Fr. Conceicao Rodrigues College of Engineering
Fr. Agnel Ashram, Bandstand, Bandra (West), Mumbai – 50.

2.6.2. Attainment of Programme outcomes and course outcomes are evaluated by the Institution.

Index

Following are the processes followed by our institution for attainment of Programme outcomes and course outcomes.

Process to Measure CO attainment

Faculty member identifies tools required to measure CO attainment for each CO.

- Faculty member assigns weightage for each tool.
- Faculty member formulates equation to calculate attainment.
- Faculty member sets target level for CO attainment.
- DQAC verifies the method/tools/target value of CO attainment calculation and suggests tools, target values, etc. if required.
- Based on feedback from DQAC, faculty member makes appropriate changes.
- Faculty member collects the data throughout semester as per the tools selected for measuring CO attainment.
- Faculty member organizes data.
- Faculty member calculates CO and PO attainments for said course.
- Faculty member analyzes CO attainment to identify remedial actions if necessary.
- DQAC verifies attainment and suggests remedial action.
- Faculty member implements remedial measures during following year to improve CO attainment or sets new target value.

Flowchart representing process to calculate CO attainment

```
┌─────────────────────┐
│ • Internal Test     │
│ • Lab               │        ┌──────────────────────┐
│   Performance       │        │ Faculty member       │
│ • Assignments       │───────▶│ identifies tools      │
│ • Quiz              │        │ required              │
│ • Oral/Practical   │        └──────────────────────┘
│   Exam              │                   │
│ • Course exit       │                   ▼
│   survey            │        ┌──────────────────────┐
│ • Final Exam        │        │ Faculty member       │
│ • Any other         │        │ assigns weightage    │
│   method            │        │ for each tool         │
└─────────────────────┘        └──────────────────────┘
                                          │
                                          ▼
                               ┌──────────────────────┐
                               │ Faculty member       │
                               │ formulates           │
                               │ attainment equation  │
                               └──────────────────────┘
                                          │
                                          ▼
                               ┌──────────────────────┐
                               │ Faculty member sets  │
                               │ target value          │
                               └──────────────────────┘
                                          │
                                          ▼
┌──────────────────────┐       ┌──────────────────────┐
│ Faculty modifies     │       │ DQAC verifies the    │
│ tools/target/formula │──────▶│ tools, target        │
│ as per suggestions   │       │ values, etc.          │
└──────────────────────┘       └──────────────────────┘
            ▲                              │
            │                              ▼
            │                       ╱──────────╲
            │              Yes     ╱  Any       ╲
            └─────────────────────�  changes?    ╲
                                    ╲            ╱
                                     ╲──────────╱
                                          │ No
                                          ▼
                               ┌──────────────────────┐
                               │ Faculty members      │
                               │ collects data        │
                               │ throughout semester  │
                               └──────────────────────┘
                                          │
                                          ▼
                               ┌──────────────────────┐
                               │ Faculty members      │
                               │ organizes data        │
                               └──────────────────────┘
                                          │
                                          ▼
                               ┌──────────────────────┐
                               │ Faculty members      │
                               │ calculates CO and    │
                               │ PO attainments       │
                               └──────────────────────┘
                                          │
                                          ▼
                               ┌──────────────────────┐
                               │ Faculty members      │
                               │ analyzes CO and PO   │
                               │ attainments to       │
                               │ identify remedial    │
                               │ action if required   │
                               └──────────────────────┘
                                          │
                                          ▼
                               ┌──────────────────────┐
                               │ PAC verifies CO and  │
                               │ PO attainments and   │
                               │ suggests remedial    │
                               │ action if required   │
                               └──────────────────────┘
                                          │
                                          ▼
                               ┌──────────────────────┐
                               │ Faculty members      │
                               │ implements remedial  │
                               │ action if any        │
                               └──────────────────────┘
```

Process to Measure PO/PSO attainment

- DQAC identifies tools required to measure PO and PSO attainment for each PO and PSO.
- DQAC assigns weightage for each tool depending type of data, etc.
- DQAC formulates equation to calculate attainment.
- DQAC sets target level for PO and PSO attainment.
- DQAC finalizes the method/tools/target value of PO and PSO attainment calculation.
- PC assigns responsibility to few faculty members to collect data and designates one of the faculty member as coordinator.
- Respective faculty member collects the data at the end of semester/year as per the tools selected for measuring PO and PSO attainment.
- Respective faculty member organizes data.
- Coordinator calculates consolidated PO and PSO attainments.
- Coordinator analyzes PO and PSO attainments.
- DQAC verifies attainment and suggests remedial action.
- DQAC ensures implementation of remedial measures to improve PO and PSO attainment at department level or sets new target value during next academic year.

Flowchart representing process to calculate PO/PSO attainment
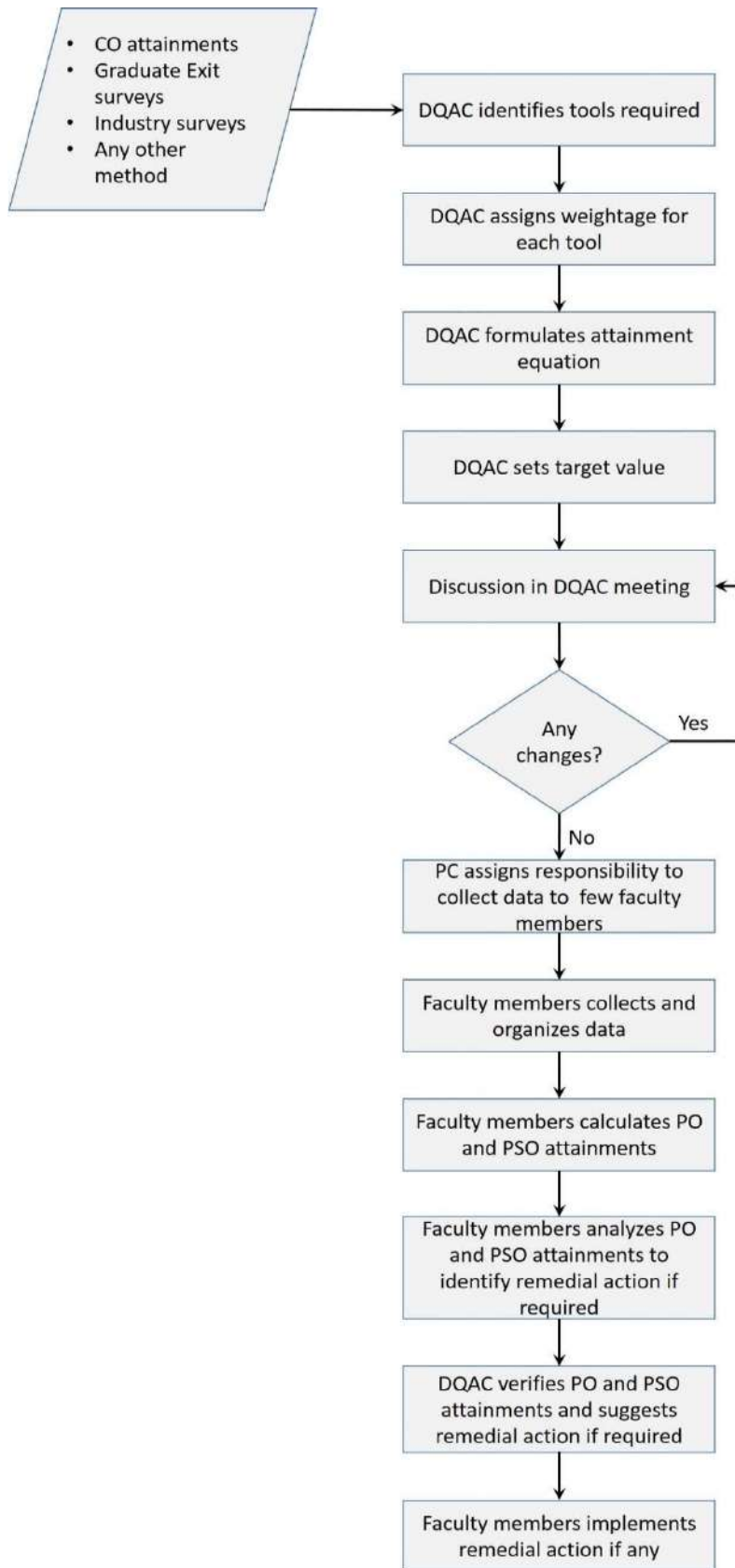
Course Outcome Assessment Plan (2023-24)

Course Code: CSDC7022	Course Name: Blockchain Technology
Prerequisite Courses:	
1. Cryptography and System Security (CSC602)	
2. Data Stuctures (CSC303)	
Course Educational Objectives:	
1. To understand blockchain platforms and its terminologies	
2. To understand the use of cryptography required for blockchain	
3. To understand smart contracts, wallets, and consensus protocols	
4. To design and develop blockchain applications	

	Course Outcomes: Student will be able to	Bloom's Level
CSDC7022.1	Explain Blockchain concepts in the context of distributed ledger.	2
CSDC7022.2	Associate concepts of cryptocurrencies, consensus algorithms and mining with security of blockchain.	2
CSDC7022.3	Apply the concepts of smart contact using Solidity programming for a given application.	3
CSDC7022.4	Explore Hyperledger Fabric and its working as a private blockchain.	2
CSDC7022.5	Explain basic working principles of Ethereum.	2
CSDC7022.6	Compare various tools of BCT using case studies.	3

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
1.1	Demonstrate competence in mathematical modeling	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems						
		1.1.2	Apply the concepts of probability, statistics and queuing theory in modeling of computer-based system, data and network protocols						
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem						
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals	YES	YES	YES	YES	YES	YES
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of computer science and engineering to solve an engineering problem	YES		YES			

PO 2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Articulate problem statements and identifies objectives						
		2.1.2	Identify processes/modulesof a computer-based system and parameters to solve the problems						
		2.1.3	Identify an algorithm that applies to a given problem						
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe the computer-based system into interconnected subsystems						
		2.2.2	Identify functionalities and computing resources.						
		2.2.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions			YES			
		2.2.4	Compare and contrast alternative solution/methods to select the best methods						
		2.2.5	Compare and contrast alternative solution processes to select the best process						
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Apply computer engineering principles to formulate modules of a system with required applicability and performance			YES			
		2.3.2	Identify design constraints for required performance criteria						
2.4	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Applies engineering mathematics to implement the solution			YES			
		2.4.2	Analyze and interpret the results using contemporary tools						
		2.4.3	Identify the limitations of the solution and sources/causes						
		2.4.4	Arrive at conclusions with respect to the objectives.						

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
	Demonstrate an ability to define a complex/ open	3.1.1	Define a precise problem statement with objectives and scope						
		3.1.2	Identify and document system requirements from stake- holders						
		3.1.3	Review state-of-the-art literature to synthesize system requirements						

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3.1	define a complex/ open-ended problem in engineering terms	3.1.4	Choose appropriate quality attributes as defined by ISO/IEC/IEEE standard						
		3.1.5	Explore and synthesize system requirements from larger social and professional concerns						
		3.1.6	Develop software requirement specifications (SRS)						

C. No.	Competencies	PI No.	Performance Indicators						
		3.2.1	Explore design alternatives						
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.2	Produce a variety of potential design solutions suited to meet functional requirements						
		3.2.3	Identify suitable non-functional requirements for evaluation of alternate design solutions						
3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Perform systematic evaluation of the degree to which several design concepts meet the criteria						
		3.3.2	Consult with domain experts and stakeholders to select optimal engineering design solution for further development						
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)						
		3.4.2	Implement and integrate the modules.						
		3.4.3	Verify the functionalities and validate the design.						

