**4.5**	**4.5**
Internal	**40**	**10.5**	**10.5**	**9.5**	**9.5**
End Term Exam	**60**				
End Term (Uni.)					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Understand Ruby environment and syntax and understand Ruby flow control and various functions, libraries.
CO1 & PO 2 Mapped at 2	Understand and creating Ruby Programs using basic features of Ruby to analyse, identify, formulate and provide the solution to given problem.
CO2 & PO 1 Mapped at 2	Understand Ruby syntax and apply Ruby control statements and functions to design appropriate models for a given problem.
CO2 & PO 2 Mapped at 2	Understand Ruby syntax and apply Ruby control statements and functions to analyse, identify, formulate and provide the solution to given problem.
CO3 & PO 1 Mapped at 2	Understand the Rail framework todesign appropriate models for a given problem and/or requirements.
CO3 & PO 2 Mapped at 2	Understand and apply Rail frameworkto analyse, identify, formulate and provide the solution to given problem.
CO4 & PO1 Mapped at 2	Apply the concepts of Object-Oriented Programming for Ruby to design appropriate models for a given problem and/or requirements.
CO4 & PO2 Mapped at 2	Apply the concepts of Object-Oriented Programming for Rubyin order to analyze, identify, formulate and provide the solution to given problem.
CO4 & PO3 Mapped at 2	Apply the concepts of Object-Oriented Programming for Ruby to Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration and industry expectations.

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	7	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	7	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 :	5	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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-
CO4	-	2	2	-	-	-	-	-	-	-
CO	1.5	1	0.5	-	-	-	-	-	-	-
CO	2	1	1	-	-	-	-	-	-	-

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	10	2.5	2.5	2.5	2.5
Live project – club activity	5				5
Assignments/ Projects	5	2	3		
Internal End Term Exam	20	5	5	5	5
Internal	40	9.5	10.5	7.5	12.5
End Term Exam	100				
End Term (Univ)					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

ReferenceBooks:

Sr.No.	Nameofthe Author	Titleof theBook	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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Understand the basic concepts of JavaScript
CO2& PO1 Mapped at 2	Understand the programming constructs and objects in JavaScript.
CO3& PO1 Mapped at 2	Understand the importance of form in JavaScript.
CO3& PO2 Mapped at 2	Ability to analyze validating the form data using JavaScript.
CO4& PO2 Mapped at 2	Ability to develop and create interactive web pages using various constructs in JavaScript
CO4& PO3 Mapped at 2	Ability to understand, transform the need and give solution in terms of interactive web site using Javascript / JQuery, AJAX and JSON.

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-(05)B**	**Android**	
	Prepared By	**Dr. Satyawan Hembade**	
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
- Todevelop proficiencyin creatingMobile basedapplicationsusingtheJavaProgrammingLanguage.
- Todevelop applicationusingandroid 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	**5**	CO2	Lecture with PPT,	Understand	Quiz

	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			Hands On Demo		
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**	**7**	CO2, CO4	Lecture with PPT,	Evaluate, analyze,	Lab Assignemnt

	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			Hands On Demo	Create	
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

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1: State features of Android, components of android architecture and android application.	-	-	2	-	-	-	-	-	-	-
CO2: Describe components of android application along with life cycle of activity, intent, fragment etc.	-	1	2	-	2	-	-	-	-	-
CO3: Apply knowledge to design and develop android application	1	2	2	-	2	-	2	-	-	-
CO4: Analise the use of Intent, Fragment, content providers and sensors.	1	2	2	-	-	-	1	-	-	-
CO5 Evaluate use of various component of android application.	1	3	2	-	-	-	2	-	-	2
CO6: Create and publish Android application using various component and database.	-	-	**3**	-	**3**	-	**3**	-	-	3
CO	0.5	1.33	2.17	-	1.15	-	1.33	-	-	0.83
CO	1	1	2	-	1	-	1	-	-	1

1- Low, 2- Medium, 3- High, If no correlation, put '-'
(Rationale in Appendix)

Evaluation (IE: 100%)

Attendance Policy

Attendance	Marks
90-100%	**10 marks**
80-89%	7 marks
75-79%	5 marks

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/

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	10	2	1.5	1.5	1.5	2	1.5
Class Test 1	10	5	2.5	2.5			
Class Test 2)	10	-	2.5	2.5	2.5	2.5	
Assignment/Mini Project	20	-	-	5	5	5	5
Internal Mid term	25	5	5	5	5	5	
Internal End Term Exam	25	-	5	5	5	5	5
Internals	100						
End Term (Uni.)							

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO3 Mapped at 2	Understanding features of Android, components of android architecture and android application is moderately useful to design and development of solution.
CO2 & PO2 Mapped at 1	Components of android application along with life cycle of activity, intent, fragment is weakly helpful during problem analysis.
CO2 & PO3 Mapped at 1	Components of android application along with life cycle of activity, intent, fragment is moderately helpful in design and development of solution.
CO2 & PO5 Mapped at 2	Components of android application along with life cycle of activity, intent, fragment is moderately related to use of android development environment
CO3& PO1 Mapped at 1	Apply knowledge to design and develop android application is weakly associated with computational knowledge
CO3 & PO2 Mapped at 2	Apply knowledge to design and develop android application is requires moderate skills of problem analysis.
CO3 & PO3 Mapped at 2	Apply knowledge to design and develop android application is moderately associated with design and development of solutions.
CO3& PO5 Mapped at 2	Apply knowledge to design and develop android application is moderately depends on modern tool usage
CO3& PO7 Mapped at 2	Apply knowledge to design and develop android application is moderately contributes to lifelong learning
CO4 & PO1 Mapped at 1	Low computational knowledge is required to analyze the use of Intent, Fragment, content providers and sensors.
CO4 & PO2 Mapped at 2	Moderate knowledge about problem analysis is required to analyze the use of Intent, Fragment, content providers and sensors
CO4 & PO3 Mapped at2	Design and development of solutions is moderately associated with analyze the use of Intent, Fragment, content providers and sensors
CO4 & PO7 Mapped at 1	Analise the use of Intent, Fragment, content providers and sensors weaklycontribute to lifelong learning
CO5& PO1 Mapped at 1	Some knowledge of computation helps to evaluate use of various component of android application.
CO5& PO2 Mapped at 3	Problem analysis is moderately helping in evaluate use of various component of android application.
CO5& PO3 Mapped at3	Design and development of solution is strongly depend on evaluation of use of various component of android application.
CO5& PO7 Mapped at 2	**E**valuation of use of various component of android application moderately contributes to lifelong learning.
CO6& PO3 Mapped at 3	Knowledge to create and publish Android application using various component and databases strongly required to design and develop solutions.
CO6& PO5 Mapped at 3	Use of modern toll usage is must to create and publish Android application using various component and databases.
CO6& PO7 Mapped at 3	Knowledge to create and publish Android application using various component and databases strongly leads to lifelong learning
CO6& PO10 Mapped at 3	Knowledge to create and publish Android application using various component and databases strongly leads to innovation and entrepreneurship development

.

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.	**6**	CO1	Lecture with PPTs, Quiz	Remembering	End Term Internals Assignments Quiz
2	**Classes and Objects:**	**6**	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	**7**	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.	**6**	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.	**6**	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, Demonstration	Creating	End Term Internals Assignments Quiz

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO-06A.1	**3**	**1**	**-**	**1**	**1**	**1**	**1**	**-**	**-**	**-**
CO-06A.2	**2**	**2**	**2**	**-**	**3**	**-**	**3**	**-**	**2**	**1**
CO-06A.3	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**1**
CO-06A.4	**2**	**1**	**3**	**2**	**2**	**-**	**-**	**2**	**-**	**-**
CO-06A.5	**3**	**-**	**1**	**3**	**1**	**1**	**1**	**-**	**-**	**1**
CO	**2.6**	**1.4**	**1.6**	**1.6**	**2**	**0.8**	**1.4**	**0.8**	**0.8**	**0.6**
CO	**3**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%

Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	**10**	**2**	**2**	**2**	**2**	**2**
Quiz	**10**	**3**	**2**	**2**	**2**	**1**
Assignments/ Projects	**10**	**2**	**2**	**2**	**2**	**2**
Internal Mid Term Exam	**20**	**4**	**4**	**4**	**4**	**4**
Internal	**50**	**11**	**10**	**10**	**10**	**9**
Internals	**100**					
End Term Exam (Uni.)						

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Helps to remember the concept of Object Oriented Programming with its features with applying the knowledge of computing fundamentals
CO1 & PO2 Mapped at 1	Ability to identify the Data types of C# and use of variables along with the operators and type conversion
CO1 & PO4 Mapped at 1	Ability to apply the control statements to solve the problems and to interprets the data.
CO1 & PO5 Mapped at 1	Ability develop an event driven programming in C#
CO1 & PO6 Mapped at 1	Helps to understand the database application programming in C#
CO1 & PO7 Mapped at 1	Ability to learn the basic concepts of object-oriented programming, event driven programming and database application programming in C#
CO2 & PO1 Mapped at 2	Understand the basic concepts to work with programming in C# also ability to understand methods and properties used in C# programming
CO2 & PO2 Mapped at 2	Ability to identify , analyze , formulate and provide the solution to the given problem
CO2 & PO3 Mapped at 2	Ability to design and evaluate the problems using C# constructors , destructors, class, Methods etc.
CO2 & PO5 Mapped at 3	Ability to make use of modern tools, skills and techniques to analyze the problems, along with the design and development
CO2 & PO7	Enhance knowledge to recognize the need for developing in continuous learning for