PO4: Conduct investigations of complex 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

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purposes of investigation, its scope and importance						
		4.1.2	Able to choose appropriate procedure/algorithm, dataset and test cases						
		4.1.3	Able to choose appropriate hardware/software tools to conduct the experiment.						
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives						
4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to analyze collected data						
		4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations						
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions						
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions						

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities						
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems						
5.2	Demonstrate an ability to select and apply discipline- specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs						
		5.2.2	Demonstrate proficiency in using discipline-specific tools					YES	
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources						
		5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use						

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at the global, regional and local level	YES	YES			YES	
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public						

9

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity						
		7.1.2	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability		YES				
7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development						
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline						

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives		YES				
8.2	Demonstrate an ability to apply the Code of Ethics	8.2.1	Identify tenets of the IEEE and CSI professional code of ethics						
		8.2.2	Examine and apply moral & ethical principles to known case studies						

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team						
		9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal						
9.2	Demonstrate effective individual and team operations-- communication, problem-solving, conflict resolution and leadership skills	9.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills						
		9.2.2	Treat other team members respectfully						
		9.2.3	Listen to other members						
		9.2.4	Maintain composure in difficult situations						
9.3	Demonstrate success in a team-based project	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts						

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PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information	YES	YES	YES	YES	YES	YES
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents	YES	YES	YES	YES	YES	YES
		10.1.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear	YES	YES	YES	YES	YES	YES
10.2	Demonstrate competence in listening, speaking, and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others						
		10.2.2	Deliver effective oral presentations to technical and non-technical audiences	YES	YES	YES	YES	YES	YES
10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations						
		10.3.2	Use a variety of media effectively to convey a message in a document or a presentation	YES	YES	YES	YES	YES	YES

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity						
		11.1.2	Analyze different forms of financial statements to evaluate the financial status of an engineering project						
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations.						
11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks						
		11.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget						
11.4	Demonstrate an ability to do financial planning by considering aspects of taxation and investment.	11.4.1	Prepare financial planning, calculate relevant taxes and propose suitable investment by considering real life constraints.						

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the requirement for continuing professional development						
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap						
12.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current						
		12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field						
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information						
		12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc						
12.4	Demonstrate entrepreneurship mindset	12.4.1	Recognize the importance of entrepreneurship and participate in activity related to business formation.						

PSO1: Develop Artificial Intelligence (AI) and Machine Learning (ML) systems.

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
13.1	Demonstrate competence in mathematical modelling, and engineering fundamentals.	13.1.1	Develop mathematical concepts required for ML and AI algorithms.						
		13.1.2	Devise the concepts of modelling for the said systems.						
		13.1.3	Apply theory and principles of Computer Science and engineering.						
13.2	Demonstrate an ability to identify the applicability of AI and ML solutions to a problem.	13.2.1	Articulate problem statements and identify objectives						
		13.2.2	Analyze the problem for applicability of AI and ML solutions						
		13.2.3	Identify an algorithm that applies to a given problem						
13.3	Demonstrate an ability to identify solutions/methods to solve the problem.	13.3.1	Identify processes/modules of an Artificial Intelligence and Machine Learning system and parameters to solve a problem						
		13.3.2	Apply various methods and evaluate their performance.						
		13.3.3	Choose an appropriate method for the given problem						

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
13.4	Demonstrate an ability to execute the solution.	13.4.1	Use the chosen method to implement the solution.						
		13.4.2	Analyse and interpret the results using contemporary tools.						
		13.4.3	Identify the limitations of the solution and sources/causes.						

PSO2: Apply cyber security mechanisms to ensure the protection of information technology assets.

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5	CO6
14.1	Demonstrate an ability to understand the cyber security regulations and legislations.	14.1.1	Interpret cyber security legislation and regulations						
		14.1.2	Explain its contribution to the protection of the information technology assets.						
14.2	Demonstrate an ability to identify potential threats and attacks to the information technology assets.	14.2.1	Analyse the static and web vulnerabilities.						
		14.2.2	Identify the flow and methodology of the attacks.						
		14.2.3	Choose appropriate tools to identify different types of threats and cyber-attacks.						
14.3	Demonstrate an ability to identify tools and measures to protect the assets from cyber-attacks.	14.3.1	Identify the defence methodologies and the measures to prevent the attacks and protect assets.						
		14.3.2	Identify the techniques to detect attacks.	YES	YES				
		14.3.3	Choose appropriate tools and methods to protect the assets from cyber-attacks.						
14.4	Demonstrate an ability to apply the security mechanisms to real-world problems.	14.4.1	Simulate the solution on a virtual system.						
		14.4.2	Apply measures and tools for protecting the assets.		YES				
		14.4.3	Analyse the strengths and weaknesses of the security mechanisms.		YES				

Dr. Sujata Deshmukh.

Dr. Monica Khanore.

BCT CSDC7022 Attainment
Academic Year: 2023-24

Sem: VII Div: B

CO attainment

CSDC7022.1	3
CSDC7022.2	2.84
CSDC7022.3	2.84
CSDC7022.4	2.76
CSDC7022.5	3
CSDC7022.6	3

CO-PO mapping

	PO1	PO2	PO5	PO6	PO7	PO8	PO10
CSDC7022.1	2	--	--	2	--	--	3
CSDC7022.2	1	--	--	2	1	1	3
CSDC7022.3	2	1	1	--	--	--	3
CSDC7022.4	1	--	--	--	--	--	3
CSDC7022.5	1	--	--	--	--	--	3
CSDC7022.6	1	--	--	1	--	--	3
Total	8	1	1	5	1	1	18

CO-PSO mapping

	PSO1	PSO2
CSDC7022.1	--	1
CSDC7022.2	--	1
CSDC7022.3	--	--
BCSDC7022.4	--	--
CSDC7022.5	--	--
CSDC7022.6	--	--
Total	--	2

PO Attainmnet

PO1	PO2	PO5	PO6	PO7	PO8	PO10
2.619	2.556	2.556	2.642	2.556	2.556	2.907

PSO Attainment

PSO2
2.628

Dr. Sujata Deshmukh.

Dr. Monica Khanore.

Fr. Conceicao Rodrigues College of Engineering

Father Agnel Ashram, Bandstand, Bandra –west, Mumbai-50

Department of Computer Engineering

BCT Practical Plan

Class: BE Computer (B)	Weekly Schedule:
Course name/code: CSDL7022	Batch A: Thursday 8.45-9.45am
Academic Year: 2023-24	Batch B: Wednesday 8.45-9.45am
Name of the teacher	Batch C: Tuesday 8.45-9.45am
Dr. Monica Khanore	Batch D: Friday 8.45-9.45am

Course Outcomes:

CSDL7022.1 Create cryptographic hash using Merkle tree.

CSDL7022.2 Design smart contract using solidity for a given application.

CSDL7022.3 Implement Ethereum blockchain using any of the Ethereum platforms.

CSDL7022.4 Explore Hyperledger Fabric and its working.

CSDL7022.5 Demonstrate the concepts of blockchain in real world applications.

Sr. No.	Title of experiment	Course Outcomes	Batch	Planned date	Actual date	Remark/HoD's Signature
1	Generation of Merkle tree and verification of valid transaction.	CSDL7022.1	A	27-07-23	03/08/23	
			B	26-07-23	26/07/23	
			C	25-07-23	25/07/23	
			D	28-07-23	28/07/23	
2	Using different variable types in Solidity	CSDL7022.2	A	03-08-23	17/08/23	
			B	02-08-23	23/08/23	
			C	01-08-23	08/08/23	
			D	04-08-23	11/08/23	

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3	1. Transactions using Solidity. 2. Transferring Ethers using Metamask	CSDL7022.2.	A	10-08-23	24 Fob 23 10 08 23
			B	09-08-23	22 08 23 09 08 23
			C	08-08-23	22 08 23 01 08 23
			D	11-08-23	15 08 43 04 08 23
4	Implementation of voting application in Solidity	CSDL7022.2.	A	17-08-23	14 09 23
			B	23-08-23	06 09 23
			C	22-08-23	05 09 23
			D	18-08-23	01 09 23
5	Implementation of smart contact for displaying the test result in Solidity	CSDL7022.2	A	24-08-23	14 09 23
			B	06-09-23	13 09 23
			C	05-09-23	12 09 23
			D	25-08-23	08 09 23
6	Create a Smart Contract in Ethereum with Ganache and Remix IDE	CSDL7022.3	A	07-09-23	05 10 23
			B	13-09-23	27 09 23
			C	12-09-23	26 09 23
			D	01-09-23	06 10 23
7	Case study of Hyperledger	CSDL7022.4	A	14-09-23	28 09 23
			B	27-09-23	13 09 23
			C	26-09-23	26 09 23
			D	08-09-23	15 09 23
8	Implementation of PAXOS Algorithm	CSDL7022.5	A	14-09-23	05 10 23
			B	27-09-23	04 10 23
			C	26-09-23	03 10 23
			D	08-09-23	06 10 23

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Department of Computer Engineering

9	Mini project	CSDL7022.2 CSDL7022.3 CSDL7022.5	A	05-10-23	26/10/23	
			B	04-10-23	26/10/23	
			C	03-10-23	26/10/23	
			D	15-09-23, 06/10/23	26/10/23	

Course Instructor: Dr. Monica Khanore

SOCIETY OF ST. FRANCIS XAVIER, PILAR'S

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING

(Approved by AICTE & Affiliated to University of Mumbai)

Fr. Agnel Ashram, Bandstand, Bandra (W), Mumbai - 400 050.

Phone : (022) 6711 4000, 6711 4101, 6711 4104

Website : www.frcrce.ac.in • Email : crce@fragnel.edu.in

Computer Engineering
(Academic Year :2023-2024)

BCT Lesson Plan

Course Code: CSDC7022

Course Name: Blockchain Technology

Course Teacher: Dr. Monica Khanore

Course Outcomes (CO): *At the End of the course students will be able to*

CSDC7022.1	Explain Blockchain concepts in the context of distributed ledger.
CSDC7022.2	Associate knowledge of consensus algorithms and mining with security of blockchain.
CSDC7022.3	Apply the concepts of smart contact using Solidity programming for a given application.
CSDC7022.4	Explore Hyperledger Fabric and its working as a private blockchain.
CSDC7022.5	Explain basic working principles of Ethereum.
CSDC7022.6	Compare various tools of BCT using case studies.

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Course Lesson Plan

Sr. No.	Proposed Date	Actual Date	Topics	CO	Teacher's Remark	HoD's Remark
1	11-07-23	11-07-23	Syllabus, Introduction to COs, Introduction to blockchain, Hashing	CSDC7022.1		
2	12-07-23	11-07-23	Peer-to-peer network, Merkle Tree	CSDC7022.1		
3	14-07-23	18-07-23	Origin of blockchain, components of blockchain	CSDC7022.1	Placement Activity	
4	18-07-23	18-07-23	Block in blockchain, how blockchain technology works	CSDC7022.1		
5	19-07-23	21-07-23	Pros and cons of BCT, Applications of BC, Types of BC	CSDC7022.1		
6	21-07-23	22-07-23	Consensus Protocols: Objectives of consensus protocols, PoW, PoS, PoB, PoET	CSDC7022.2		
7	25-07-23	25-07-23	Transactions in blockchain, UTXOs, Double-spending problem	CSDC7022.1		
8	26-07-23	26-07-23	Cryptocurrency difficulty, Mining pools and their methods, Lifespan of a miner	CSDC7022.2		
9	27-07-23	27-07-23	Cryptocurrency: wallets: Hot, cold	CSDC7022.1		
10	01-08-23	01-08-23	cryptocurrency: Altcoin, Tokens: utility, security, Hybrid	CSDC7022.1	Assignment 1	
11	02-08-23	02-08-23	Cryptocurrency usage: players, Ecosystem Cryptomining, Airdrop, Token or Coin burning	CSDC7022.1		
12	03-08-23	03-08-23	Cryptocurrency usage: Investment and Trading, Cryptocurrency safety, Regulations around cryptocurrency	CSDC7022.1		
13	08-08-23	08-08-23	Smart Contracts intro, how SC works, Types of Smart Contracts	CSDC7022.3	Quiz 1 on Modules 1-2	
14	09-08-23	09-08-23	Structure of a Smart Contract, Limitations of Smart Contracts, Solidity: Functions	CSDC7022.3		
15	10-08-23	16-08-23	Solidity: Fixed sized arrays, Dynamic-sized arrays Structures	CSDC7022.3		
	15-08-23		Independence Day			
	16-08-23		Parsi New Year			
16	17-08-23	17-08-23	Bytes, String arrays, Memory and Storage	CSDC7022.3		

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17	22-08-23	22-08-23	Enum, mapping, error Handling	CSDC7022.3		
18	23-08-23	23-08-23	Introduction to Public Blockchain, Ethereum and its Components	CSDC7022.5		
19	24-08-23	24-08-23	Mining in Ethereum, Ethereum Virtual Machine (EVM), Transactions	CSDC7022.5		
	29-08-23 to 30-08-23		Unit Test-1	CSDC7022.1, CSDC7022.2		
20	05-09-23		Accounts, Architecture and Workflow, Comparison between Bitcoin and Ethereum	CSDC7022.5	Mass bunk. Given as an assignment	
21	06-09-23	06|09|23	Types of test-networks used in Ethereum	CSDC7022.5	Quiz 2 on Modules 3-4	
22	07-09-23	12|09|28	key characteristics, Smart Contract in a Private Environment	CSDC7022.3	Declared as holiday	
23	12-09-23	12|09|23	State Machine Replication, Consensus Algorithms for Private Blockchain - PAXOS	CSDC7022.2		
24	13-09-23	13-09-23	RAFT algorithm, Byzantine Faults	CSDC7022.2		
25	14-09-23	14|09|23	Byzantine Fault Tolerant (BFT), Practical BFT	CSDC7022.2		
	19-09-23 to 22-09-23		**Shri Ganesh Festival**			
26	26-09-23	26|09|23	Hyperledger: Tools and frameworks	CSDC7022.4		
27	27-09-23	26|09|23 27|09|23	Hyperledger fabric, comparison between Hyperledger fabric and other technologies	CSDC7022.4		
	28-09-23		**Anant Chaturdashi**			
28	03-10-23	27|09|23	Hyperledger fabric architecture	CSDC7022.4		
29	04-10-23	04|10|23	Components of Hyperledger Fabric: MSP, Chain Codes, Transaction Flow	CSDC7022.4		
30	05-10-23	04|10|23	Working of Hyperledger Fabric, case study of Supply chain management using Hyperledger Case Study of Supply Chain Management using Hyperledger	CSDC7022.4		
	09-10-23 to 13-10-23		Unit Test-2	CSDC7022.3 CSDC7022.4 CSDC7022.5		

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				CSDC7022.6		
31	13-10-23	05 10 23	Corda, Ripple	CSDC7022.6		
32	14-10-23	13 10 23	Quorum	CSDC7022.6		
33	16-10-23		Blockchain in DeFi	CSDC7022.6	Quiz 3 on Modules 5-6	
42	17-10-23		Remedial Session			
			University ESE Examination			

Text books:

1. Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhillash K. A and Meena Karthikeyen, Universities Press.
2. Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly.
3. Imran Bashir, Mastering Blockchain: A deep dive into distributed ledgers, consensusprotocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Packt Publishing.

Reference Books:

1. Blockchain for Beginners, Yathish R and Tejaswini N, SPD
2. Blockchain Basics, A non-Technical Introduction in 25 Steps, Daniel Drescher, Apress
3. Blockchain with Hyperledger Fabric, Luc Desrosiers, Nitin Gaur, Salman A. Baset, Venkatraman Ramakrishna, Packt Publishing

Course Instructor: Dr. Monica Khanore

CO-PO-PSO Attainment

Subject: Blockchain Technology (CSDC 7022)
Sem VII   Div B

Teacher-in-charge: Prof. Monica Khanore
Academic Year: 2023-24

CSDC7022.1 Assessment:						
Target Level-CSDC7022.1	Weightage	Successful	Total Students	Performance	Attainment Level	Attainment (%)
End Sem Exam						
60% students with minimum 60% marks	0.6	53	70	76.00%	3	1.8
Test1:						
60% students with minimum 60% marks	0.2	54	70	77.00%	3	0.6
Assignment 1						
60% students with minimum 60% marks	0.1	57	70	81.00%	3	0.3
Quiz 1:						
60% students with minimum 60% marks	0.1	50	70	71%	3	0.3
Course Exit Survey:						
70% students strongly aggree and aggree	1	47	51	92%	3	3
End Sem exam	Test 1	Assignment 1	Quiz 1	CES		
40-60	<60	<60	<60	70-79	Low(1)	
61-70	61-70	61-70	61-70	80-89	Medium(2)	
>70	>70	>70	>70	>=90	High(3)	
CSDC7022.1 Attainment=	3					

Dr. Sujata Deshmukh.

Dr. Monica Khanore.

CSDC7022.2 Assessment:

Target Level-CSDC7022.2	Weightage	Successful	Total Students	Performance	Attainment Level	Attainment (%)
End Sem Exam						
60% students with minimum 60% marks	0.6	53	70	76.00%	3	1.8
Test1:						
60% students with minimum 60% marks	0.2	44	70	63.00%	2	0.4
Assignment 1:						
60% students with minimum 60% marks	0.1	57	70	81.00%	3	0.3
Quiz 1:						
60% students with minimum 60% marks	0.1	50	70	71.00%	3	0.3
Course Exit Survey:						
70% students strongly aggree and aggree	1	46	51	90.00%	3	3

End Sem exam	Test 1	Assignment 1	Quiz 1	CES	Attainment Level	
40-60	<60	<60	<60	70-79	Low(1)	
61-70	61-70	61-70	61-70	80-89	Medium(2)	
>70	>70	>70	>70	>=90	High(3)	
CSDC7022.2 Attainment=	2.84					
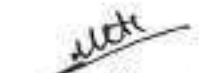
Dr Sujata Deshmukh.

Dr Monica Khanore

CSDC7022.3 Assessment:

Target Level-CSDC7022.3	Weightage	Successful	Total Students	Performance	Attainment Level	Attainment (%)
End Sem Exam						
60% students with minimum 60% marks	0.6	53	70	76.00%	3	1.8
Test2:						
60% students with minimum 60% marks	0.1	43	70	61.00%	2	0.2
Assignment 1:						
60% students with minimum 60% marks	0.1	57	70	81.00%	3	0.3
Assignment 2:						
60% students with minimum 60% marks	0.1	70	70	100.00%	3	0.3
Quiz 2:						
60% students with minimum 60% marks	0.1	48	70	69.00%	2	0.2
Course Exit Survey:						
70% students strongly aggree and aggree	1	46	52	88.00%	3	3

End Sem exam	Test 2	Assignment 1	Assignment 2	Quiz 2	CES	
50-59	<60	<60	<60	<60	70-79	Low(1)
60-69	61-70	61-70	61-70	61-70	80-89	Moderate(2)
>70	>70	>70	>70	>70	>=90	Substantial(3)

CSDC7022.3 Attainment=	2.84					
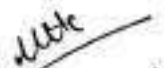
Dr. Sujata Deshmukh

Dr. Monica Khanore

CSDC7022.4 Assessment:

Target Level-CSDC7022.4	Weightage	Successful	Total Students	Performance	Attainment Level	Attainment (%)
End Sem Exam						
60% students with minimum 60% marks	0.6	53	70	76.00%	3	1.8
Test2:						
60% students with minimum 60% marks	0.1	30	70	43.00%	1	0.1
Assignment 1:						
60% students with minimum 60% marks	0.1	57	70	81.00%	3	0.3
Assignment 2:						
60% students with minimum 60% marks	0.1	70	70	100.00%	3	0.3
Quiz 2:						
60% students with minimum 60% marks	0.1	48	70	69.00%	2	0.2
Course Exit Survey:						
70% students strongly aggree and aggree	1	47	51	92.00%	3	3

End Sem exam	Test 2	Assignment 2	Quiz 2	CES	Attainment Level	
50-59	<60	<60	<60	70-79	Low(1)	
60-69	61-70	61-70	61-70	80-89	Moderate(2)	
>70	>70	>70	>70	>=90	Substantial(3)	

| CSDC7022.4 Attainment= | 2.76 | | | | | |
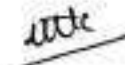
Dr. Sujata Deshmukh.

Dr. Monico Khanore

CSDC7022.5 Assessment:

Target Level-CSDC7022.5	Weightage	Successful	Total Students	Performance	Attainment Level	Attainment (%)
End Sem Exam						
60% students with minimum 60% marks	0.6	53	70	76.00%	3	1.8
Test 2:						
60% students with minimum 60% marks	0.2	66	70	94.00%	3	0.6
Assignment 1:						
60% students with minimum 60% marks	0.1	57	70	81.00%	3	0.3
Assignment 2:						
60% students with minimum 60% marks	0.1	70	70	100.00%	3	0.3
Course Exit Survey:						
70% students strongly aggree and aggree	1	47	51	92.00%	3	3

End Sem exam	Test 2	Assignment 2	CES	
50-59	<60	<60	70-79	Low(1)
60-69	61-70	61-70	80-89	Moderate(2)
>70	>70	>70	>=90	Substantial(3)

CSDC7022.5 Attainment=	3
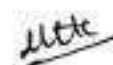
Dr. Sujata Deshmukh.

Dr. Monica Khan

CSDC7022.6 Assessment:

Target Level-CSDC7022.6	Weightage	Successful	Total Students	Performance	Attainment Level	Attainment (%)
End Sem Exam						
60% students with minimum 60% marks	0.6	53	70	76.00%	3	1.8
Assignment 2:						
60% students with minimum 60% marks	0.2	52	70	74.00%	3	0.6
Quiz 3:						
60% students with minimum 60% marks	0.2	65	70	93%	3	0.6
Course Exit Survey:						
70% students strongly aggree and aggree	1	47	51	92.00%	3	3

End Sem exam	Assignment 2	Quiz 3	CES			
50-59	<60	<60	70-79	Low(1)		
60-69	61-70	61-70	80-89	Moderate(2)		
>70	>70	>70	>=90	Substantial(3)		
CSDC7022.6 Attainment=	3					

Dr. Sujata Deshmukh.

Dr. Monica Khanore

Course Outcomes (CO) Program Outcome (PO) Mapping:

PO	PO1			PO2			PO3			PO4			PO5			PO6			PO7			PO8			PO9			PO10			PO11			PO12			PSO1			PSO2		
CO	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG
CO1	5	2	40	14			14			8			6			2	1	50	4			3			7			7	5	71	6			7			12			11	1	9
CO2	5	1	20	14			14			8			6			2	1	50	4	1	25	3	1	33	7			7	5	71	6			7			12			11	3	27
CO3	5	2	40	14	3	21	14			8			6	1	17	2			4			3			7			7	5	71	6			7			12			11		
CO4	5	1	20	14			14			8			6			2			4			3			7			7	5	71	6			7			12			11		
CO5	5	1	20	14			14			8			6			2			4			3			7			7	5	71	6			7			12			11		
CO6	5	1	20	14			14			8			6			2	1		4			3			7			7	5	71	6			7			12			11		
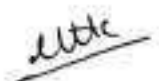
TPI: Total Performance Indicators
MPI: Mapped Performance Indicators
MG: Mapping Grade

Threshold	% Level
3	>=67%
2	60% to 34%
1	<34%

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2			2					3					1
CO2	1					2	1	1	3					1
CO3	2	1		1					3					
CO4	1								3					
CO5	1								3					
CO6	1					1			3					

Dr. Sujata Deshmukh.

Dr. Monica Khanore.

CO Attainment Tools and Weightages

	Unit Test		Extra					Internal	External	
	1	2	A1	A2	Q1	Q2	Q3	IA	ESE	Indirect
CO1	20%	--	10%	--	10%	--	--	40%	60%	100%
CO2	20%	--	10%	--	10%	--	--	40%	60%	100%
CO3	--	10%	10%	10%	--	10%	--	40%	60%	100%
CO4	--	10%	10%	10%	--	10%	--	40%	60%	100%
CO5	--	10%	10%	10%	--	--	10%	40%	60%	100%
CO6	--	--	--	30%	--	--	10%	40%	60%	100%

Dr. Sujata Deshmukh.

Dr Manica Khanore.

Course Code:	Course Title	Credit
CSDC7022	Blockchain	3

Prerequisite: Cryptography and System Security

Course Objectives:

1	Understand blockchain platforms and its terminologies.
2	Understand the use of cryptography required for blockchain.
3	Understand smart contracts, wallets, and consensus protocols.
4	Design and develop blockchain applications

Course Outcomes:

1	Explain blockchain concepts.
2	Apply cryptographic hash required for blockchain.
3	Apply the concepts of smart contracts for an application.
4	Design a public blockchain using Ethereum.
5	Design a private blockchain using Hyperledger.
6	Use different types of tools for blockchain applications.