Mapped at 3	recent trends in C# Programming with its techniques.
CO2 & PO9 Mapped at 2	Ability to draw reports , design documentations and presentations to elaborate about complex computing in C# programming .
CO2 & PO10 Mapped at 1	Helps to understand the properties of various controls of windows forms application along with database objects and their methods.
CO3 & PO1 Mapped at 3	Applying the concept of Abstraction, Inheritance, Polymorphism, Encapsulation, Exception Handling, Windows forms applications and database applications.
CO3 & PO2 Mapped at 3	Ability to provide the solution to the given problem by applying the concept of inheritance and polymorphism
CO3 & PO3 Mapped at 2	Ability to design and develop application using c# Programming according to the specific need.
CO3 & PO4 Mapped at 2	Ability to design the experiments using windows form application and exception handling in C# programming
CO3 & PO5 Mapped at 3	Applying the recent trends in C# Programming to design, development and problem analysis along with the testing and deployments
CO3 & PO6 Mapped at 2	Ability to learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world while deploying application of C# Programming.
CO3 & PO7 Mapped at 2	Enhance learning and practicing the development of C# Applications.
CO3 & PO8 Mapped at 2	Applying the use of innovative techniques like windows application and database applications to develop the project using computational and management skills
CO3 & PO9 Mapped at 2	Ability to applying the skills to draw the required reports and design the documentation of Projects
CO3 & PO10 Mapped at 1	Ability to provide the environment to build the C# application according to the need
CO4 & PO1 Mapped at 2	Ability to use proper methods of C# to solve object oriented problems.
CO4 & PO2 Mapped at 1	Applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO4 & PO3 Mapped at 3	Ability to design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations
CO4 & PO4 Mapped at 2	Ability to design of experiments, analysis,evaluate and interpretation of data, and synthesis of the information to provide valid conclusions.
CO4 & PO5 Mapped at 2	Ability to design, development, testing and deployment , problems analysed by using modern tools.
CO4 & PO8 Mapped at 2	Ability to involve in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO5 & PO1 Mapped at 3	Helps to creating the console based and windows based applications by using the concepts of C# programming.
CO5 & PO3 Mapped at 1	Ability to design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations
CO5 & PO4 Mapped at 3	Ability to design of experiments, analysis,evaluate and interpretation of data, and synthesis of the information to provide valid conclusions
CO5 & PO5 Mapped at 1	Helps to creating the windows and database applications by using modern tools in C# Programming
CO5 & PO6	Helps to Learn and inculcate professional ethics, cyber regulations, professional

Mapped at 1	responsibilities and norms of professional computing world.
CO5 & PO7 Mapped at 1	Helps to create project development applications and Practice of data access and data binding in ADO.Net
CO5 & PO10 Mapped at 1	Providing conducive environment for innovation and entrepreneurship leading to solutions

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.Ne**t: 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.	8	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.	7	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.	6	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.	5	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	5	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.					

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-
CO3	2	1	2	-	2	2	-	-	2	1
CO4	2	-	2	-	3	2	-	-	2	-
CO	2.25	0.25	1	-	1.25	1	-	-	1	0.25
CO	2	0	1	-	1	1	-	-	1	0

1- Low, 2- Medium, 3- High, if no correlation, put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total: 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
PracticalAttendance	**5**			**2.5**	**2.5**
Assignments/ Projects	**5**			**2.5**	**2.5**
Internal End Term Exam	**20**	**5.5**	**5.5**	**4.5**	**4.5**

Internal	**40**	**8.0**	**8.0**	**12**	**12**
Internals	**100**				
End Term (Univ)					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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)

Rationale for Mapping Program Outcomes and Course Outcomes:

Mapping	Level	Justification
CO1-PO1	3	BasicknowledgeaboutconceptsofObjectOrientedProgrammingandC# will begained bystudents.
CO2-PO1	2	Conceptslearnedinthissubjectwillbeusefultodesigngoodlookandfeelof the software.
CO3-PO1	2	Studentswillgainknowledgeaboutwebapplicationdevelopmentusing ASP.NetandC#.
CO3-PO2	1	Todevelopanefficientsolution,studentwillanalyzeproblem completely.
CO3-PO3	2	ConceptsofstatemanagementandASP.Netwillbeusefulindesigning reliablewebapplications.
CO3-PO5	3	Students use Visual Studio platform for performing their laboratory experiments.So,theywillbeacquaintedwith latesttools andtechniques.
CO3-PO6	2	Knowledgeaboutadvancedconceptsofprogrammingisdeliveredwhich
		subsequentlyused insolvingrealtime problems.
CO3-PO9	2	Studentswilldesignvariousapplicationsingroupwhichimpartteam work skills.
CO3-PO10	1	Studentsinagroupcommunicatewithvariousstackholdersfor formulating exact problem andvalidatingpreparedsolutionwhichdevelops communication skills.
CO4-PO1	2	ConceptualknowledgeaboutAJAX and MVC is delivered whichcanfurtherbeutilized forservingsoftware industries.
CO4-PO3	3	Applyknowledgeof MVC and AJAXfordesigningreal world problem.
CO4-PO5	3	KnowledgeofmoderntechnologieslikeAJAXandMVCisdeliveredto enrich the software.
CO4-PO6	2	Afterunderstandinglatestconceptsof.Net,studentscaneffectivelysolve real world problems.
CO4-PO9	2	Analyzingsoftware requirements andframingsolutions requiredgroup efforts whichimpartteamwork andleadership skills.

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 Element in HTML5, Handlingof Unknown Elements by the Browsers, Headers, Articles, Dates and Times, Navigation, Footers	7	CO2	Lectures with PPTs	Understand	Quiz Short Answers
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	5	CO4	Lectures with PPTs	Create	Quiz Short Answers

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**-**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO	**1.5**	**0.5**	**0.5**	**-**	**0.5**	**-**	**-**	**-**	**-**	**-**

CO	**2**	**1**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)

Evaluation

Internals: 100%

Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Live project – club activity	**5**				**5**
Assignments/ Projects	**5**	**1**	**2**	**2**	
Internal End Term Exam	**20**	**5**	**5**	**5**	**5**
Internal	**40**	**8.5**	**9.5**	**9.5**	**12.5**
Internals	**100**				
End Term					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

ReferenceBooks:

Sr.No.	Nameofthe Author	Titleof theBook	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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Understand the basics of HTML and HTML5
CO2& PO1 Mapped at 2	Ability to understand the basic features and elements of HTML5
CO3& PO1 Mapped at 2	Understand the advancement of tags in HTML5
CO4& PO2 Mapped at 2	Ability to analyze the usage of various controls while designing a web form
CO4& PO3 Mapped at 2	Ability to create a web form using required controls in HTML5.
CO4& PO5 Mapped at 2	Ability to understand, transform the need and give solution in terms of website/webpage using HTML5.

Program:MCACBCS– Revised Syllabusw.e.f.-Year 2022–2023			
Semester	**Course Code**	**CourseTitle**	
IV	**ELE- (07)B**	**AJAX PROGRAMMING**	
	Prepared By	**Mrs. Vrushali Salunkhe**	
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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**2**	**-**	**1**	**3**	**-**	**-**	**-**	**-**	**-**
CO4	**-**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**
CO	**1.5**	**1.25**	**0.5**	**0.75**	**1.25**	**-**	**-**	**-**	**-**	**-**
CO	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Live project – club activity	**5**				**5**
Assignments/ Projects	**5**	**2**	**3**		
Internal End Term Exam	**20**	**5**	**5**	**5**	**5**
Internal	**40**	**9.5**	**10.5**	**7.5**	**12.5**
Internals	**100**				
End Term (Uni.)					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

ReferenceBooks:

Sr.No.	Nameofthe Author	Titleof theBook	Year Edition	Publisher Company
1	Anil Gaikwad, Jyoti Birada	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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Understand the conceptual Knowledge
CO2 & PO1 Mapped at 2	Understand working of web server
CO2 & PO2	Analysis of working of server and use proper tool to develop website

Mapped at 1	
CO3 & PO1 Mapped at 2	Understand and gain knowledge about the basic tools and techniques used by Ajax
CO3 & PO2 Mapped at 2	Ability to analyze available tools for design better web application
CO3 & PO4 Mapped at 1	Ability to design and develop web sites/ application
CO3 & PO5 Mapped at 3	Able to use modern web designing and developing tool like XML,JSON and AJAX
CO4 & PO2 Mapped at 2	Ability to understand, transform the need and give solution in term of software/project using PHP, Ajax, and XML
CO4 & PO3 Mapped at 2	Able to develop business applications like B2B and B2C as well as C2C we applications, with help of PHP and JSON and AJAX
CO4 & PO4 Mapped at 2	Ability to conduct research for use of tools and techniques to develop business applications
CO4 & PO5 Mapped at 2	Able to use modern website development looks like AJAX , PHP, XML and JSON to develop effective, attractive, responsive and user friendly business application

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.	06	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,	06	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	8	CO5	Lecture with PPTs Case Study	Evaluate	Performance Calculating
4	**Recent developments:** Attacks on collaborative recommender systems, Online consumer decision making	6	CO6	Lectures with PPTs	Understand	Decision Making Tools
5	**Recommender systems and the next-generation web** Recommendations in ubiquitous environments.	6	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					

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	2	1	1	-	2	-	-	2
CO2	1	1	-	1	2	1	2	-	-	2
CO3	1	-	-	2	2	1	1	-	2	3
CO4	2	1	-	3	2	2	1	1	-	2
CO5	-	3	1	2	-	3	2	1	2	3
CO6	2	2	3	-	3	2	1	2	2	3
CO.	1.16	1.5	1	1.5	1.66	1.5	1.5	0.66	1	2.5
CO	1	2	1	2	2	2	2	1	1	3

1- Low , 2- Medium, 3- High, If no correlation, put '-'
(Rationale in Appendix)
Evaluation
Internals: 100%
Total: 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	10	2	2	2	2	2	-
Live project – club activity	10	-	-	4			6
Case study discussion	10	2	2	2	2	2	-

Assignments/ Projects	**10**	**-**	**-**	**-2**	**2**	**2**	**4**
Internal End Term Exam	**60**	**10**	**10**	**10**	**20**	**10**	**-**
Internal	**100**	**14**	**14**	**20**	**26**	**16**	**10**
End Term Exam (Uni.)							

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 1	Knowledge-Base Recommendation (or Recommender) Systems (KBRS) provide the user with advice about a decision to make or an action to take. KBRS rely on knowledge provided by human experts, encoded in the system and applied to input data, in order to generate recommendations.
CO1 & PO 2 Mapped at 2	Focuses on enhancing students' ability to understand The problem of recommender systems is mainly focused on finding the values which are missing in the utility matrix. This task is often difficult as the initial matrix is usually very sparse because users generally tend to rate only a small number of items
CO1 & PO 3 Mapped at 2	Designing and evaluating solutions, systems, modules, and processes for a specified set of needs with appropriate consideration of societal values and industry expectations. A recommendation engine is an AI-driven system that generates personalized suggestions to users based on collected data. The recommendation process consists of 4 main steps: collecting, analyzing, and filtering data, and then generating recommendations using machine learning techniques.
CO1 & PO 4 Mapped at 1	Applying research-based knowledge and research methods, including the design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
CO1 & PO5 Mapped at 1	Introducing students to basic tools and providing them with initial hands-on experience, preparing them for more advanced tool usage in subsequent levels
CO1 & PO6 Mapped at 3	Prepares an individual to navigate ethical challenges and make responsible decisions in the dynamic field of computing.
CO1& PO10 Mapped at 2	Suggests a moderate level of proficiency in providing a conductive environment for innovation and Machine Learning concepts leading to solutions for the betterment of society in the context of providing flexible and scalable infrastructures as per user requirements.
CO2& PO1 Mapped at 1	Applying knowledge of computing fundamentals, Machine Learning techniques, and the given domain to design appropriate models for a given problem and/or requirements. This alignment is focused on understanding the different machine Learning Algorithm in the context of providing flexible and scalable infrastructures as per user requirements.
CO2& PO2 Mapped at 1	Provides an individual with a Recommendation techniques in the analytical aspects of virtualization, setting the stage for more advanced problem-solving for Business analytics in subsequent levels
CO2& PO4 Mapped at 1	Understanding the components of Problem of Business Benefits providing flexible and scalable Decision Making as per user requirements.
CO2& PO5	Recommendation systems are tools that can be utilized in many ways in the

Mapped at2	educational field to recommend learning pathways and other educational scenarios. Educators utilize recommender systems to improve their competencies and learning practices.
CO2& PO6 Mapped at2	Applying professional recommend appropriate items to users based on their interest and previous preference which can lead to increased sales. Lifelong learning is cognitive phenomenon has led individuals to realize great intellectual achievements and inventions throughout history.
CO2& PO10 Mapped at 2	Focuses is on instilling an entrepreneurial mindset, exploring creative solutions, and understanding the societal impact of innovative Machine Learning Model design. Students are guided to recognize the potential for positive change through their work in the computing field.
CO3 & PO1 Mapped at 1	Establish a foundational connection between carrying out practical activities through virtualization and applying techniques of Recommender System. The focus is on providing students with a solid grounding in both theoretical concepts and hands-on experience Recommender techniques and more advanced exploration
CO3 & PO3 Mapped at3	Designing and evaluating solutions in the context of practical activities through Recommender System techniques. Incorporating advanced design principles, considering societal values, and aligning with industry expectations to create impactful recommender systems. Students are encouraged to think critically about the societal implications of their designs and to strive for excellence in meeting business standards.
CO3 & PO4 Mapped at2	Introducing research methods, emphasizing data analysis, and encouraging students to apply research-based knowledge in their practical activities. This level of alignment prepares students for more advanced research activities
CO3& PO5 Mapped at2	Hands-on experience with tools relevant to problem analysis, design, development, testing, and deployment, preparing students for effective tool usage in real-world scenarios.
CO3& PO6 Mapped at1	Introducing ethical considerations, fostering awareness of regulations, and promoting responsible behavior to implement the recommender system in projects. This foundational level sets the stage for deeper exploration and application of ethical principles
CO3& PO7 Mapped at1	Focuses is on introducing the concept of lifelong learning, fostering a proactive attitude toward staying updated, and laying the groundwork for a mindset of continuous improvement in the rapidly evolving in Recommender System.
CO3& PO9 Mapped at2	Communicating effectively about complex computing topics within the context of carrying out practical activities through Recommender System. Both verbal and non-verbal communication skills, with an emphasis on clear articulation, documentation, presentation Recommender techniques.
CO3& PO10 Mapped at3	To be aware of individual, cultural difficulties of organizations and to be able to master over them and Read, write, and contribute to Business literature are not totally aligned as CO 4 will ensure reading and writing ability but whether they will contribute to business literature is doubtful.
CO4& PO1 Mapped at2	Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment is possible only when cultural aspects are taken into consideration
CO4 & PO2 Mapped at 1	Understanding of research methods, problem analysis, and the application of fundamental knowledge in the context of conducting research for recommender system projects. Introducing students to the basics of research-based knowledge and methods, providing them with the skills to analyze problems and formulate solutions

	in recommender system scenarios
CO4& PO4 Mapped at 3	Advanced research methods, complex experiment design, sophisticated data analysis techniques, and the synthesis of information to contribute valuable insights to the field. This level of alignment prepares students for advanced research roles and positions them to make meaningful contributions to the virtualization domain.
CO4 & PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing self-motivated, independent learning in the context of conducting research in computing problems related to virtualization.
CO4 & PO8 Mapped at 1	Introducing students to collaborative project development, both individually and in groups, within the context of solving problems in various domains related to recommender system. This foundational level sets the stage for more advanced project management and problem-solving activities
CO4 & PO9 Mapped at 2	Refining communication skills through advanced verbal presentations, comprehensive reports, interactive design reviews, and client-facing scenarios. This level of alignment prepares students for more advanced communication challenges
CO4 & PO10 Mapped at 3	Creating a conductive environment for innovation within the context of conducting research in computing problems related to recommendations.Promoting innovative thinking, assessing societal impact, collaborating with industry partners, and preparing students for developing a recommender system and implementation.
CO5& PO2 Mapped at 3	Advanced tool integration in problem analysis, design, development, testing, and deployment phases & prepares students to problem-solving in software engineering projects are implemented in recommender system.
CO5 & PO3 Mapped at 1	Introducing basic tools relevant to solution design, development, testing, and deployment. Prepares students for hybrid recommender system, particularly in the context of designing and evaluating solutions, systems, modules, and processes.
CO5 & PO4 Mapped at 2	Integrating research-oriented tools for experimental design and data analysis, and emphasizing tool-supported documentation of research methodology. This level of alignment prepares students for more advanced applications of tools in computing research
CO5 & PO6 Mapped at 3	Instilling a deep understanding of ethical considerations in recommender techniques selection, compliance with regulations, and utilization within the context of the professional computing environment. This level of alignment prepares students to navigate the ethical complexities associated with hybrid recommendation system usage in their future professional roles.
CO5 & PO7 Mapped at 2	Providing opportunities for self-motivated and independent learning in recommender system implemented in machine learning, ensuring that students are equipped to adapt to concepts and technologies throughout their professional careers.
CO6 & PO1 Mapped at 2	Creating a conducive environment for innovation, specifically within the context of applying computational knowledge to design recommender system for societal betterment.
CO6 & PO2 Mapped at 2	Applying software engineering principles to analyze problems and formulate solutions and creating a conductive environment for innovation and entrepreneurship, specifically within the context of recommender system.
CO6 & PO3 Mapped at 3	Integrating advanced design methodologies, fostering entrepreneurial considerations in solution evaluation, and emphasizing strategic planning for innovative solutions with a focus on societal betterment
CO6 & PO5 Mapped at 3	To problem analysis, design, development, testing, and deployment. Integrating of recommender techniques into the business process, enhancing efficiency, and supporting various aspects of the innovation lifecycle.
CO6 & PO7	Introducing these concepts, the goal is to create awareness and encourage a mindset

Mapped at 1	that values lifelong learning for sustained success for recommendation.
CO6 & PO8 Mapped at 2	This level of alignment prepares students to contribute to recommender system projects by leveraging a combination of business and management expertise.
CO6 & PO9 Mapped at 2	Equip students with a moderate level of proficiency in creating a conductive environment for innovation and entrepreneurship, particularly focusing on effective communication.
CO6 & PO10 Mapped at 3	Involves strategic integration, understanding of innovation ecosystems, and a focus on societal impact assessment in entrepreneurial ventures. The goal is to prepare students for leadership roles in driving positive societal change through innovative and entrepreneurial initiatives.

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 o 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,	07	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.	07	CO4	Lecture with Ppts	Apply (Analyse)	Knowledge Management Tool
3	**Technology and KM:** Technology components of KM – IT &KM , Ecommerce and KM	7	CO5	Lecture with PPTs Case Study	Evaluate	Technology Concepts
4	**Total Quality Management and KM:** TQM and KM , Bench marking and KM.	7	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	7	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.	05	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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	2	1	1	-	2	-	-	2
CO2	1	1	-	1	2	1	2	-	-	2
CO3	1	-	-	2	2	1	1	-	2	3
CO4	2	1	-	3	2	2	1	1	-	2
CO5	-	3	1	2	-	3	2	1	2	3
CO6	2	2	3	-	3	2	1	2	2	3
CO.	1.16	1.5	1	1.5	1.66	1.5	1.5	0.66	1	2.5
CO	1	2	1	2	2	2	2	1	1	3

1- Low , 2- Medium, 3- High, If no correlation, put '-'
(Rationale in Appendix)
Evaluation
Internals: 100%
Total: 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	10	2	2	2	2	2	-
Live project – club activity	10	-	-	4			6
Case study discussion	10	2	2	2	2	2	-
Assignments/ Projects	10	-	-	-2	2	2	4
Internal End Term Exam	60	10	10	10	20	10	-
Internals	100	14	14	20	26	16	10

End Term Exam (Uni.)							

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 1	Students are aware about Knowledge management is how businesses gather, organize, update, and share information with customers, employees, and business partners. It's also the technology that makes it possible to store, access, and update information.

CO1 & PO 2 Mapped at 2	Make useful resources for Knowledge Management is the process of perpetually managing this knowledge to make it a useful resource for your employees. A Knowledge Management system can regularly adapt to changes and offer employees knowledge in a format that best suits them.
CO1 & PO 3 Mapped at 2	Knowledge Management is the process of perpetually managing this knowledge to make it a useful resource for your employees. A Knowledge Managementsystem can regularly adapt to changes and offer employees knowledge in a format that best suits them.
CO1 & PO 4 Mapped at 1	Applying research-based knowledge and research methods, including the design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
CO1 & PO5 Mapped at 1	Introducing students to basic tools of Knowledge management and providing them with initial hands-on experience, preparing them for more advanced tool usage in subsequent levels
CO1 & PO6 Mapped at 3	Prepares an individual to navigate ethical challenges and make responsible decisions in the dynamic field of computing.
CO1& PO10 Mapped at 2	Suggests a moderate level of proficiency in providing a conductive environment for innovation and Knowledge Management concepts leading to solutions for the betterment of society in the context of providing flexible and as per user requirements.
CO2& PO1 Mapped at 1	Applying knowledge of knowledge management fundamentals, Knowledge Management tools, and the given domain to design appropriate models for a given problem and/or requirements.
CO2& PO2 Mapped at 1	Provides an individual with store and share information that their employees and clients can use to enhance their knowledge or learn more about specific company offerings. Many organizations also use a KMS system as a training tool.
CO2& PO4 Mapped at 1	Understanding the components of Problem of Business Benefits knowledge management system is any kind of IT system that stores and retrieves knowledge to improve understanding, collaboration, and process alignment. Knowledge management systems can exist within organizations or teams, but they can also be used to center your knowledge base for your users or customers.
CO2& PO5 Mapped at2	Knowledge management tools ensure your organization can capture information and apply that knowledge for maximum value to your business. Different knowledge management tools focus on different knowledge types and are designed to improve efficiency in specific parts of your business.
CO2& PO6 Mapped at2	Focuses it on to process of knowledge in organizations will be evaluated within a new model that is called "knowledge management life cycle". This model consists offive sequential steps, as knowledge creating, sharing, structuring, using and auditing.
CO2& PO10 Mapped at 2	It emphasizes teaching students to explore creative ideas and to comprehend the impact that innovative With knowledge management; students are helped to see how their work in the computing industry may lead to positive change.
CO3 & PO1 Mapped at 1	Establish a basic connection between applying knowledge management techniques and carrying out practical tasks. The major objective is to provide students with a solid foundation in theoretical concepts and practical experience, along with knowledge, skills, and more advanced exploration.
CO3 & PO3 Mapped at3	Creating and assessing solutions using knowledge management methodologies within the framework of real-world tasks. Integrating cutting-edge design concepts, taking society values into account, and matching industry standards to produce Knowledge Managements that have an impact. Pupils are urged to satisfy