Module		Content	Hrs
1		**Introduction to Blockchain**	6
	1.1	What is a blockchain, Origin of blockchain (cryptographically secure hash functions), Foundation of blockchain: Merkle trees	
	1.2	Components of blockchain, Block in blockchain, Types: Public, Private, and Consortium, Consensus Protocol, Limitations and Challenges of blockchain	
2		**Cryptocurrency**	6
	2.1	Cryptocurrency: Bitcoin, Altcoin, and Tokens (Utility and Security), Cryptocurrency wallets: Hot and cold wallets, Cryptocurrency usage, Transactions in Blockchain, UTXO and double spending problem	
	2.2	Bitcoin blockchain: Consensus in Bitcoin, Proof-of-Work (PoW), Proof-of-Burn (PoB), Proof-of-Stake (PoS), and Proof-of-Elapsed Time (PoET), Life of a miner, Mining difficulty, Mining pool and its methods	
3		**Programming for Blockchain**	8
	3.1	Introduction to Smart Contracts, Types of Smart Contracts, Structure of a Smart Contract, Smart Contract Approaches, Limitations of Smart Contracts	
	3.2	Introduction to Programming: Solidity Programming – Basics, functions, Visibility and Activity Qualifiers, Address and Address Payable, Bytes and Enums, Arrays-Fixed and Dynamic Arrays, Special Arrays-Bytes and strings, Struct, Mapping, Inheritance, Error handling	
	3.3	Case Study – Voting Contract App, Preparing for smart contract development	

4		Public Blockchain	8
		Introduction to Public Blockchain, Ethereum and its Components, Mining in Ethereum, Ethereum Virtual Machine (EVM), Transaction, Accounts, Architecture and Workflow, Comparison between Bitcoin and Ethereum	
		Types of test-networks used in Ethereum, Transferring Ethers using Metamask, Mist Wallet, Ethereum frameworks, Case study of Ganache for Ethereum blockchain. Exploring etherscan.io and ether block structure	
5		Private Blockchain	8
	5.1	Introduction, Key characteristics, Need of Private Blockchain, Smart Contract in a Private Environment, State Machine Replication, Consensus Algorithms for Private Blockchain - PAXOS and RAFT, Byzantine Faults: Byzantine Fault Tolerant (BFT) and Practical BFT	
	5.2	Introduction to Hyperledger, Tools and Frameworks, Hyperledger Fabric, Comparison between Hyperledger Fabric & Other Technologies	
	5.3	Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes, Transaction Flow, Working of Hyperledger Fabric, Creating Hyperledger Network, Case Study of Supply Chain Management using Hyperledger	
6		Tools and Applications of Blockchain	3
		Corda, Ripple, Quorum and other Emerging Blockchain Platforms, Blockchain in DeFi: Case Study on any of the Blockchain Platforms.	

Textbooks:	
1	Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhillash K. A and Meena Karthikeyen, Universities Press.
2	Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly.
3	Imran Bashir, Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Packt Publishing

References:	
1	Blockchain for Beginners, Yathish R and Tejaswini N, SPD
2	Blockchain Basics, A non Technical Introduction in 25 Steps, Daniel Drescher, Apress.
3	Blockchain with Hyperledger Fabric, Luc Desrosiers, Nitin Gaur, Salman A. Baset, Venkatraman Ramakrishna, Packt Publishing

Assessment:

Internal Assessment:

Assessment consists of two class tests of 20 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 40% syllabus is completed. Duration of each test shall be one hour.

End Semester Theory Examination:

1	Question paper will comprise a total of six questions.
2	All question carries equal marks
3	Questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4	Only Four question need to be solved.
5	In question paper weightage of each module will be proportional to the number of respective lecture hours as mention in the syllabus.

Digital Useful Links	
1	Blockchain By Example, Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, November 2018, Implement decentralized blockchain applications to build scalable Dapps.
2	Blockchain for Business, https://www.ibm.com/downloads/cas/3EGWKGX7.
3	https://www.hyperledger.org/use/fabric
4	NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs63/preview

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Mathematics - I (FEC101)	2.98													
	Engineering Physics - I (FEC102)	3													
	Engineering Chemistry - I (FEC103)	2.592													
	Engineering Mechanics (FEC104)	2.6663	2.9983	2.9747											
	Basic Electrical & Electronics Engineering (FEC105)	2.89	2.84												
	Engineering Mathematics-II FEC201	3													
	Engineering Physics-II (FEC202)	3													
	Engineering Chemistry -II (FEC203)	2.6757													
	Engineering Graphics (FEC204)	2.96	2.96	2.56								2.96				
	C-Programming FEC205	2.606	2.606	2.606												
	Professional Communication and Ethics - I (FEC206)											3		2.606		
	BASIC WORKSHOP PRACTICE 1 & 2 (FEL105 & FEL205)	2.9		2.9		2.6	2.9			2.9						
2020-21	ENGINEERING MECHANICS LAB	2.666333	2.576667	2.964444												
	ENGINEERING GRAPHICS LABS	3	3	3		3						3				
	Engineering Mathematics - III (CSC301) (C305) SE Computer A (2020-2021)	2.56														
	Discrete Structures and Graph Theory CSC302 -(C305) SE COMPS A (2020-2021)	2.42	2.36	2.36						2.04	2.04		2.04	2.376	2.18
	Data Structures CSC303- (C304) SE COMPS A	2.77	2.8	2.8								2.84	2.84	2.77	2.77
	Digital Logic and Computer Architecture(CSC304)-(C306) SE COMPS A	2.57	2.9										2.57	2.57	
	Computer Graphics(CSC305) SE COMPS A	2.69	2.92	2.96		2.96			1	3	3	1	2	2.99	3
	Object Oriented Programming Methodology (CSL304) -(C02) SE COMPS A	2.4	2.39	2.38		2.34	2.13			2.12	2.13	2.13	2.13	2.38	2.4
	Mini Project CSM 301 SE COMPS A	2.34	2.34	2.68	2.8	2.68			3	1	3	3	3.6	3.34	2.84
	Engineering Mathematics III (CSC301)- (C301) SE COMPS B	3													
	Discrete Structures and Graph Theory CSC302 -(C306) SE COMPS B	2.36	2.32	2.32						2.04	2.04		2.04	2.36	2.04
	Data Structures CSC303- (C203) SE COMPS B	2.77	2.8	2.8								2.84	2.84	2.77	2.77
	Digital Logic and Computer Architecture(CSC304)-(C206) SE COMPS B	3	3	3		1							2.96	2.96	
	Computer Graphics(CSC305) SE COMPS B	2.63	2.68	2.53		2.56			1.88	1.88	1.88	1.88	1.88	2.63	2.32
	Object Oriented Programming Methodology (CSL304) -(C02) SE COMPS B	2.4	3.39	2.36		2.34	2.13			2.12	2.13	2.13	2.13	2.37	2.37
	Mini Project CSM 301 SE COMPS B	2.34	2.34	2.68	2.5	2.68		3		3	3	3	2.6	2.34	2.84
	Engineering Mathematics -4 CSC401-L1	2.86													
	Analysis of Algorithms CSC402- (C212) SE COMPS A	2.64	2.57	2.52						2.54				2.64	2.54
	Database Management System CSC403 -(C213) SE COMPS A	2.92	2.92	2.92		2.92				2.14	2.14	2.14	2.75	2.92	2.92
	Operating System CSC404 SE COMPS A	2.88	2.66		2.88									2.68	
	MICROPROCESSOR(CSC405)SE COMPS A	2.73	2.7	2.68		2.7							2.7	2.71	
	Open Source Technology Lab CSL405 SE COMPS A	2.49	2.44	2.43		2.6				2.36			2.4	2.49	2.52
	CSM 401 Mini Project SE COMPS A	3	3	3	3	3			3	3	3	3	3	3	0
	Engineering Mathematics IV* (CSC401)-(C211) SE COMPS B	2.86													
	Analysis of Algorithms CSC402- (C212) SE COMPS B	2.64	2.57	2.52						2.54				2.64	2.54
	Database Management System CSC403 -(C213) SE COMPS B	2.88	2.85	2.85		2.8				2.88	2.82	2.8	2.85	2.88	2.88
	Operating System CSC404 SE COMPS B (Mahantra)	2.52	2.52		2.52										
2021-22	MICROPROCESSOR(CSC405)SE COMPS B	2.83	2.84	2.6		2.73							2.52		
	Open Source Technology Lab CSL405 SE COMPS B	2.49	2.44	2.43		2.42				2.4			2.83	2.81	
	CSM 401 Mini Project SE COMPS B (2020-21)	3	3	3	3	3		3		3	3	3	2.38	2.49	2.52
	Theoretical Computer science CSC501-(C301) TE COMPS A & B (2022-23)	2.07	2.07	2.06	2.19					2.86			2.86	2.484	2.484
	Software Engineering CSC502 TE COMPS A	2.54	2.54	2.76	2.60	3.00				3.00	2.53	3.00	2.53	3.74	3.642
	Computer Network CSC503 TE COMPS A & B	2.88	2.85	2.12											
	Data Warehousing and Mining CSC504 TE COMPS A & B	2.437372727	2.366	2.363333333	3.31	1.17		2.83		2.363333333	2.363	3.363	2.333333333		
	Internet Programming CSDL09012 (Department level Elective) CSDL502 COMPS A & B	1.43	1.43	1.43	0	1.43				1.43	0	0	2.484	2.497058834	0
	Professional Communication and Ethics-2 CSL504 TE COMPS A & B									3.00			1.43	0	0
	Mini Project A CSM 501 TE COMPS A & B	2.83	2.80	2.80	2.83	2.60	2.80	2.80	1.87	2.80	1.49	0.00	2.43	0.00	0

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Department of Computer Engineering
CO-PO/PSO-Attainment of Computer Deartment (2023-24)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	System Programming and Compiler construction CSC 601 TE COMPS A & B	2.324	2.328	2.4		2.52								3.44	
	Cryptography and System Security CSC 602 TE COMPS A & B	2.41	2.43	2	2.46666667	2.52			2.38	2.48	2.48		2.496		2.52
	Mobile Computing CSDC603 TE COMPS A & B	2.04	2.04											2.04	2.04
	Artificial Intelligence CSC 604 TE COMPS A & B	2.6	2.24	2.6	2.6									2.36	
	Cloud Computing CSL605 TE COMPS A & B	2.51	2.51	2.51	2.51	2.51							2.51	2.51	
	Quantitative Analysis CSDL0613 TE COMPS A & B CSDL601	2.62	2.5			2.50									
	Internet of Things CSDLD6011 TE COMPS A & B CSDL602	2.224	2.168	2.13	2.08	2.34					2.32	2.32	2.32	2.32	2.32	2.32
2022-23	Mini Project 2B CSM601 TE COMPS A & B	3	3	3	3	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3	3	3
	Machine Learning CSL 701 BE COMPS A & B (2023-24)	2.64	2.65	2.63	2.67									2.64	2.50
	Big Data Analytics CSC702 BE COMPS A & B	2.70	2.60	2.50	2.40	2.20	2.30	2.20	2.40	2.50			2.60	2.60	2.60
	Management Information System (MIS) ILOT0130(Institute level Elective) CSL0701 BE COMPS A & B	2.60	2.563333333				2.5625	0	2.525				2.542		
	CSDC7013: Natural Language Processing (Department level Elective) CSDC7013 BE COMPS A & B	2.5	2.2	2.2	2.5	2.5		2.5	2.5	2.5	2.5		2.5	2.5	
	CSDC7022: Block Chain (Department level Elective) CSDC7022 BE COMPS A & B	2.56	2.84			2.84	2.84	2.84	2.84		2.91				2.92
	ILOT016 : Cybersecurity and Laws (Institute level Elective) ILOT016 BE COMPS A & B	1.43	1.43	1.43	0	1.43	0	0	0	1.43	0	0	1.43		
	Project 1 CSP701 BE COMPS A & B	3	2.68	2.64	3	2.68	3	2.68	3	3	2.7	2.68	3	2.92	2.92
	Distributed Computing CSC801 BE COMPS A & B	2.65	2.60	2.66	2.66	2.6						2.66		2.6	2.6
	CSDC8013 : Applied Data Science (department Level Elective BE COMPS A	2.66	2.66	2.63	2.67								2.64	2.6	
	CSDC8023: Social Media Analytics (department Level Elective) CSDC8023 BE COMPS A & B	2.56	2.53			2.56	2.60	2.60	2.70	2.20	2.40	2.60	2.20	2.30	2.40
	Project Management ILO6021(Institute Level Elective) (JM) CSL0801 BE COMPS A & B	2.8	2.24	2.8	2.8									2.24	
	Finance Management ILO6022(Institute Level Elective) CSL0802 (BSD) BE COMPS A & B	2.66	2.7	2.7	2.7	2.7						2.6	2.6		
2023-24	Project II CSP801 (S415) BE COMPS A & B	3	3	3	3	3	2.68	2.68	3	2.92	2.92	3	3	2.92	2.92
DIRECT ATTAINMENT	SUM of Direct PO and PSO attainment	100.7935357	147.2600003	127.752144	63.343333333	82.16666667	29.0393	30.18	35.07160667	74.04533333	75.23055667	51.313	100.383	106.9707255	83.579
	Count N (Subjects Mapped to each PO)	68	57	49	26	36	13	14	16	30	31	23	40	43	35
	Average of direct PO and PSO attainment	2.655778495	2.583514941	2.607164412	2.436262851	2.582562963	2.233730769	2.155714386	2.191579167	2.46857778	2.42679699	2.231	2.509575	2.478589865	2.387965714
INDIRECT ATTAINMENT	Indirect PO Attainment (graduate Exit Survey)	3	3	3	3	2	3	3	3	3	3	3	3	3	3
	Alumni Exit survey	3	3	3	3	2	3	3	3	3	3	3	3	2	3
	Indirect PO attainment (Events)	2.533333333	2.578447365	2.64705854	2.4	2.4375	2.066666106	2.384915385	2.73642106	2.616047616	2.618476718	2.555555550	2.52173913	1.638210526	1.666666667
	Average Indirect PO & PSO attainment (Graduate Exit Survey & Alumni Exit Survey & Events)	2.577777770	2.859648123	2.882352941	3.9	2.145833333	3.051851852	2.734871795	2.912280702	2.206340286	2.873915873	2.861951852	2.587246377	2.342165263	2.333333333
	Average PO Attainment (0.8*Direct+0.2*Indirect)	2.722530152	2.638741857	2.682215879	2.589329841	2.495037037	2.357354196	3.383545788	3.336039474	2.43795263	3.516039734	2.36517037	2.509106275	2.451532225	2.378975238
	Total Subjects : 71														