	commercial requirements with excellence and to consider the societal ramifications of their designs seriously.
CO3 & PO4 Mapped at2	Research methodologies are introduced, data analysis is emphasized, and students are encouraged to use information based on research in their practical tasks. Students are better prepared for more complex research activities at this level of alignment.
CO3& PO5 Mapped at2	Practical tool experience that prepares students for efficient tool use in real-world situations. This experience relates to problem analysis, design, development, testing, and deployment.
CO3& PO6 Mapped at1	Introducing moral issues, raising regulatory awareness, and encouraging moral conduct in order to apply knowledge management in projects. This fundamental stage lays the groundwork for a more thorough investigation and implementation of ethical concepts.
CO3& PO7 Mapped at1	The idea of lifelong learning is introduced, a proactive approach to staying current is encouraged, and the foundation for a continuous improvement mindset in the quickly changing field of knowledge management is laid.
CO3& PO9 Mapped at2	Using knowledge management to efficiently communicate about intricate computing concepts while conducting practical tasks. Communication abilities, both written and spoken, with a focus on precise expression, documentation, and presentation strategies.
CO3& PO10 Mapped at3	Students are able to be conscious of and equipped to handle organizational challenges, including personal and cultural ones. Reading, writing, and contributing to business literature are somewhat related.
CO4& PO1 Mapped at2	Individuals may only effectively lead themselves and others towards the achievement of organizational goals and contribute to a team environment when cultural aspects are taken into consideration.
CO4 & PO2 Mapped at 1	Research methodology comprehension, problem solving skills, and the application of core knowledge are all necessary while conducting research for Knowledge Management initiatives. Giving students an overview of research-based concepts and techniques and equipping them with the knowledge and abilities to identify issues and develop solutions in Knowledge Management situations.
CO4& PO4 Mapped at 3	Advanced data analysis tools, intricate experiment designs, cutting-edge research methodologies, and information synthesis to provide significant new insights into the topic. This degree of alignment puts students in a position to contribute significantly to the virtualization field and prepares them for employment in advanced research.
CO4 & PO7 Mapped at 2	Recognizing the importance of ongoing professional growth and engaging in self-directed, autonomous learning within the framework of research on computing issues pertaining to knowledge management.
CO4 & PO8 Mapped at 1	Educating students on the creation of knowledge management projects in groups and individually while they work to find solutions to issues in a range of knowledge management-related fields. This fundamental level lays the groundwork for more complex problem-solving and project management tasks.
CO4 & PO9 Mapped at 2	Enhancing communication abilities through in-person client interactions, thorough reports, interactive design reviews, and sophisticated verbal presentations. Students are better prepared for more complex communication issues with this level of alignment.
CO4 & PO10 Mapped at 3	Establishing an atmosphere that encourages creativity while doing research on computing issues pertaining to knowledge management. Encouraging creative thinking, evaluating the influence on society, working with business partners, and getting students ready to create a Knowledge Management application.
CO5& PO2	Students are prepared to solve problems in software engineering projects by means

Mapped at 3	of advanced tool integration in the phases of problem analysis, design, development, testing, and deployment that are applied in knowledge management.
CO5 & PO3 Mapped at 1	Introducing fundamental tools that are important for developing, testing, and deploying solutions. helps students get ready for hybrid knowledge management, especially when it comes to creating and assessing systems, modules, solutions, and procedures.
CO5 & PO4 Mapped at 2	Including tools for data analysis and experimental design that are focused on research, and placing a strong emphasis on tool-supported documentation of research methods. Students are prepared for more sophisticated tool applications in computing research at this level of alignment.
CO5 & PO6 Mapped at 3	Gaining a full understanding of the ethical considerations surrounding the selection, application, and observance of knowledge techniques in the context of the computer-related workplace. Students that achieve this level of alignment will be better prepared to deal with the ethical conundrums that may come up in their future employment utilizing knowledge management systems.
CO5 & PO7 Mapped at 2	Giving students the chance to acquire Knowledge Management independently and with motivation through expert system will ensure that they are prepared to adjust to new ideas and technology in their future employment.
CO6 & PO1 Mapped at 2	Establishing an environment that is conducive to innovation, especially in the area of using computational expertise to the advancement of Knowledge Management for societal good.
CO6 & PO2 Mapped at 2	Utilizing software engineering concepts to identify issues, develop solutions, and foster an atmosphere that encourages entrepreneurship and creativity, particularly in the context of knowledge management.
CO6 & PO3 Mapped at 3	utilizing innovative design techniques, promoting entrepreneurial elements in the evaluation of concepts, and emphasizing strategic planning for innovative solutions with a view to enhancing society
CO6 & PO5 Mapped at 3	To the design, development, testing, and deployment of problems. using knowledge strategies to improve corporate processes, boost productivity, and assist different stages of the innovation lifecycle.
CO6 & PO7 Mapped at 1	By presenting Knowledge Management ideas, the intention is to raise awareness and promote a way of thinking that prioritizes continuous learning for long-term success and recommendation.
CO6 & PO8 Mapped at 2	By utilizing a blend of business and management knowledge, this degree of alignment equips students to participate in Knowledge Management projects.
CO6 & PO9 Mapped at 2	Assign moderate instruction to students who can foster an atmosphere that encourages innovation and entrepreneurship, with a focus on effective communication in particular.
CO6 & PO10 Mapped at 3	Involves a focus on social effect assessment in entrepreneurial endeavors, awareness of innovation ecosystems, and strategic integration. The goal is to prepare students for leadership roles in driving positive societal change through innovative and entrepreneurial initiatives.

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. Ujwala Kawade**	
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	7	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	7	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	7	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	7	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,	7	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	5	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	5	CO 2, CO 6	Lectures with PPTs Group Activity Video Cases	Analyze, Create	Case Study

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	2	2	3	-	-	-	-
CO2	3	1	2	3	1	2	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	-	-
CO5	**2**	**1**	-	-	-	-	-	-	-	-
CO6	**1**	**2**	-	-	-	-	-	-	-	-
CO	1.6	1.6	2	2.5	1.5	2.5	-	-	-	-

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**8**	**2**	**2**	**1**	**1**	**1**	**1**
Live project – club activity	**8**	**2**		**2**		**2**	**2**
Case study discussion	**8**	**2**	**1**	**1**		**2**	**2**
Assignments/ Projects	**6**		**2**	**-**		**2**	**2**
Internal End Term Exam	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Internal	**40**	**8**	**7**	**6**	**3**	**8**	**8**
Internals	**100**						
End Term (Univ)							

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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/

CO1 & PO1 Mapped at 2	Moderatelyunderstandtheimpactandchallengeson Node Red with Raspberry Pi.
CO2& PO2 Mapped at 2	Moderatetoidentifythe basic 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.
CO2& PO3 Mapped at 3	Highlydesignand identify application on OSI Layer.
CO2& PO4 Mapped at 2	ModeratelyusethebasictechnologiesofIoTfordevelopinginnovative applications.
CO3& PO2 Mapped at 2	Moderatelyusecloud models to storeand maintain data.
CO3& PO3	Moderatelydesignanddevelopsolutionsbasedonapplicationprotocolsfor IoT.

Mapped at 2	
CO4& PO1 Mapped at 2	SlightlybasicinsightonprototypesandoperatingsystemforIoT.
CO4& PO2 Mapped at 2	Moderatelyusethe principles ofsupervised and un-supervised learning.
CO4& PO3 Mapped at 3	Highlydesign and developsolutions based onedgestreamingusingHadoop.
CO5 & PO3 Mapped at 3	Highlyable to develop applications usingArduino programmingand sensor system
CO6 & PO3 Mapped at 3	Develop application on wireless technologies for IoT.

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. Ujwala Kawade**	
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 and design 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,	10	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.	8	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.	7	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	8	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	12	CO4	Lecture Case Activity	Understand	Short Answers

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2
CO2	3	1	2	3	1
CO3	-	2	-	-	-
CO4	1	2	-	-	-

CO.	**1.5**	**1**	**-**	**-**	**-**
CO	**2**	**1**			

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4
Class Participation/ Attendance	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Live project – club activity	**5**	**3**		**2**	
Case study discussion	**10**	**2.5**	**2.5**	**2.5**	**2.5**
Assignments/ Projects	**5**		**2**	**3**	
Internal End Term Exam	**20**	**5.5**	**5.5**	**4.5**	**4.5**
Internal	**50**	**13.5**	**12.5**	**14.5**	**9.5**
Internals	**100**				
End Term (Univ)					

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks

80-84%	7 marks
75- 79%	6 marks

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/

CO1 & PO1 Mapped at 2	Moderatelyunderstandtheimpactandchallengeson Node Red with Raspberry Pi.
CO2& PO2 Mapped at 2	Moderatetoidentifythe basic 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.
CO2& PO3	Highlydesignand identify application on OSI Layer.

Mapped at 3	
CO2& PO4 Mapped at 2	ModeratelyusethebasictechnologiesofIoTfordevelopinginnovative applications.
CO3& PO2 Mapped at 2	Moderatelyusecloud models to storeand maintain data.
CO3& PO3 Mapped at 2	Moderatelydesignanddevelopsolutionsbasedonapplicationprotocolsfor IoT.
CO4& PO1 Mapped at 2	SlightlybasicinsightonprototypesandoperatingsystemforIoT.
CO4& PO2 Mapped at 2	Moderatelyusethe principles ofsupervised and un-supervised learning.
CO4& PO3 Mapped at 3	Highlydesign and developsolutions based onedgestreamingusingHadoop.

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.	7	CO1, CO2	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Decision Theory And Strategy:**	7	CO1, CO2,	Lecture with Ppts	Understand	Quiz, Short Questions

	Business Intelligence 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.		CO5	Case Study Psychometric Tools		End Term: 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.	7	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.	7	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	7	CO2, CO4	Lecture	Understand, Apply	End Term Exam

	Vertical AI, Use of Business Intelligence in Vertical AI, Case Study.					
6	**Security:** Define Security, Security in Big Data, Problems with Security, Business Intelligence for Security, Case Study.	5	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.	5	CO1, CO2, CO5	Lectures with PPT	Understand, Apply	Short Answers

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**3**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**-**	**-**	**3**	**-**	**-**	**3**	**-**	**-**
CO3	**-**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**
CO4	**-**	**2**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**
CO5	**-**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**
CO.	**2.5**	**2.75**	**3**	**2.5**	**3**	**-**	**-**	**3**	**-**	**-**
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**-**	**-**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	**20**	**4**	**4**	**4**	**4**	**4**
Assignments/ Projects	**20**	**4**	**4**	**4**	**4**	**4**
Case Study Solution and Presentation	**30**	**6**	**6**	**6**	**6**	**6**
End Term Exam	**30**	**6**	**6**	**6**	**6**	**6**
Internal	**100**	**20**	**20**	**20**	**20**	**20**
End Term (Univ)						

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Understand and Apply Big Data techniques for given domain to design appropriate model.
CO1 & PO4 Mapped at 2	Concept and meaning of the term Big Data, which is yet to be explored creates opportunity to carry research in the field to find new opportunities.
CO1 & PO5 Mapped at 3	Big Data, which is the latest technology, promotes students to use modern tools like Hadoop.
CO2 & PO1 Mapped at 2	Decision making techniques require computational knowledge helping in designing decision models for various cases.
CO2 & PO2 Mapped at 3	Data scientist while decision making process needs to critically analyze the data to select and apply proper decision model.
CO2& PO5 Mapped at 3	Modern tools and techniques are used to develop various decision models.
CO2& PO8 Mapped at 3	In management domain the major role is played by data scientist in decision making by studying and analyzing data as well as they also need knowledge about different management skills.
CO3 & PO2 Mapped at 3	Analytical skills are required for effective use of big data by considering its various dimensions.
CO3 & PO3 Mapped at 3	Analytical skills always help in designing and developing solutions for different cases.
CO3 & PO5 Mapped at 3	For handling, analyzing and designing solution based on big data modern tools need to used which always keep on evolving, and hence the learner need to update his knowledge time to time.
CO4 & PO2 Mapped at 3	AI techniques always works with Big Data which helps in designing developing intelligent models, are using analytical skills.
CO4 & PO3 Mapped at 3	AI solutions are based on Big data and hence need to Understand role of Big Data.
CO4 & PO5 Mapped at 3	Designing AI solutions always requires proficiency in using modern tools and techniques like machine learning, deep learning etc.
CO5 & PO2 Mapped at 3	Applying various Decision Making tools for various use cases develops ability of learner to develop his analytical skills.
CO5 & PO3 Mapped at 3	Applying various Decision Making tools for various use cases develops skills of learner to design and develop solutions.
CO5 & PO4	Applying various Decision Making tools for various use cases develops learners

Mapped at 3	research aptitude by carrying out various experiments and conclude based on various results.
CO5 & PO5 Mapped at 3	Decision Making tools and techniques applied for various use cases promotes learner to learn and apply modern tools and keep his knowledge updated.

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.	7	CO1, CO4, CO5	Lecture Case Activity	Understand Apply	Case Presentation Activity End Term: Theory Applied
6	**MAPREDUCE:** What is MapReduce?,The	7	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.	7	CO1, CO4, CO5	Lectures with PPTs	Understand, Apply	Activity End Term: Short Answers and Case study

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	-	-	-	**3**	-	**3**	**3**	-	-
CO2	**2**	**3**	**3**	**2**	**3**	-	-	**3**	-	-
CO3	-	**2**	**2**	-	**3**	-	-	**3**	**2**	**1**

CO4	**-**	**2**	**2**	**2**	**3**	**3**	**-**	**2**	**-**	**2**
CO5	**-**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**
CO.	**2**	**2.5**	**2.5**	**2**	**3**	**3**	**3**	**2.75**	**2**	**1.5**
CO	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**2**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5
Class Participation/ Attendance	**20**	**4**	**4**	**4**	**4**	**4**
Assignments/ Projects	**20**	**4**	**4**	**4**	**4**	**4**
Case Study Solution and Presentation	**30**	**6**	**6**	**6**	**6**	**6**
End Term Exam	**30**	**6**	**6**	**6**	**6**	**6**
Internal	**100**	**20**	**20**	**20**	**20**	**20**
End Term (Univ)						

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks

80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO5 Mapped at 3	Big data and HADOOP are currently developed technologies preferred by different businesses.
CO1 & PO7 Mapped at 3	Both these concepts, Big Data and Hadoop, are in developing stage and are still being explored, hence the one who is working on it need to be updated.
CO1 & PO8 Mapped at 3	Business data is the major source of big data which need to be handled using latest technologies like HADOOP, which helps management in decision making process.
CO1& PO10 Mapped at 3	For decision making processes in different businesses entrepreneurs need to depend on Big Data, which also gives insight for innovative decisions.
CO2 & PO1 Mapped at 2	Excel as a powerful tool helping in analyzing data and drawing conclusion, one need to understand data first and then a model is developed, for which he need computational knowledge.
CO2& PO2 Mapped at 3	Analyzing problem under study and coming to conclusion need to use analytical skills.

CO2& PO3 Mapped at 3	Applying Excel functions on data for optimizing decisions making process and results which helps in design of solution.
CO2 & PO4 Mapped at 3	Big data and Hadoop are latest technologies which are still in development stage on which still research is going on.
CO2 & PO5 Mapped at 3	Advanced Excel as an analysis tool is popular solution designing technique is used for optimized decision making.
CO2 & PO8 Mapped at 3	Before developing solution and applying excel functions on the data need to thought together with the management domain which may affect the decision making process.
CO3 & PO2 Mapped at 2	Case studies in BI helps to develop ability of analyzing the problem data.
CO3 & PO3 Mapped at 2	Case studies in BI helps to develop ability of designing and developing the solution to the stated problem.
CO3 & PO5 Mapped at 3	Knowledge of latest tools used in designing solution for cases in BI is required and keep updated.
CO3 & PO8 Mapped at 3	Development of decision making model for different cases in a business, it also need to understand management domain.
CO3 & PO9 Mapped at 2	While practicing on different cases, these cases to be communicated with the client efficiently.
CO3 & PO10 Mapped at 1	While applying BI techniques for designing solution for the given business problem under study, one need to work on different cases to develop skills for understanding cases.
CO4 & PO2 Mapped at 2	Proper analysis of problem helps to understand and get idea about the problem under study, which helps in designing solution.
CO4 & PO3 Mapped at 2	Objective of using BI in businesses is to generate insights for further decision making and design and develop solution for the problem under study.
CO4 & PO4 Mapped at 2	Getting insights from the analysis of available business data one need to apply different strategies while analyzing data, which can developed through researching business data.
CO4 & PO5 Mapped at 3	Hadoop is the latest technology used by businesses for analyzing their data.
CO4 & PO8 Mapped at 2	Business intelligence has defined different advanced tools which help management in decision making.
CO4 & PO10 Mapped at 2	Managing business data, which is big in size, analysis of which helps an entrepreneur in taking innovative decisions.
CO5 & PO1 Mapped at 1	While storing and managing big data, which is already complex in nature, one need expertise in computational knowledge.
CO5 & PO5 Mapped at 3	For managing big data generated through different business activities and is valuable for business needs to be stored and managed with proper security can be done using Hadoop, a platform helping in managing big data.

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	7	**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	7	**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	7	**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	5	**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	5	**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	7	**CO4, CO5**	Lecture with PPTs Case Study	Analyze, Evaluate	
7	Compliance Standards ▪ IT Act ▪ ISO 27001 ITIL Framework	7	**CO6**	Lecture with PPTs Case Study	Create	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**

CO2	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
CO6	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**
CO.	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1.833**
CO	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**10**	**1**	**1**	**2**	**2**	**2**	**2**
Live Case study – club activity	**20**	**2**	**2**	**4**	**4**	**4**	**4**
Assignments	**20**	**2**	**2**	**4**	**4**	**4**	**4**
Internal End Term Exam	**50**	**5**	**5**	**10**	**10**	**10**	**10**
Internal	**100**	**10**	**10**	**20**	**20**	**20**	**20**
End TermExam(Uni.)							

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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)

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	By following these steps, you can apply computing fundamentals, mathematics, and domain-specific knowledge to design effective models for information systems that address the given problem and requirements.
CO1 & PO2 Mapped at 3	By systematically applying these principles, you can analyze, identify,formulate, and provide effective solutions to problems in the information systems domain, integrating software engineering and various systems domain concepts.
CO1 & PO3 Mapped at 3	By incorporating these considerations into the design and evaluation process, you can develop information systems that not only meet specified needs but alsoalign with societal values and industry expectations. Regularly reassessing thesefactors ensures the ongoing relevance and sustainability of the information system.
CO1 & PO4	By following these steps, researchers can apply research-based knowledge and