DL

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Electronics and Computer Science
(Academic Year:2023-2024)

Class: B.E. ECS (Semester VII)	Weekly Schedule:
Course name/code: Deep Learning/ECCDO701	Tuesday: 9:45 – 10:45
Academic Year: 2023-24	Wednesday: 1:30 – 2:30
Name of Teacher: Dipali Koshti	Thursday: 1:30 – 2:30

Course Outcomes (CO): *At the End of the course students will be able to*	
DO701.1	Solve simple classification problems using Neural Networks.
DO701.2	Explain the process of training, optimization, and Regularization of Deep Neural Networks
DO701.3	Design supervised models for Deep Neural Networks
DO701.4	Design unsupervised models for Deep Neural Network
DO701.5:	Select and apply a suitable DNN model for a given application

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Course Lesson Plan

Sr. No.	Planned Dates	Topics	Mode of Delivery	Course Outcome	Reference book	Actual Date	Remark
		Module 1: Introduction					
1	11/7/23	Introduction to the course, informing course objectives and plan, Biological neuron. Mc-Culloch-Pitt Model	Classroom Teaching PPT	CO1	3,4	11/7	
2	12/7/23	Perceptron, perceptron learning	Classroom Teaching PPT, Virtual Lab	CO1	3,4,8	12/7	
3	13/7/23	Delta learning	Classroom Teaching PPT	CO1	3,4,8	13/7	
4	18/7/23	Multilayer perceptron	Classroom Teaching PPT, Virtual Lab	CO1	3,4	13/7	Extra
5	19/7/23	Deep Networks	Classroom Teaching PPT	CO1	1,2	14/7	Extra
		Module 2: Training, Optimization and Regularization of Deep Neural Network					
6	20/7/23	Multi-Layered Feed Forward Neural Network, Learning Factors,	Classroom Teaching PPT	CO2	1,2	18/7	
7	25/7/23	Activation functions	Classroom Teaching PPT	CO2	1,2,3	19/7	
8	26/7/23	Loss Functions	Classroom Teaching PPT	CO2	1,2	19/7	Extra
9	27/7/23	Learning with Backpropagation	Classroom Teaching PPT	CO2	1,2	20/7	cancelled due to heavy Rain
10	1/8/23	Learning parameters	Classroom Teaching PPT	CO2	1,2	20/7	Extra
11	2/8/23	Overview of overfitting, types of biases, Bias – variance trade off	Classroom Teaching PPT	CO2	1,2,15	25/7	
12	3/8/23	Regularization: L1,L2, Parameter sharing, Drop out, weight decay	Classroom Teaching PPT	CO2	1,2,5,15	26/7	
13	8/8/23	Batch Normalization, Data augmentation, early stopping, Adding noise to input and output	Classroom Teaching PPT	CO2	1,2,5,15	1/8	

		Module 3: Convolutional Neural Networks (CNN): Supervised Learning					
14	9/8/23	Convolution Operation, Motivation,	Classroom Teaching PPT [NPTEL Video, coursera video]	CO3	1,2	2|8	9|8 cancelled due to placemet
15	10/8/23	Basic structure of a convolutional neural network: Padding, strides	Classroom Teaching PPT [NPTEL Video, coursera video]	CO3	1,2	3|8	
	15/8/23	**Independence Day**					
16	17/8/23	pooling, fully connected layers, interleaving between layers	Classroom Teaching PPT	CO3	1,2	8|8	
17	22/8/23	Training a convolutional network: Backpropagation through convolution,	Classroom Teaching PPT	CO3	1,2	10|8	
18	23/8/23	Backpropagation as convolution with inverted filter, convolution/ backpropagation as matrix multiplication	Classroom Teaching PPT	CO3	1,2	22|8	
19	24/8/23	LeNet, AlexNet	Classroom Teaching PPT, [Technical paper]	CO3	1,2	23|8	
	28/8	**Unit Test-1**					
	29/8	**Unit Test-1, Mid-Term Feedback**					
20	5/9/23	ZF-Net, VGGNet,	Classroom Teaching PPT,[Technical paper]	CO3	1,2	24|8	
21	6/9/23	GoogLeNet, ResNet	Classroom Teaching PPT	CO3	1,2	31|8	
		Module 4: Recurrent Neural Networks (RNN)					
22	7/9/23	Sequence Learning Problem, Unfolding Computational graphs	Classroom Teaching PPT	CO3	1,2	5|9	Holiday declared Janmastmi
23	12/9/23	Recurrent Neural Network, Bidirectional RNN	Classroom Teaching PPT	CO3	1,2	6|9	
24	13/9/23	Back propagation Through Time (BTT), Vanishing and Exploding Gradients,, Truncated BTT	Classroom Teaching PPT	CO3	1,2	12|9	
25	14/9/23	Game Activity (Content beyond syllabus)	Game		1,2	13|9	
	19/9-21/9	Shri Ganesh Chaturthi (Mid term Break)					

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26	26/9/23	Long Short Term Memory: Selective Read, Selective write, Selective Forget, Gated Recurrent Unit	Classroom Teaching PPT	CO3	1,2	14|9	
27	27/9/23	Long Short-Term Memory (continued)	Classroom Teaching PPT	CO3	1,2	26|9	
	28/9/23	Anata Cahturdhashi					
	2/10/23	Mahatma Gandhi Jayanti					
		Module 5: Autoencoders: Unsupervised Learning					
28	3/10/23	Introduction, linear encoder	Classroom Teaching PPT	CO4	1,2	26|9	Extra
29	4/10/23	Undercomplete encoder	Classroom Teaching PPT	CO4	1,2	27|9	
30	5/10/23	Overcomplete encoder	Classroom Teaching PPT	CO4	1,2	3|10	
	9/10	Unit Test-2	S				
	10/10	Unit Test-2					
31	14/10	Regularization in encoder (Extra)	Classroom Teaching PPT	CO4	1,2	4|10	
32	14/10	Denoising encoders (Extra)	Classroom Teaching PPT	CO4	1,2	5|10	
33	15/10	Sparse encoders, Contractive encoders	Classroom Teaching PPT	CO4	1,2	6|10	
		Module 6: Recent Trends and Applications					
34	16/10	Generative Adversarial network: architecture	Classroom Teaching PPT	CO5	1,8	14/10	
35	17/10	Applications: Image compression	Flipped class room	CO5	Technical papers	18/10	Sp. topic sem
36	21/10	Brain tumour detection (Extra)	Flipped class room	CO5	Technical Paper	19/10	
37	21/10	Expression Identification (Extra)	Flipped class room	CO5	Technical Paper	20/10	

21/10 Extra Mr Besantek

26/10 Extra Mr Prascal

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Text Books:

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville. Deep Learning. An MIT Press book,2016.
2. Li Deng and Dong Yu, "Deep Learning Methods and Applications", now publishers Inc (30 June 2014),
3. Satish Kumar "Neural Networks A Classroom Approach" Tata McGraw-Hill.
4. J M Zurada "Introduction to Artificial Neural Systems", Jaico Publishing House
5. M. J. Kochenderfer, Tim A. Wheeler. "Algorithms for Optimization", MIt Press.

Reference Books:

6. Jon Krohn, Grant Beyleveld, Aglae Bassens, "Deep Learning Illustrated: A Visual, Interactive
7. Guide to Artificial Intelligence", Pearson Education.
8. Buduma, N. and Locascio, N., "Fundamentals of deep learning: Designing next-generation machine intelligence algorithms" 2017. O'Reilly Media, Inc.".
9. François Chollet, "Deep Learning with Python", Manning Publications, 2018.
10. Douwe Osinga. "Deep Learning Cookbook", O'REILLY, SPD Publishers, Delhi.
11. Simon Haykin, Neural Network- A Comprehensive Foundation- Prentice Hall International, Inc.

Online references:

12. https://nptel.ac. https://deeplearning.cs.cmu.edu/S21/index.html
13. http://www.cse.iitm.ac.in/~miteshk/CS6910.html
14. https://nptel.ac.in/courses/106/106/106106184/
15. https://www.deeplearningbook.org/
16. http://introtodeeplearning.com/
17.   http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/index.php

Videos:

Video 1: L2 Regularization: **L1 and L2 Regularization Methods, Explained | Built In**
Video 2: Convolution Operation: **Deep Learning(CS7015): Lec 11.1 The convolution operation - YouTube**
Video 3: CNN: **Deep Learning(CS7015): Lec 11.3 Convolutional Neural Networks - YouTube**
Video 4: CNN: One Layer of a Convolutional Network - Foundations of Convolutional Neural Networks | Coursera
Video 5: **How to calculate Neural network Parameters:** https://www.youtube.com/watch?v=bikmA-VmSbY

Technical papers:

[1] Alex Krichevsky et al. "ImageNet Classification with Deep Convolutional Neural Networks ", NIPS'12: Proceedings of the 25th International Conference on Neural Information Processing Systems - Volume 1 December 2012 .

[2] Karen Simonyan et al. "VERY DEEP CONVOLUTIONAL NETWORKS FOR LARGE-SCALE IMAGE RECOGNITION", ICLR 2015,

[3] Asifullah Khan et al. ," A Survey of the Recent Architectures of Deep Convolutional Neural Networks", In Artificial Intelligence Review, DOI: https://doi.org/10.1007/s10462-020-09825-6.

[4] Khan MS, Rahman A, Debnath T, Karim MR, Nasir MK, Band SS, Mosavi A, Dehzangi I. Accurate brain tumor detection using deep convolutional neural network. Computational and Structural Biotechnology Journal. 2022 Jan 1;20:4733-45.https://doi.org/10.1016%2Fj.csbj.2022.08.039

[5] J. Li and E. Y. Lam, "Facial expression recognition using deep neural networks," 2015 IEEE International Conference on Imaging Systems and Techniques (IST), Macau, China, 2015, pp. 1-6, doi: 10.1109/IST.2015.7294547.https://doi.org/10.1109/IST.2015.7294547

Course Instructor: Dipali Koshti

Dr. Sapna Prabhu

DQAC Member

Fr. Conceicao Rodrigues College of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Electronics and Computer Science

Course outcome Assessment Plan

(2023-24)

Course code: ECCDO701
Course Name: Deep Learning

Pre-requisite:
- Basic Mathematics
- Linear Algebra
- Machine Learning

Course Educational Objectives: .
- To develop mathematical concepts required for Deep Learning algorithms
- To gain an in-depth understanding of training Deep Neural Networks.
- To acquire knowledge of advanced concepts of Convolution Neural Networks, Autoencoders and
  Recurrent Neural Networks
- To get familiarised with the recent trends in Deep Learning.