Mapped at 3	methods to investigate and contribute valuable insights to the field of information systems. The alignment of research concepts with information systems ensures that the findings have practical relevance and contribute to the advancement of the discipline.
CO1 & PO5 Mapped at 3	Using **Modern** tools in each phase of the development lifecycle aligns with the concepts involved in information systems by promoting collaboration, automation, consistency, and efficiency. Additionally, these tools contribute to achieving milestones more effectively and ensuring the successful delivery of information systems.
CO1 & PO6 Mapped at 2	Practicing professional ethics, adhering to cyber regulations, fulfilling responsibilities, and embracing professional norms create a foundation for trust, reliability, and sustainability in the information systems field. These principles are essential for the ethical and effective use of technology in today's interconnected world.
CO1 & PO7 Mapped at 2	By acknowledging the need for continuous professional development and engaging in self-motivated, independent learning, information systems professionals can stay relevant, adapt to changing technologies, and contribute effectively to the success of information systems projects. This proactive approach aligns with the dynamic and ever-evolving nature of the field.
CO1 & PO8 Mapped at 2	By engaging in project development with a focus on problem-solving in various domains, individuals or groups apply these information systems concepts to create effective and valuable solutions. This hands-on experience helps reinforce theoretical knowledge, fosters practical skills, and contributes to the continuous improvement of information systems in real-world scenarios.
CO1 & PO9 Mapped at 2	By demonstrating efficacy in verbal and non-verbal means of communication through reports, design documentation, and presentations, individuals contribute to the effective development and understanding of complex computing concepts in the realm of information systems. This alignment ensures that information is conveyed accurately, fostering collaboration, understanding, and successful project outcomes.
CO1 & PO10 Mapped at 2	By fostering a culture of creativity, embracing cutting-edge technologies, and encouraging an entrepreneurial mindset, organizations can contribute to the development of solutions that positively impact society. This approach supports

	the continuous evolution and improvement of information systems in alignment with societal needs and advancements.
CO2 & PO1 Mapped at 3	By mapping fundamental software engineering concepts to security concerns in each phase of the development lifecycle, organizations can systematically address and mitigate security risks in information systems. This approach ensures that security considerations are an integral part of the overall software engineering process, leading to robust and resilient information systems.
CO2 & PO2 Mapped at 3	By aligning fundamental software engineering concepts with security concerns at each stage of the development process, organizations can systematically address and mitigate security risks in information systems. This approach ensures that security is an integral part of the overall software engineering process, resulting in robust and resilient information systems.
CO2 & PO3 Mapped at 3	By mapping these design and evaluation aspects with security concerns, information systems can be developed with a holistic approach that addresses both functional and security requirements. This ensures that the solutions not only meet the specified needs but also align with societal values and industry expectations in a secure and ethical manner.
CO2 & PO4 Mapped at 3	By incorporating research-based knowledge and methods into security considerations, organizations can develop a proactive and informed approach to information systems security. This approach enables them to stay ahead of evolving threats, make data-driven decisions, and continually enhance their security posture.
CO2 & PO5 Mapped at 3	By integrating modern tools into each phase of the software development lifecycle, organizations can enhance security practices, automate security checks, and streamline collaboration, contributing to the overall robustness of information systems. The emphasis on security considerations across tools ensures a proactive approach to addressing potential threats and vulnerabilities at every stage of development.
CO2 & PO6 Mapped at 2	By mapping principles to security concerns, professionals in the information systems field can contribute to the development and maintenance of secure systems while upholding ethical standards and regulatory compliance. This comprehensive approach ensures that security is not only a technical

	consideration but also an integral part of professional conduct in the computing world.
CO2 & PO7 Mapped at 2	By embracing the need for continuous professional development through self-motivated, independent learning, individuals in the information systems and cybersecurity domain can stay well-equipped to address emerging security concerns and contribute effectively to the overall security posture of organizations.
CO2 & PO8 Mapped at 2	By integrating security concerns into each phase of the project development lifecycle, individuals or groups can ensure that computational and management skills are applied in a way that prioritizes information system security. This holistic approach contributes to building resilient and secure projects in various domains and environments.
CO2 & PO9 Mapped at 2	By effectively utilizing verbal and non-verbal means of communication in various scenarios, a professional can demonstrate efficacy in conveying complex computing concepts, especially those related to security concerns in information systems. Clear communication is essential for fostering understanding, collaboration, and the implementation of robust security measures within an organization.
CO2 & PO10 Mapped at 1	By aligning innovation and entrepreneurship efforts with security concerns in information systems, organizations can create an environment that encourages creativity, problem-solving, and the development of solutions that not only advance technology but also contribute to the betterment of society while maintaining a robust security posture.
CO3 & PO1 Mapped at 3	By combining computing fundamentals, mathematics, and domain expertise, security professionals can design robust models and implement effective measures to address information security concerns within specific domains. This holistic approach ensures that security solutions are tailored to the unique challenges and requirements of the given context.
CO3 & PO2 Mapped at 3	By mapping the principles of software engineering and systems domain knowledge to security concerns, professionals can systematically address information security challenges, ensuring that solutions are both technically robust and contextually relevant to the specific systems environment. This comprehensive approach contributes to the development of secure and resilient

	information systems.
CO3 & PO3 Mapped at 3	By aligning design and evaluation activities with societal values and industry expectations, organizations can ensure that information security solutions not only meet technical requirements but also contribute positively to society while addressing ethical considerations. This integrated approach enhances the overall effectiveness and acceptance of security measures.
CO3 & PO4 Mapped at 3	By integrating research-based knowledge and methods into the understanding of concerns to improve information security, organizations can build a proactive and adaptive approach to address evolving threats and challenges. This approach ensures that information security measures are grounded in empirical evidence and continuously refined based on the latest research findings.
CO3 & PO5 Mapped at 3	By incorporating modern tools at each stage of the software development lifecycle, organizations can enhance their ability to deliver secure software solutions. These tools not only improve efficiency but also play a crucial role in identifying and mitigating security concerns throughout the development process. Continuous integration of security tools and practices contributes to a proactive and robust information security posture.
CO3 & PO6 Mapped at 2	By aligning professional ethics, cyber regulations, professional responsibilities, and norms of the professional computing world with an understanding of concerns to improve information security, individuals can contribute to a holistic and ethical approach to securing digital assets. This integrated approach ensures that information security practices not only meet regulatory requirements but also adhere to ethical standards and professional norms, fostering a secure and trustworthy computing environment.
CO3 & PO7 Mapped at 2	By integrating continuous professional development and self-motivated, independent learning into the understanding of concerns to improve information security, individuals can ensure their skills remain relevant, and they are well-equipped to address the evolving challenges in the field. This proactive approach contributes to a robust and resilient information security posture.
CO3 & PO8 Mapped at 2	By integrating computational and management skills into each phase of project development while considering information security concerns, individuals or groups can ensure that projects not only meet functional requirements but also adhere to robust security standards. This comprehensive approach contributes to

	the overall resilience and security of the developed solutions.
CO3 & PO10 Mapped at 2	By aligning the promotion of innovation and entrepreneurship with an understanding of concerns to improve information security, organizations can create a balanced and secure environment. This approach ensures that innovative solutions not only contribute to societal betterment but also adhere to robust information security practices.
CO4 & PO1 Mapped at 3	By mapping computing fundamentals, mathematics, and domain-specific knowledge to real-life scenarios, organizations can design effective models and systems that address complex problems and contribute to advancements in various fields. This integrated approach ensures that solutions align with the specific requirements and challenges present in the given domain.
CO4 & PO2 Mapped at 3	By applying fundamental knowledge of software engineering and various systems domains to analyze, identify, and formulate solutions, developers can create effective and tailored information systems that address specific challenges in real-life scenarios. These solutions contribute to improved efficiency, accuracy, and innovation across different domains.
CO4 & PO3 Mapped at 3	In each of these scenarios, the design and evaluation process involves a careful balance between meeting specified needs, considering societal values, and aligning with industry expectations. This approach ensures that the resulting information systems are not only technically sound but also ethically responsible and aligned with the broader societal and industry context.
CO4 & PO4 Mapped at 3	In these real-life scenarios, the application of research-based knowledge and research methods contributes to the generation of valid conclusions and actionable recommendations for improving information systems. The iterative nature of experimentation, analysis, and synthesis ensures that conclusions are well-informed and aligned with the goals and requirements of the respective contexts.
CO4 & PO5 Mapped at 3	The use of modern tools is tailored to the specific milestones within the information system development lifecycle. These tools contribute to collaboration, efficiency, and the overall success of projects by streamlining processes, automating repetitive tasks, and providing valuable insights for informed decision-making.
CO4 & PO6	The application of professional ethics, adherence to cyber regulations,

Mapped at 2	fulfillment of professional responsibilities, and embracing norms of the computing world contribute to creating ethical, secure, and successful information systems. These principles guide individuals and organizations in making responsible decisions, fostering trust, and ensuring the positive impact of information technology on society.
CO4 & PO7 Mapped at 2	The professional acknowledges the necessity of continuous development and actively pursues self-motivated, independent learning. This commitment ensures that they remain relevant, adaptable, and well-equipped to navigate the dynamic landscape of information systems. It also contributes to personal and professional growth, making a positive impact on individual careers and the organizations they serve.
CO4 & PO8 Mapped at 2	The combination of computational and management skills is essential for successful project development. These skills enable teams to address challenges, meet domain-specific requirements, and deliver effective solutions in various real-life environments and domains within the realm of information systems.
CO4 & PO9 Mapped at 2	Effective communication, both verbal and non-verbal, plays a crucial role in conveying complex computing concepts and information. Clear, concise verbal explanations are complemented by visual aids, documentation, and presentations to enhance understanding and ensure that technical details are communicated successfully in real-life information system contexts.
CO4 & PO10 Mapped at 2	The conducive environments provided by incubators, innovation hubs, corporate initiatives, and collaborative communities play a pivotal role in fostering innovation and entrepreneurship in information systems. Entrepreneurs leverage these environments to create solutions that address societal needs, ultimately contributing to positive social impact and advancement.
CO5 & PO1 Mapped at 3	The application of computing fundamentals, mathematics, and domain-specific knowledge is crucial for designing effective and secure information systems. These models address specific security concerns and contribute to the development of robust solutions in various domains, such as finance, healthcare, voting systems, smart homes, and corporate networks.
CO5 & PO2 Mapped at 3	The application of fundamental knowledge in software engineering and various systems domains is crucial for identifying, formulating, and implementing effective solutions to security concerns in information systems. This process

	involves thorough analysis, identification of vulnerabilities, formulation of robust security strategies, and the application of software engineering principles to develop and deploy secure solutions.
CO5 & PO3 Mapped at 3	The design and evaluation of solutions for information systems with security concerns involve a thoughtful consideration of societal values and industry expectations. Balancing technological functionality with ethical and regulatory considerations ensures that the resulting systems not only meet the specified needs but also contribute positively to society while adhering to industry norms.
CO5 & PO4 Mapped at 3	Research-based knowledge and methods are integral to designing experiments, collecting and analyzing data, and synthesizing information to draw valid conclusions. The application of rigorous research methodologies enhances the understanding of information systems and security concerns, enabling organizations to make informed decisions and implement effective cybersecurity measures.
CO5 & PO5 Mapped at 3	The use of modern tools plays a critical role in each milestone of the development process, contributing to the overall security of the information systems. These tools enhance analysis accuracy, support secure coding practices, automate deployment processes, and facilitate ongoing security monitoring and management.
CO5 & PO6 Mapped at 2	The integration of professional ethics, cyber regulations, professional responsibilities, and norms of the professional computing world is crucial for making informed and ethical decisions in information systems and security contexts. By applying these principles, organizations and professionals contribute to a responsible and trustworthy computing environment while addressing security concerns.
CO5 & PO7 Mapped at 3	The acknowledgment of the need for continuous professional development is paired with self-motivated, independent learning. Professionals actively seek out opportunities to stay current with industry trends, enhance their skills, and adapt to the evolving landscape of information systems and security concerns. This commitment to ongoing learning contributes to the individual's effectiveness in their role and the overall resilience of the organization.
CO5 & PO8 Mapped at 2	Working in a group, effective collaboration, communication, and division of tasks are crucial for project success

CO5 & PO9 Mapped at 2	By combining well-structured reports, comprehensive design documentation, and a polished presentation, you can effectively communicate the intricacies of your project involving information systems and security concerns. Remember to adapt your communication style to your audience, making complex computing concepts accessible and understandable.
CO5 & PO10 Mapped at 2	By Provide conducive environment for innovation and entrepreneurship, organizations can create an environment that not only encourages innovation and entrepreneurship but also ensures that the solutions developed address information systems and security concerns responsibly, contributing to the betterment of society.
CO6 & PO1 Mapped at 3	By systematically applying Computational Knowledge, you can design models that not only address the given problem and requirements but also incorporate information security awareness to handle real-world scenarios effectively. This holistic approach ensures that security is an integral part of the system design rather than an afterthought.
CO6 & PO2 Mapped at 3	By systematically integrating Problem Analysis steps, you can leverage your software engineering knowledge to design and implement solutions that not only address the given problem within various systems domains but also incorporate robust information security measures. This approach ensures that the software is resilient to real-world security challenges
CO6 & PO3 Mapped at 3	By systematically integrating Design/Development of Solutions considerations into the design and evaluation process, you can ensure that your solutions not only meet specified needs but also align with societal values, industry expectations, and security awareness for real-world scenarios. This approach results in more robust, ethical, and secure solutions.
CO6 & PO4 Mapped at 3	By mapping research-based knowledge and methods to a specific scenario, such as enhancing email security, and integrating information security awareness, you can contribute valuable insights to real-world scenarios while addressing pressing security concerns.
CO6 & PO5 Mapped at 3	By integrating Modern tools throughout the software development lifecycle and aligning them with information security awareness, you can streamline processes, enhance collaboration, and ensure the security of your applications in real-world scenarios. Always adapt the toolset based on the specific

	requirements and technologies used in your development environment.
CO6 & PO6 Mapped at 2	Organizations can create a robust framework that integrates professional ethics, cyber regulations, professional responsibilities, norms of the professional computing world, and information security awareness into their real-world scenarios. This approach helps to build a culture of responsible and secure computing practices.
CO6 & PO7 Mapped at 2	organizations can create a holistic approach to continuous professional development and self-motivated, independent learning that is specifically tailored to address the challenges of real-world scenarios in information security.
CO6 & PO8 Mapped at 2	By combining computational skills, management expertise, and information security awareness throughout the project development lifecycle, individuals or groups can effectively address real-world scenarios, ensuring not only the functionality and efficiency of the solution but also its security and resilience against potential threats.
CO6 & PO9 Mapped at 2	By effectively combining verbal and non-verbal communication strategies in reports, design documentation, and presentations, and by integrating information security awareness, you can enhance your ability to convey complex computing concepts and address real-world scenarios in a compelling and understandable manner.
CO6 & PO10 Mapped at 2	By aligning innovation and entrepreneurship efforts with information security awareness, organizations can not only drive positive societal impact but also ensure the safety and integrity of the solutions developed. This mapping helps create a holistic approach where innovation and security work hand in hand to address real-world challenges.

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

Course Objectives:

- 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.

Course Outcomes:

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	07	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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	2	-	-	-
CO3	2	2	-	-	2	-	2	-	-	-
CO4	2	2	-	-	2	-	2	-	-	-
CO5	2	-	1	-	2	-	2	-	-	-
CO6	2	-	2	-	2	-	2	-	-	-
CO7	2	2	-	-	2	-	2	-	-	-
CO.	0.5	0.5	0.66	0.33	1.33	1.16	1	0.33	0.83	1.16
CO	1	1	1	0	1	1	1	0	1	1

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Externals:
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6	CO7
Class Participation/ Attendance	10	2	2	-	2	2	-	2
Live project – club activity	10	-	-	3	2	2	3	-
Case study discussion	10	-	-	2	2	2	2	2

Assignments/ Projects	**10**	**2**	**2**	**2**	**2**	**-**	**2**	**-**
Internal End Term Exam	**60**	**10**	**10**	**10**	**10**	**10**	**10**	**-**
Internals	**100**	**14**	**14**	**18**	**20**	**17**	**17**	**-**
End Term (Univ.)								

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Appendix:

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Apply knowledge of computing fundamentals to understand the basic fundamentals of TCP/IP, Operating System, Web application and Database, Ethical Hacking and Advanced Persistent Threats
CO2& PO1 Mapped at 2	Apply knowledge of computing fundamentals to understand the Information about Footprinting, Advance Google Hacking, Nmapping the Network and Fingerprinting
CO2& PO7 Mapped at 2	Apply fundamental knowledge of software engineering in order to analyze, identify, formulate and provide the solution to given problem of networking and Hacking.
CO3& PO1 Mapped at 2	Ability to understand the concept of Hacking Networks, Hacking Servers, Hacking Databases and Password Cracking
CO3& PO2 Mapped at 2	Apply fundamental knowledge of software engineering to analyze, identify, formulate and provide the solution for Hacking Networks, Hacking Servers, Hacking Databases and Password Cracking
CO3& PO5 Mapped at 2	Understanding the Use of modern tools for Hacking Networks, Hacking Servers, Hacking Databases and Password Cracking
CO3& PO7 Mapped at 2	Acknowledge the need for continuous professional development and practice it
CO4& PO1 Mapped at 2	Apply knowledge of computing fundamentals to understand Advanced Exploitation like Hacking WLANs, Evading IDS, Firewalls, Web Application Hacking, Advanced Web Hacking and Hacking Web Browsers
CO4& PO2 Mapped at 2	Apply fundamental knowledge of software engineering to analyze, identify, formulate and provide the solution for Hacking WLANs, Evading IDS, Firewalls, Web Application Hacking, Advanced Web Hacking and Hacking Web Browsers
CO4& PO5 Mapped at 2	Understanding the Use of modern tools forprovide the solution for Hacking WLANs, Evading IDS, Firewalls, Web Application Hacking, Advanced Web Hacking and Hacking Web Browsers
CO4& PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing.
CO5& PO1 Mapped at 2	Apply knowledge of computing fundamentals to understand concept of Social Engineering
CO5 & PO3 Mapped at 1	Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of Social Engineering
CO5 & PO5 Mapped at 2	Understanding the Use of modern tools for Social Engineering
CO5 & PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing.
CO6 & PO1	Apply knowledge of computing fundamentals to understand concept of

Mapped at 2	Cryptography
CO6 & PO3 Mapped at 2	Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of Cryptography
CO6 & PO5 Mapped at 2	Understanding the Use of modern tools for Cryptography
CO6 & PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing.
CO7& PO1 Mapped at 2	Apply knowledge of computing fundamentals to understand concept of Malware Attacks
CO7 & PO2 Mapped at 2	Apply fundamental knowledge of software engineering to analyze, identify, formulate and provide the solution for Malware Attacks
CO7 & PO5 Mapped at 2	Understanding the Use of modern tools for Malware Attacks
CO7 & PO7 Mapped at 2	Acknowledging the need for continuous professional development and practicing.

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
III	**(12)A**	**Data Management Environment**	
	Prepared By		
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

Unit	Contents	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.	7	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** Business intelligence, OLAP ,Data mart, Data mining, Data	7	CO2 CO3	Lecture with PPTs Case Study	Analyse	Case Study with Presentations End Term Exams: Case

	movement (Extract, transform, load), Data warehouse					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.	5	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.	5	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	5	CO6	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO(12)A.1	**2**	**2**	**1**	**1**	**1**	**0**	1	1	0	0
CO(12)A.2	**2**	**1**	**0**	**0**	**0**	**0**	0	0	0	0
CO(12)A.3	**0**	**1**	**0**	**0**	**0**	**0**	0	0	0	0
CO(12)A.4	**1**	**1**	**1**	**1**	**1**	**0**	0	0	0	0

CO(12)A.5	**1**	**1**	**1**	**1**	**1**	**0**	0	0	0	0
CO(12)A.6	**3**	**3**	**3**	**3**	**3**	**0**	**0**	**3**	0	0
CO.	**1.5**	**1.5**	**1**	**1**	**1**	**0**	**0.16**	**0.66**	**0**	**0**
CO	**2**	**2**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**0**

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Externals: 00%
Total : 100%

Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	**10**	**1**	**1**	**2**	**2**	**2**	**2**
Live project – club activity	**5**	**1**	2	**2**			
Case study discussion	**10**	**2**	**2**	**2**	**2**	**1**	**1**
Assignments/ Projects	**5**		**2**	**3**			
Internal End Term Exam	**20**	**4**	**4**	**3**	**3**	**3**	**3**
Internal	**50**	**8**	**11**	**12**	**7**	**6**	**6**
End Term	**50**	**12**	**7**	**8**	**6**	**11**	**6**

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks

75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 2	Able to describe the basic concepts, data management is slightly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.
CO1 & PO 2 Mapped at 2	Able to describe the basic concepts, data management is slightly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.
CO1 & PO 3 Mapped at 1	Able to describe the basic concepts, data management is partly correlated with designing and evaluating solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO1 & PO 4 Mapped at 1	Able to describe the basic concepts, data management is partly correlated with using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

CO1 & PO5 Mapped at 1	Able to describe the basic concepts, data management is partly correlated with using of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO1 & PO6 Mapped at 0	Able to describe the basic concepts, data management is not related with professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO1& PO7 Mapped at 1	Able to describe the basic concepts, data management is partly correlated with acknowledging the need for continuous professional development and practices it through self-motivated, independent learning.
CO1& PO8 Mapped at 1	Able to describe the basic concepts, data management is partly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO1& PO9 Mapped at 0	Able to describe the basic concepts, data management is not correlated with demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO1& PO10 Mapped at 0	Able to describe the basic concepts, data management is not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO2& PO1 Mapped at 0	Able to Interpret the data is correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.
CO2& PO 2 Mapped at 0	Able to Interpret the data is correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.
CO2& PO 3 Mapped at 0	Able to Interpret the data is not correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO2& PO 4 Mapped at 0	Able to Interpret the data is not correlated with applying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO2& PO5 Mapped at 0	Able to Interpret the data is not correlated with applying modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO2& PO6 Mapped at 0	Able to Interpret the data is not correlated with learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO2& PO7 Mapped at 0	Able to Interpret the data is not correlated with acknowledging the need for continuous professional development and practice it through self-motivated, independent learning.
CO2& PO8 Mapped at 0	Able to Interpret the data is not correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO2& PO9 Mapped at 0	Able to Interpret the data is not correlated with demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO2& PO10 Mapped at 0	Able to Interpret the data is not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO3& PO1 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.
CO3& PO 2	Able to Solve the data requirement on understanding the case is partially correlated