Course outcomes:

	Course Outcomes*: Student will be able to	Bloom's Level	Target
CO1	Solve simple classification problems using Neural Networks	3	2.5
CO2	Explain the process of training, optimization, and Regularization of Deep Neural Networks	2	2.5
CO3	Design supervised models for Deep Neural Networks	3	2.5
CO4	Design unsupervised models for Deep Neural Network	3	2.5
CO5	Select and apply a suitable DNN model for a given application	4	2.5

CO to PI mapping:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.				CO1	CO2	CO3	CO4	CO5
C. No.	Competencies	PI No.	Performance Indicators					
1.1	Demonstrate competence in mathematics	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems	YES	YES	YES	YES	YES
		1.1.2	Apply the concepts of mathematics for modelling of Electronic systems, Computer-based system, data and network protocols	YES	YES	YES	YES	YES

C. No.	Competencies	PI No.	Performance Indicators					
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem					
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals to solve an engineering problem	YES	YES	YES	YES	YES
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of electronics and/or computer science and engineering to solve an engineering problem	YES		YES	YES	YES

PO 2: Problem analysis: Identify, formulate, research literature, and Analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

C. No.	Competencies	PI No.	Performance Indicators					
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Articulate problem statements and identifies objectives			YES	YES	YES
		2.1.2	Identify Electronic Systems/components, variables, and parameters to solve the problems		YES	YES	YES	YES
		2.1.3	Identify processes/modules/algorithms of a computer-based system and parameters to solve the problems	YES		YES	YES	YES
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Re-frame complex problems into interconnected sub-problems					
		2.2.2	Identify, assemble and evaluate information and resources					
		2.2.3	Identify existing solution/methods to solve the problem, compare and contrast alternative solution/methods to select the best methods		YES			
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Apply electronics and computer engineering principles to formulate model of a system with required applicability and performance			YES	YES	YES
		2.3.2	Identify design constraints for required performance criteria			YES	YES	YES
2.4	Demonstrate an ability to execute a solution process and analyse results	2.4.1	Apply engineering mathematics, natural sciences, and engineering sciences to implement the solution.	YES				
		2.4.2	Analyse and interpret the results using contemporary tools					
		2.4.3	Identify the limitations of the solution and sources/causes of error					
		2.4.4	Derive the conclusions consistent with objectives and limitations of the analysis					

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations

C. No.	Competencies	PI No.	Performance Indicators							
3.1	Demonstrate an ability to define a complex/ open-ended problem in engineering terms	3.1.1	Define a precise problem statement with objectives and scope					YES	YES	YES
		3.1.2	Identify and document system requirements from stake-holders							
		3.1.3	Review state-of-the-art literature to synthesize system requirements							
		3.1.4	Choose appropriate quality attributes as defined by industry standard							
		3.1.5	Explore and synthesize system requirements from larger social and professional concerns							
		3.1.6	Draft a design document							
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Explore design alternatives	YES				YES	YES	YES
		3.2.2	Produce a variety of potential design solutions suited to meet functional requirements					YES	YES	YES
		3.2.3	Identify suitable non-functional requirements for evaluation of alternate design solutions							
3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Perform systematic evaluation of the degree to which several design concepts meet the criteria							
		3.3.2	Consult with domain experts and stakeholders to select optimal engineering design solution for further development							
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)					YES	YES	YES
		3.4.2	Generate information through appropriate tests to improve or revise the design							

PO4: Conduct investigations of complex 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

C. No.	Competencies	PI No.	Performance Indicators							
4.1	Demonstrate an ability to conduct investigations of	4.1.1	Define the purpose, scope and importance of the proposed investigation							

C. No.	Competencies	PI No.	Performance Indicators						
	technical issues consistent with their level of knowledge and understanding	4.1.2	Examine relevant methods, tools and techniques of experiment design, system calibration, data acquisition, analysis and presentation						
		4.1.3	Establish a relationship between measured data and underlying principles						
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives						
		4.2.2	Choose an appropriate experimental design plan based on the study objectives						
4.3	Demonstrate an ability to Analyse data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyse data						
		4.3.2	Critically analyse data for trends and correlations, stating possible errors and limitations						
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions						
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions						

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

C. No.	Competencies	PI No.	Performance Indicators						
5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities						
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems						
5.2	Demonstrate an ability to select and apply discipline-specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modelling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs						
		5.2.2	Demonstrate ability to use discipline-specific tools						
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations of tools, techniques and resources						
		5.3.2	Verify the credibility of results from tool used with reference to the accuracy and limitations, and the assumptions inherent in their use						

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

C. No.	Competencies	PI No.	Performance Indicators					
6.1	Demonstrate an ability to contribute as an engineer in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and contribute in various engineer's roles; particularly as pertains to protection of the public and public interest at the global, regional and local level					
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public					

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development

C. No.	Competencies	PI No.	Performance Indicators					
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1	Identify risks/impacts of an engineering product or activity on society and environment					
		7.1.2	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability					
7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development					
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline					

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

C. No.	Competencies	PI No.	Performance Indicators					
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives					
8.2	Demonstrate an ability to apply the Code of Ethics	8.2.1	Identify professional code of ethics relevant to the problem domain/discipline					

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

C. No.	Competencies	PI No.	Performance Indicators						
9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team						YES
		9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal						
9.2	Demonstrate effective individual and team operations-- communication, problem- solving, conflict resolution and leadership skills	9.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills						YES
		9.2.2	Maintain composure in difficult situations						
9.3	Demonstrate success in a team-based project	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts						YES

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

C. No.	Competencies	PI No.	Performance Indicators						
10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information						YES
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents						YES
		10.1.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear						YES
10.2	Demonstrate competence in listening, speaking, and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others						
		10.2.2	Deliver effective oral presentations to technical and non-technical audiences						YES
10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations						
		10.3.2	Use a variety of media effectively to convey a message in a document or a presentation						YES

C. No.	Competencies	PI No.	Performance Indicators					
	PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments							
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity					
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyse different forms of financial statements to evaluate the financial status of an engineering project					
		11.2.2	Analyse and select the most appropriate proposal based on economic and financial considerations.					
11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks					
		11.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget					
	PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change							
12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the requirement for continuing professional development					YES
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap					YES
12.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advancements and recognize the need to keep updated regarding new developments in the concerned area					
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information					YES
		12.3.2	Analyse sourced technical and popular information for feasibility, viability, sustainability, etc					

PSO1: Design and Implement Hardware/Software systems for real life applications

C. No.	Competencies	PI No.	Performance Indicators						
13.1	Demonstrate an ability to design and develop Hardware systems	13.1.1	Based on the knowledge gained in a course carry out requirement analysis to develop Electronic system						
		13.1.2	Design and develop hardware solution for an identified problem						
13.2	Demonstrate an ability to design and develop Software	13.2.1	Based on the knowledge gained in a course carry out requirement analysis to develop software			YES	YES	YES
		13.2.2	Design and develop software solution for an identified problem			YES	YES	YES
13.3	Implement Real Life Application	13.3.1	Implement the developed solution for real life application						

PSO2: Adapt to new generation technologies in Electronics & Computer Science domains with an innovative approach

C. No.	Competencies	PI No.	Performance Indicators						
14.1	Demonstrate adaptability to new generation technologies in Electronics	14.1.1	Comprehend the information related to advancements in Electronics Engineering						
		14.1.2	Use innovative approaches to understand concepts in Electronics Engineering						
14.2	Demonstrate adaptability to new generation technologies in Computer Science	14.2.1	Comprehend the information related to advancements in Computer Science			YES	YES	YES
		14.2.2	Use innovative approaches to understand concepts in Computer Science			YES	YES	YES

dhostt
12/7/2023

Dr. Sapna Prabhu,
DQAc Member

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII
Course: Deep Learning (ECCDO701)

Academic Year: 2023-24

Course Outcomes (CO) to Program Outcome (PO) Mapping

PO	PO1			PO2			PO3			PO4			PO5			PO6			PO7			PO8			PO9			PO10			PO11			PO12			PSO1			PSO2		
CO	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG
CO1	5	4	0.8	12	2	0.2	13	1	0.1	9			8			2			4			2			5			7			5			5			5			4		
CO2	5	3	0.6	12	2	0.2	13	4	0.3	9			6			2			4			2			5			7			5			5			5			4		
CO3	5	4	0.8	12	5	0.4	13	4	0.3	9			6			2			4			2			5			7			5			5			5	2		4	2	2
CO4	5	4	0.8	12	5	0.4	13	4	0.3	9			8			2			4			2			5			7			5			5			5	2		4	2	2
CO5	5	4	0.8	12	5	0.4	13	4	0.3	9			8			2			4			2			5	3	0.6	7	5	0.7	5			5	3	0.6	5	2	0.4	4	2	0.5

TPI: **Total Performance Indicators**
Mapped Performance
MPI: **Indicators**

MG: **Mapping Grade**

(Dipali Koshti)

Dr. Supna Prabhu.

CO-PO Mapping grade

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	1	1											
CO 2	2	1	1											
CO 3	3	2	1										2	2
CO 4	3	2	1										2	2
CO 5	3	2	1						2	3		2	2	2
Avg	2.8	1.60	1						2	3		2	2	2

Mapping grade	% mapping Level
3	>=67%
2	66% to 34%
1	<34%

(Dipali Kushti)

Dr. Supna Prabhu.

CO assessment tools and weightage

| | Internal (40%) | | | | | | | | | | | case study | External (60%) |
| | Unit Test | | Assignment | | | | Quiz | | | | | | |
	1	2	A1	A2	A3	A4	Q1	Q2	Q3	Q4			ESE
CO1	20		10				10						60
CO2	20			10				10					60
CO3	10	10			10							10	60
CO4		20				10						10	60
CO5		20										20	60

(Dipali Koshti)

Dr. Sapna Prabhu.

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII
Course: Deep Learning (ECCDO701)

Academic Year: 2023-24

CO Attainment

CO No.	Course outcome	Attainment
CO1	Solve simple classification problems using Neural Networks.	2.2
CO2	Explain the process of training, optimization, and Regularization of Deep Neural Networks	2.36
CO3	Design supervised models for DNN	2.04
CO4	Design unsupervised models for DNN	2.36
CO5	Select and apply a suitable DNN model for a given application	2.04

Dr. Sapna Prabhu,
DQAC Member

Branch/Semester: ECS/VII

Course: Deep Learning (ECCDO701)

Academic Year: 2023-24

CO1 Attainment

CO1: *Solve simple classification problems using Neural Networks.*

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Test	0.2	No. of students score >3.6/6 in Test1 =	23	32	71.88	1	0.2
60% of students will minimum score 60% marks							
Quiz	0.1	No. of students score >= 7/10 in Quiz1 =	26	32	81.25	3	0.3
60% of students will minimum score 70% marks							
Assignment	0.1	No. of students score >=7 /10 in Ass1 =	31	32	96.88	3	0.3
70% students will minimum score 70% marks							
End semester Examination(TH)	0.6	No. of students score >= 48/80	25	32	78.13	2	1.2
60% of Students with minimum score 60% marks							
Indirect Method (weightage 0.2)						sum	2
Course Exit Survey	1	No. of students agree or strongly agree =	25	25	1.00	3	3
75% students strongly agree and agree		No.of Respondents = 25					

CO1 attainment= 2.2

Levels	Test	Assignment	Quiz	End Sem exam(TH)	Survey
1 (Low)	60-70	70-80	60-70	60-70	75-80
2 (Medium)	71-80	81-90	71-80	71-80	81-85
3 (High)	80 above	90 above	80 above	81 above	86 above

Dr. Sapna Prabhu

DQAC member

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Branch/Semester: ECS/VII
Course: Deep Learning (ECCDO701)

Academic Year: 2023-24

CO2 Attainment

CO2: *Explain the process of training, optimization, and Regularization of Deep Neural Networks*

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Test 60% of students will minimum score 60% marks	0.2	No. of students score >= 4.8/8 in Test1 =	27	32	84.38	3	0.6
Quiz 60% of students will minimum score 70% marks	0.1	No. of students score >= 7/10 in Quiz2 =	25	32	78.13	1	0.1
Assignment 70% students will minimum score 70% marks	0.1	No. of students score >=7 /10 in Assignment2 =	32	32	100.00	3	0.3
End semester Examination(TH) 60% of Students with minimum score 60% marks	0.6	No. of students score >= 48/80	25	32	78.13	2	1.2
Indirect Method (weightage 0.2)						sum	2.2
Course Exit Survey 75% students strongly agree and agree	1	No. of students agree or strongly agree = No.of Respondents = 25	25	25	1.00	3	3

CO2 Attainment = 2.36

Levels	Test	Assignment	Quiz	End Sem exam(TH)	Survey
1 (Low)	60-70	70-80	60-70	60-70	75-80
2 (Medium)	71-80	81-90	71-80	71-80	81-85
3 (High)	80 above	90 above	80 above	81 above	86 above

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FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII
Course: Deep Learning (ECCDO701)

Academic Year: 2023-24

CO3 Attainment

CO3: *Design supervised models for DNN*

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Test	0.2	No. of students score >= 7.2/12 in Test1(Q3) + test2 (Q1)=	8	32	25.00	0	0
60% of students will minimum score 60% marks							
Special topic Seminar	0.1	No. of students score >=11 /15 in Special Topic seminar =	31	32	96.88	3	0.3
60% students will minimum score 70% marks							
Assignment	0.1	No. of students score >=7 /10 in Assignment3 =	31	32	96.88	3	0.3
70% students will minimum score 70% marks							
End semester Examination(TH)	0.6	No. of students score >= 48/80	25	32	78.13	2	1.2
60% of Students with minimum score 60% marks							
Indirect Method (weightage 0.2)						sum	1.8
Course Exit Survey	1	No. of students agree or strongly agree =	25	25	1.00	3	3
75% students strongly agree and agree		No.of Respondents = 25					

CO3 attainment = 2.04

Levels	Test	Special Topic seminar	Assignment	End sem exam(TH)	Survey
1 (Low)	60-70	70-80	70-80	60-70	75-80
2 (Medium)	71-80	81-90	81-90	71-80	81-85
3 (High)	80 above	90 above	90 above	81 above	86 above

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Branch/Semester: ECS/VII

Course: Deep Learning (ECCDO701)

Academic Year: 2023-24

CO4 Attainment

CO4: Design unsupervised models for DNN

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Test 60% of students will minimum score 60% marks	0.2	No. of students score >= 3.6/6 in Test2 (Q2)	19	32	59.38	2	0.4
Special topic Seminar 60% students will minimum score 70% marks	0.1	No. of students score >=11 /15 in Special Topic seminar =	31	32	96.88	3	0.3
Assignment 70% students will minimum score 70% marks	0.1	No. of students score >=7 /10 in Assignment4	28	32	87.50	3	0.3
End semester Examination(TH) 60% of Students with minimum score 60% marks	0.6	No. of students score >= 48/80	25	32	78.13	2	1.2
						sum	2.2
Indirect Method (weightage 0.2)							
Course Exit Survey 75% students strongly agree and agree	1	No. of students agree or strongly agree = No of Respondents = 25	25	25	1.00	3	3

CO4 attainment = 2.36

Levels	Test	Special Topic seminar	Assignment	End sem exam(TH)	Survey
1 (Low)	60-70	70-80	70-80	60-70	75-80
2 (Medium)	71-80	81-90	81-90	71-80	81-85
3 (High)	80 above	90 above	90 above	81 above	86 above

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FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII
Course: Deep Learning (ECCDO701)

Academic Year: 2023-24

CO5 Attainment

CO5: *Select and apply a suitable DNN model for a given application*

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Test	0.2	No. of students score >= 4.8/8 in Test2 (Q2) and test2 (Q1)=	12	32	37.50	0	0
60% of students will minimum score 60% marks							
Special topic Seminar	0.2	No. of students score >=11 /15 in Special Topic seminar =	31	32	96.88	3	0.6
60% students will minimum score 70% marks							
End semester Examination(TH)	0.6	No. of students score >= 48/80	25	32	78.13	2	1.2
60% of Students with minimum score 60% marks							
Indirect Method (weightage 0.2)						sum	1.8
Course Exit Survey	1	No. of students agree or strongly agree =	25	25	1.00	3	3
75% students strongly agree and agree		No.of Respondents = 25					

CO5 attainment=2.04

Levels	Test	Special Topic seminar	End sem exam(TH)	Survey
1 (Low)	60-70	70-80	60-70	75-80
2 (Medium)	71-80	81-90	71-80	81-85
3 (High)	80 above	90 above	81 above	86 above

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DQAc Member

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING

(Approved by AICTE & Affiliated to University of Mumbai)

Fr. Agnel Ashram, Bandstand, Bandra (W), Mumbai - 400 050

Phone : (022) 6711 4000, 6711 4101, 6711 1104

Website : www.fcrce.ac.in • Email : crce@frcrce.edu.in

DL Lab

Electronics and Computer Science
(Academic Year :2023-2024)

Class: B.E. ECS (Semester VII)	Weekly Schedule:
Course name/code: Deep Learning / ECL703	Batch C: Wednesday (8:45-10:45)
Academic Year 2023-24	Batch D: Friday (11:00 – 1:00)
Name of the teacher: Dipali Koshti	

Course Outcome

Course Outcomes (CO): *At the End of the course students will be able to*

CO1	Implement basic neural network models to solve simple classification problems.
CO2	Train feedforward neural networks using various optimization algorithms
CO3	Build and train supervised/unsupervised deep learning models to solve real world problem.
CO4	Select and train a suitable deep learning model to solve the real-world problem and evaluate the performance of the model with respect to the estimation of test error.

SOCIETY OF ST. FRANCIS XAVIER, PILAR'S

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Fr. Agnel Ashram, Bandstand, Bandra (W), Mumbai - 400 050.

Phone : (022) 6711 4000, 671: 4101, 6711 4104

Website : www.frcrce.ac.in - Email : crce@frcrce.edu.in

Lab Plan

Sr. No.	Title of experiment	Software/ Hardware	Course Outcome	Batch	Planned date	Actual date	Remark
1	Implement a perceptron algorithm to solve a given linearly separable pattern.	Software	CO1	C	26-7-23	8617/2%	
				D	18-7-23	281723	
2	Implement MLP to simulate EX-OR gate	Software	CO1	C	2-8-23	81123	
				D	4-8-23	41823	
3	Implement basic Gradient Descent Algorithm for 1D objective function	Software	CO2	C	9-8-23		cancelled (correction)
				D	11-08-23	11823	
4	Implement the Gradient Descent Optimization with Nesterov Momentum)	Software	CO2	C	23-8-23		
				D	18-08-23		
5	Design and implement a fully connected deep neural network with at least 2 hidden layers for a classification application. Use appropriate Learning Algorithm, output function and loss function	Software		C	6-9-23		
			CO3	D	25-8-23		
6	Design and implement a CNN model for image classification	Software	CO3	C	13-9-23	13923	
				D	8-9-23		

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Phone : (022) 6711 4000, 6711 4101, 6711 4104
Website : www.fcrce.ac.in - Email : crce@fragnel.edu.in

					C	27-9-23	21/9/23	
7	Design and implement an LSTM for predicting Time series data.	Software		CO3	D	15-9-23	3/9/23	→sketch
8	Design the architecture and implement the auto-encoder model for Image denoising.	Software		CO3	C	4-10-23	6/10/23	
					D	29-9-23	5/9/23	
9	Mini project based on real-world problem (Content beyond Syllabus)	Software		CO4	C	11-10-23	13/10/23	
					D	6-10-23	6/10/23	
10	Case study (Content Beyond syllabus)	Software		CO4	C	13-10-23	13/10/23	
					D	13-10-23	13/10/23	

Course Instructor: Dipali Koshti

Fr. Conceicao Rodrigues College of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Electronics and Computer Science

Course outcome Assessment Plan

Course code: ECL703
Course Name: Deep Learning Lab
Pre-requisite:
 Basic Mathematics
 Linear Algebra
 Machine Learning

Course Educational Objectives:

- To develop mathematical concepts required for Deep Learning algorithms
- To gain an in-depth understanding of training Deep Neural Networks.
- To acquire knowledge of advanced concepts of Convolution Neural Networks, Autoencoders and Recurrent Neural Networks
- To get familiarised with the recent trends in Deep Learning.

	Course Outcomes*: Student will be able to	Bloom's Level	Target
CO1	Implement basic neural network models to solve simple classification problems	3	2.5
CO2	Design and train feedforward neural networks using various optimization algorithms	3	2.5
CO3	Build and train supervised/unsupervised deep learning models to solve real-world problem.	3	2.5
CO4	Select and train a suitable deep learning model to solve the real-world problem and evaluate the performance of the model with respect to the estimation of test error.	4	2.5

CO to PI mapping:

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.				CO1	CO2	CO3	CO4
C. No.	**Competencies**	**PI No.**	**Performance Indicators**				
1.1	Demonstrate competence in mathematics	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems	YES	YES	YES	YES
		1.1.2	Apply the concepts of mathematics for modelling of Electronic systems, Computer-based system, data and network protocols		YES	YES	YES

C. No.	Competencies	PI No.	Performance Indicators				
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem				
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals to solve an engineering problem	YES	YES	YES	YES
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of electronics and/or computer science and engineering to solve an engineering problem	YES		YES	YES

PO 2: Problem analysis: Identify, formulate, research literature, and Analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

C. No.	Competencies	PI No.	Performance Indicators				
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Articulate problem statements and identifies objectives			YES	YES
		2.1.2	Identify Electronic Systems/components, variables, and parameters to solve the problems		YES	YES	YES
		2.1.3	Identify processes/modules/algorithms of a computer-based system and parameters to solve the problems	YES	YES	YES	YES
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Re-frame complex problems into interconnected sub-problems				
		2.2.2	Identify, assemble and evaluate information and resources				
		2.2.3	Identify existing solution/methods to solve the problem, compare and contrast alternative solution/methods to select the best methods		YES	YES	YES
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Apply electronics and computer engineering principles to formulate model of a system with required applicability and performance			YES	YES
		2.3.2	Identify design constraints for required performance criteria			YES	YES
2.4	Demonstrate an ability to execute a solution process and analyse results	2.4.1	Apply engineering mathematics, natural sciences, and engineering sciences to implement the solution.	YES			
		2.4.2	Analyse and interpret the results using contemporary tools				
		2.4.3	Identify the limitations of the solution and sources/causes of error				
		2.4.4	Derive the conclusions consistent with objectives and limitations of the analysis				

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations

C. No.	Competencies	PI No.	Performance Indicators				
3.1	Demonstrate an ability to define a complex/ open-ended problem in engineering terms	3.1.1	Define a precise problem statement with objectives and scope			YES	YES
		3.1.2	Identify and document system requirements from stake- holders				YES
		3.1.3	Review state-of-the-art literature to synthesize system requirements				YES
		3.1.4	Choose appropriate quality attributes as defined by industry standard				
		3.1.5	Explore and synthesize system requirements from larger social and professional concerns				
		3.1.6	Draft a design document				YES
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Explore design alternatives	YES	YES	YES	YES
		3.2.2	Produce a variety of potential design solutions suited to meet functional requirements			YES	YES
		3.2.3	Identify suitable non-functional requirements for evaluation of alternate design solutions				
3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Perform systematic evaluation of the degree to which several design concepts meet the criteria				
		3.3.2	Consult with domain experts and stakeholders to select optimal engineering design solution for further development				
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)			YES	YES
		3.4.2	Generate information through appropriate tests to improve or revise the design				

PO4: Conduct investigations of complex 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

C. No.	Competencies	PI No.	Performance Indicators				
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their	4.1.1	Define the purpose, scope and importance of the proposed investigation				YES
		4.1.2	Examine relevant methods, tools and techniques of experiment design, system calibration, data acquisition, analysis and presentation				YES

C. No.	Competencies	PI No.	Performance Indicators				
	level of knowledge and understanding	4.1.3	Establish a relationship between measured data and underlying principles				
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives				YES
		4.2.2	Choose an appropriate experimental design plan based on the study objectives				YES
4.3	Demonstrate an ability to Analyse data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyse data				YES
		4.3.2	Critically analyse data for trends and correlations, stating possible errors and limitations				
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions				YES
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions				

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

C. No.	Competencies	PI No.	Performance Indicators				
5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities	YES	YES	YES	YES
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems				
5.2	Demonstrate an ability to select and apply discipline-specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modelling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs				YES
		5.2.2	Demonstrate ability to use discipline-specific tools				YES
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations of tools, techniques and resources				YES
		5.3.2	Verify the credibility of results from tool used with reference to the accuracy and limitations, and the assumptions inherent in their use				

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

C. No.	Competencies	PI No.	Performance Indicators					
6.1	Demonstrate an ability to contribute as an engineer in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and contribute in various engineer's roles; particularly as pertains to protection of the public and public interest at the global, regional and local level					
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public					

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development

C. No.	Competencies	PI No.	Performance Indicators					
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1	Identify risks/impacts of an engineering product or activity on society and environment					
		7.1.2	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability					
7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development					
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline					

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

C. No.	Competencies	PI No.	Performance Indicators					
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives					YES
8.2	Demonstrate an ability to apply the Code of Ethics	8.2.1	Identify professional code of ethics relevant to the problem domain/discipline					

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

C. No.	Competencies	PI No.	Performance Indicators					

C. No.	Competencies	PI No.	Performance Indicators					
9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team					YES
		9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal					
9.2	Demonstrate effective individual and team operations- - communication, problem- solving, conflict resolution and leadership skills	9.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills					YES
		9.2.2	Maintain composure in difficult situations					
9.3	Demonstrate success in a team-based project	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts					YES