Mapped at 1	with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO3& PO 3 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO3& PO 4 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with applying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO3& PO5 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with applying modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO3& PO6 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO3& PO7 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with acknowledging the need for continuous professional development and practice it through self-motivated, independent learning
CO3& PO8 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO3& PO9 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO3& PO10 Mapped at 0	Able to Solve the data requirement on understanding the case is not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO4& PO1 Mapped at 1	Analyzing the data quality is partially correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.
CO4& PO 2 Mapped at 1	Analyzing the data quality is partially correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO4& PO 3 Mapped at 1	Analyzing the data quality is slightly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO4& PO 4 Mapped at 1	Analyzing the data quality is slightly correlated with applying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO4& PO5 Mapped at 1	Analyzing the data quality is slightly correlated with applying modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO4& PO6 Mapped at 0	Analyzing the data quality is not correlated with learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO4& PO7 Mapped at 0	Analyzing the data quality is not correlated with acknowledging the need for continuous professional development and practice it through self-motivated, independent learning
CO4& PO8	Analyzing the data quality case is not correlated with involving in projects

Mapped at 0	development as individual or group to solve problems in various domains and environments using computational and management skills.
CO4& PO9 Mapped at 0	Analyzing the data quality is not correlated with demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO4& PO10 Mapped at 0	Analyzing the data quality is not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO5& PO1 Mapped at 1	Ability to judge functionality of data management is partially correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements
CO5& PO 2 Mapped at 1	Ability to judge functionality of data management is partially correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO5& PO 3 Mapped at 1	Ability to judge functionality of data managementis slightly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations
CO5& PO 4 Mapped at 1	Ability to judge functionality of data managementis slightly correlated with applying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
CO5& PO5 Mapped at 1	Ability to judge functionality of data managementis slightly correlated with applying modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO5& PO6 Mapped at 0	Ability to judge functionality of data managementis not correlated with learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO5& PO7 Mapped at 0	Ability to judge functionality of data managementis not correlated with acknowledging the need for continuous professional development and practice it through self-motivated, independent learning
CO5& PO8 Mapped at 0	Ability to judge functionality of data managementis not correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO5& PO9 Mapped at 0	Ability to judge functionality of data managementis not correlated with demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO5& PO10 Mapped at 0	Ability to judge functionality of data managementis not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society
CO6& PO1 Mapped at 3	Design data management model with proper validation is strongly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements
CO6& PO 2 Mapped at 3	Design data management model with proper validationis strongly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO6& PO 3 Mapped at 3	Design data management model with proper validationis strongly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations
CO6& PO 4 Mapped at 3	Design data management model with proper validationis strongly correlated with applying research-based knowledge and research methods including design of

	experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
CO6& PO5 Mapped at 3	Design data management model with proper validationis strongly correlated with applying modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO6& PO6 Mapped at 0	Design data management model with proper validationis not correlated with learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO6& PO7 Mapped at 0	Design data management model with proper validationis not correlated with acknowledging the need for continuous professional development and practice it through self-motivated, independent learning
CO6& PO8 Mapped at 3	Design data management model with proper validationis strongly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO6& PO9 Mapped at 0	Design data management model with proper validationis not correlated with demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO6& PO10 Mapped at 0	Design data management model with proper validationis not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**(12)B**	**Industrial Data Management and Security**	
	Prepared By		
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

Unit	**Contents**	**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	7	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 publishing, Metadata registry	8	CO 2	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied 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.	5	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.**	5	CO5	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied
7	**Advanced data security tools** Wireshark, Kali linux, John the ripper,metasploit,cain and abel etc..	5	CO6	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO(12)B.1	3	2	3	2	1	0	0	3	0	0
CO(12)B.2	1	1	1	1	1	1	1	1	0	0
CO(12)B.3	1	1	1	1	1	1	1	1	0	0
CO(12)B.4	1	1	1	1	1	1	1	1	0	0
CO(12)B.5	1	1	1	1	1	1	1	1	0	0
CO(12)B.6	1	1	1	1	1	1	1	1	0	0
CO.	1.33	1.16	1.33	1.16	1	0.83	0.83	1.33	0	0
CO	1	1	1	1	1	1	1	1	0	0

1- Low , 2- Medium, 3- High, If no correlation,put '-'

(Rationale in Appendix)
Evaluation
Internals: 100%
Externals: 00%
Total : 100%
Internal Assessment Mapping

Parameter	Marks	CO1	CO2	CO3	CO4	CO5	CO6
Class Participation/ Attendance	10	1	1	2	2	2	2
Live project – club activity	5	1	2	2			
Case study discussion	10	2	2	2	2	1	1
Assignments/ Projects	5		2	3			
Internal End Term Exam	20	4	4	3	3	3	3
Internal	50	8	11	12	7	6	6
End Term (Univ)	50	12	7	8	6	11	6

Attendance Policy

95-100%	**10 marks**
90-94%	9 marks
85-89%	8 marks
80-84%	7 marks
75- 79%	6 marks

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

Rationale for Mapping Program Outcomes and Course Outcomes:

CO1 & PO1 Mapped at 3	Memorise remind data hiding and data security concepts are strongly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.
CO1 & PO 2 Mapped at 2	Memorise remind data hiding and data security concepts are strongly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.
CO1 & PO 3 Mapped at 3	Memorise remind data hiding and data security concepts are strongly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO1 & PO 4 Mapped at 2	Memorise remind data hiding and data security concepts are strongly correlated with applying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO1 & PO5 Mapped at 1	Memorise remind data hiding and data security concepts are strongly correlated with use of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO1 & PO6 Mapped at 0	Memorise remind data hiding and data security concepts are not correlated with learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO1 & PO7 Mapped at 0	Memorise remind data hiding and data security concepts are not correlated with acknowledging the need for continuous professional development and practice it through self-motivated, independent learning.
CO1 & PO8 Mapped at 3	Memorise remind data hiding and data security concepts are strongly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO1 & PO9 Mapped at 0	Memorise remind data hiding and data security concepts are not correlated with demonstrating efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO1 & PO10 Mapped at 0	Memorise remind data hiding and data security concepts are not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO2& PO1 Mapped at 1	Understanding need of data management and security is slightly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.
CO2& PO 2 Mapped at 1	Understanding need of data management and security is slightly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO2& PO 3 Mapped at 1	Understanding need of data management and security is slightly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO2& PO 4 Mapped at 1	Understanding need of data management and security is slightly correlated withapplying research-based knowledge and research methods including design of

	experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO2& PO5 Mapped at 1	Understanding need of data management and security is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO2& PO6 Mapped at 1	Understanding need of data management and security is not correlated with learning and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.
CO2& PO7 Mapped at 1	Understanding need of data management and security is slightly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO2& PO8 Mapped at 1	Understanding need of data management and security is slightly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO2& PO9 Mapped at 0	Understanding need of data management and security is not correlated with demonstrating efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO2& PO10 Mapped at 0	Understanding need of data management and security is not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO3& PO1 Mapped at 1	Identify data security threats and application of security tools is slightly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements
CO3& PO 2 Mapped at 1	Identify data security threats and application of security tools is slightly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO3& PO 3 Mapped at 1	Identify data security threats and application of security tools is slightly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO3& PO 4 Mapped at 1	Identify data security threats and application of security tools is slightly correlated withapplying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO3& PO5 Mapped at 1	Identify data security threats and application of security tools is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO3& PO6 Mapped at 1	Identify data security threats and application of security tools security is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO3& PO7 Mapped at 1	Identify data security threats and application of security tools is slightly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO3& PO8	Identify data security threats and application of security tools is slightly correlated

Mapped at 1	withinvolving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO3& PO9 Mapped at 0	Identify data security threats and application of security tools is not correlated with demonstrating efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO3& PO10 Mapped at 0	Identify data security threats and application of security tools is not correlated with providing conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO4& PO1 Mapped at 1	Analysis of data management is slightly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements
CO4& PO 2 Mapped at 1	Analysis of data management is slightly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO4 & PO 3 Mapped at 1	Analysis of data management is slightly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO4& PO 4 Mapped at 1	Analysis of data management is slightly correlated withapplying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO4& PO5 Mapped at 1	Analysis of data management is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO4& PO6 Mapped at 1	Analysis of data management is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO4& PO7 Mapped at 1	Analysis of data management is slightly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO4& PO8 Mapped at 1	Analysis of data management is slightly correlated withinvolving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO4& PO9 Mapped at 0	Analysis of data management is not correlated withdemonstrating efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO4& PO10 Mapped at 0	Analysis of data management is not correlated withproviding conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO5& PO1 Mapped at 1	Evaluation of threats and application of security measures is slightly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements
CO5& PO 2 Mapped at 1	Evaluation of threats and application of security measures is slightly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO5 & PO 3 Mapped at 1	Evaluation of threats and application of security measures is slightly correlated withdesigning and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO5& PO 4	Evaluation of threats and application of security measures is slightly correlated

Mapped at 1	withapplying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO5& PO5 Mapped at 1	Evaluation of threats and application of security measures is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO5& PO6 Mapped at 1	Evaluation of threats and application of security measures is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO5& PO7 Mapped at 1	Evaluation of threats and application of security measures is slightly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO5& PO8 Mapped at 1	Evaluation of threats and application of security measures is slightly correlated withinvolving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO5& PO9 Mapped at 0	Evaluation of threats and application of security measures is not correlated withdemonstrating efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO5& PO10 Mapped at 0	Evaluation of threats and application of security measures is not correlated withproviding conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.
CO6& PO1 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated with applying knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements
CO6& PO 2 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated with applying fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem
CO6 & PO 3 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated with designing and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.
CO6& PO 4 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated withapplying research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO6& PO5 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO6& PO6 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated withuse of modern tools for delivering milestones like problem analysis, design, development, testing and deployment
CO6& PO7 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated with involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO6& PO8 Mapped at 1	Creation of protective environment for sharing industrial data is slightly correlated withinvolving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.
CO6& PO9	Creation of protective environment for sharing industrial data is not correlated

Mapped at 0	withdemonstrating efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.
CO6 & PO10 Mapped at 0	Creation of protective environment for sharing industrial data is not correlated withproviding conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.