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

C. No.	Competencies	PI No.	Performance Indicators					
10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information					YES
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents					YES
		10.1.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear					YES
10.2	Demonstrate competence in listening, speaking, and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others					
		10.2.2	Deliver effective oral presentations to technical and non-technical audiences					YES
10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations					
		10.3.2	Use a variety of media effectively to convey a message in a document or a presentation					YES

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments

C. No.	Competencies	PI No.	Performance Indicators					

C. No.	Competencies	PI No.	Performance Indicators					
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity					
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyse different forms of financial statements to evaluate the financial status of an engineering project					
		11.2.2	Analyse and select the most appropriate proposal based on economic and financial considerations.					
11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks					
		11.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget					

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

C. No.	Competencies	PI No.	Performance Indicators					
12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the requirement for continuing professional development				YES	
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap				YES	
12.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advancements and recognize the need to keep updated regarding new developments in the concerned area					
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information				YES	
		12.3.2	Analyse sourced technical and popular information for feasibility, viability, sustainability, etc					

PSO1: Design and Implement Hardware/Software systems for real life applications

C. No.	Competencies	PI No.	Performance Indicators					
13.1	Demonstrate an ability to design and develop Hardware systems	13.1.1	Based on the knowledge gained in a course carry out requirement analysis to develop Electronic system					
		13.1.2	Design and develop hardware solution for an identified problem					

13.2	Demonstrate an ability to design and develop Software	13.2.1	Based on the knowledge gained in a course carry out requirement analysis to develop software				YES	YES
		13.2.2	Design and develop software solution for an identified problem				YES	YES
13.3	Implement Real Life Application	13.3.1	Implement the developed solution for real life application					YES

PSO2: Adapt to new generation technologies in Electronics & Computer Science domains with an innovative approach

C. No.	Competencies	PI No.	Performance Indicators					
14.1	Demonstrate adaptability to new generation technologies in Electronics	14.1.1	Comprehend the information related to advancements in Electronics Engineering					
		14.1.2	Use innovative approaches to understand concepts in Electronics Engineering					
14.2	Demonstrate adaptability to new generation technologies in Computer Science	14.2.1	Comprehend the information related to advancements in Computer Science				YES	YES
		14.2.2	Use innovative approaches to understand concepts in Computer Science				YES	YES

Dipali Koshti

(Course Instructor)

CO to PO Mapping

Course code: ECL703
Course Name: Deep Learning Lab

PO	PO1			PO2			PO3			PO4			PO5			PO6			PO7			PO8			PO9			PO10			PO11			PO12			PSO1			PSO2		
CO	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG
CO1	5	3	0.6	12	2	0.16	13	0	0.00	9	0		6	1	0.17	2	0		4	0	0	2	0	0	5	0	0	7	0	0	5	0	0	5	0	0	5	0	0	4	0	0
CO2	5	3	0.6	12	3	0.25	13	0	0.00	9	0		6	1	0.17	2	0		4	0	0	2	0	0	5	0	0	7	0	0	5	0	0	5	0	0	5	0	0	4	0	0
CO3	5	4	0.8	12	6	0.5	13	4	0.31	9	0		6	1	0.17	2	0		4	0	0	2	0	0	5	0	0	7	0	0	5	0	0	5	0	0	5	2	0.4	4	2	0.5
CO4	5	4	0.8	12	6	0.5	13	7	0.54	9	6	0.7	6	4	0.67	2	0		4	0	0	2	1	0.5	5	3	0.6	7	5	0.7	5	0	0	5	3	0.6	5	3	0.6	4	2	0.5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1			1									
CO2	2	1			1									
CO3	3	2	1		1									
CO4	3	2	2	3	3			2	2	3		2	2	2
CO TO PO	10	6	3	3	6	0	0	2	2	3	0	2	2	2
CO -PO Matrix	2.5	1.5	1.5	3	1.5	0	0	2	2	3		2	2	2

CO Assessment Tools

(2023-24)

Course code: ECL703

Course Name: Deep Learning Lab (Sem-VII)

CO	Internal (50%)				External (50%)
	Lab	Viva voce	Mini Project (implementation)	Mini project Presentation	
	1	2	3	4	ESE
CO1	30	20			50
CO2	30	20			50
CO3	30	20			50
CO4			30	20	50

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII

Course: Deep Learning Lab (ECL703)

Academic Year: 2023-24

CO ATTAINMENT

CO No.	Course Outcome	Attainment
CO1	Implement basic neural network models to solve simple classification problems	3
CO2	Design and train feedforward neural networks using various learning algorithms	2.84
CO3	Build and train supervised/unsupervised deep learning models to solve real-world problems	2.84
CO4	Select and train a suitable deep learning model to solve a real-world problem and evaluate the performance of the model with respect to the estimation of the test error.	3

Dr. Sapna Prabhu.
(DQAc Member)

Branch/Semester: ECS/VII
Course: Deep Learning Lab (ECL703)

Academic Year: 2023-24

CO ATTAINMENT

CO No.	Course Outcome	Attainment
CO1	Implement basic neural network models to solve simple classification problems	3
CO2	Design and train feedforward neural networks using various learning algorithms	2.84
CO3	Build and train supervised/unsupervised deep learning models to solve real-world problems	2.84
CO4	Select and train a suitable deep learning model to solve a real-world problem and evaluate the performance of the model with respect to the estimation of the test error.	3

Dr. Sapna Prabhu,
(DQAc Member)

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII
Course: Deep Learning Lab (ECL703)

Academic Year: 2023-24

CO1 Attainment

CO1: Implement basic neural network models to solve simple classification problems

Direct Methods (weightage 0.8)	Weightage	Successful students	Total No. Stud		Per(%)	Level	Attainment
Lab Performance	0.3	No students score >=14/20 in exp1,2	31	32	96.88	3	0.9
70% students will minimum score 70% marks							
Viva Voce/Post Lab questions	0.2	No students score >=14/20 in exp1,2	30	32	93.75	3	0.6
60% of students will minimum score 60% marks							
End semester PR Examination	0.5	No. of students score >=17.5 /25 =	31	32	96.88	3	1.5
60% of Students with minimum score 60% marks							
Indirect Method (weightage 0.2)						sum	3
LAB Exit Survey	1	No. of students agree or strongly agree =	25	25	1.00	3	3
75% students strongly agree and agree		No.of Respondents = 25					

CO1 attainment : 3

Levels	Lab Performance	Viva voce	End Sem exam	Lab Exit Survey
1 (Low)	70-80	60-70	60-70	75-80
2 (Medium)	81-90	71-80	71-80	81-85
3 (High)	90 above	80 above	81 above	86 above

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII
Course: Deep Learning Lab (ECL703)

Academic Year: 2023-24

CO2 Attainment

CO2: Design and train feedforward neural networks using various learning algorithms

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Lab Performance	0.3	No students score >=14/20 in exp3,4	31	32	96.88	3	0.9
70% students will minimum score 70% marks							
Viva Voce/Post Lab questions	0.2	No students score >=14/20 in exp3,4	24	32	75.00	2	0.4
60% of students will minimum score 60% marks							
End semester PR Examination	0.5	No. of students score >=17.5 /25 =	31	32	96.88	3	1.5
60% of Students with minimum score 60% marks							
Indirect Method (weightage 0.2)						sum	2.8
LAB Exit Survey	1	No. of students agree or strongly agree =	25	25	1.00	3	3
75% students strongly agree and agree		No.of Respondents = 25					

Co2 attainment = 2.84

Levels	Lab Performance	Viva voce	End sem exam(TH)	Survey
1 (Low)	70-80	60-70	60-70	75-80
2 (Medium)	81-90	71-80	71-80	81-85
3 (High)	90 above	80 above	81 above	86 above

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII
Course: Deep Learning Lab (ECL703)

Academic Year: 2023-24

CO3 Attainment

CO3: Build and train supervised/unsupervised deep learning models to solve real-world problems

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Lab Performance	0.3	No students score >=14/20 in exp 5 to 8	32	32	100.00	3	0.9
70% students will minimum score 70% marks							
Viva Voce/Post Lab questions	0.2	No students score >=14/20 in exp 5 to 8	25	32	78.13	2	0.4
60% of students will minimum score 60% marks							
End semester PR Examination	0.5	No. of students score >=15 /25 =	31	32	96.88	3	1.5
60% of Students with minimum score 60% marks							
Indirect Method (weightage 0.2)						sum	2.8
LAB Exit Survey	1	No. of students agree or strongly agree =	25	25	1.00	3	3
75% students strongly agree and agree		No.of Respondents = 25					

CO3 attainment = 2.84

Levels	Lab Performance	Viva voce	End sem exam(TH)	Survey
1 (Low)	70-80	60-70	60-70	75-80
2 (Medium)	81-90	71-80	71-80	81-85
3 (High)	90 above	80 above	81 above	86 above

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE

Branch/Semester: ECS/VII

Academic Year: 2023-24

Course: Deep Learning Lab (ECL703)

CO4 Attainment: Select and train a suitable deep learning model to solve a real-world problem and evaluate the performance of the model with respect to the estimation of the test error.

Direct Methods (weightage 0.8)	Weightage	Successful students		Total No. Stud	Per(%)	Level	Attainment
Mini Project Implementation	0.3	No. of students score >=8.4 /12 in Implementation	32	32	1.88	3	0.9
70% students will minimum score 70% marks							
Miniproject Presentation	0.2	No. of students score >=6.3/9 in presentation and report	29	32	90.63	3	0.6
70% students will minimum score 70% marks							
End semester PR Examination	0.5	No. of students score >=15 /25 =	31	32	96.88	3	1.5
60% of Students with minimum score 60% marks							
						sum	3
Indirect Method (weightage 0.2)						3	3
LAB Exit Survey	1	No. of students agree or strongly agree =	13	13	1.00	3	3
75% students strongly agree and agree		No.of Respondents = 25					

CO4 attainment =3

Levels	Mini project Implementation	Mini project Presentation + Report	End sem exam(TH)	Survey
1 (Low)	70-80	60-70	60-70	75-80
2 (Medium)	81-90	71-80	71-80	81-85
3 (High)	90 above	80 above	81 above	86 above

PO Attainment

Course code: ECL703
Course Name: Deep Learning Lab

Academic Term- 2023-24

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Co attainment
CO1	2	1			1										3
CO2	2	1			1										2.84
CO3	3	2	1		1										2.84
CO4	3	2	2	3	3			2	2	3		2	2	2	3
CO TO PO	10	6	3	3	6	0	0	2	2	3	0	2	2	2	
CO -PO Matrix	2.5	1.5	1.5	3	1.5	0	0	2	2	3		2	2	2	
PO Attainment	2.92	2.92	2.95	3.00	2.97			3.00	3.00	3.00		3.00	3.00	3.00	

Dipali Koshti

(Course Instructor)

COURSE ID	Course	Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Year
C101	Applied Mathematics-i	FEC101	3 2.5														
C102	Applied Physics-I	FEC102	2.4														
C103	Applied Chemistry-I	FEC103	2.2														
C104	Engg Mechanics	FEC104	3 2.5	2 2.33	2 1.833												
C105	BasicElectrical	FEC105	3 2.6	2 2.3													
C106	Basic Workshop	FEL105	2 1.8	2 2.2	2 1.67												
C107	Applied Mathematics-	FEC201	3 2.5														
C108	Applied Physics-II	FEC202	2 2.4														
C109	Applied Chemistry-II	FEC203	2 2.4														
C110	Engineering Graphics	FEC204	3	1	1								1			3	
C111	C programming	FEC205	3	1	1							3			3		
C112	Professional	FEC206															
C113	Basic Workshop	FEL206	1 1.2		1 1.1		1 1.3	2			(2)1.5						2020-21
C201	Engg Mathematics-III	ECC301	1									1	1	1			
C202	Electronic Devices	ECC302	1.6667	2 1.6	3	2 2.4	2.33								1	1	
C203	Digital Electronics	ECC303	3	2	2 2.3		2								1		
C204	Data Structures &	ECC304	2	3	3		3				3 2.3	2 2.25	2 2.25	2	3	2	
C205	Database Management	ECC305	3	3	3		3				3 2.5	2 2.25	2 2.25	2	3	2	2021-22
C206	OOPM-Lab	ECL305	3	3	3		2	3	3	2	3	3	2	3	3	3	
C207	Mini Project - 1A	ECM301	3	3	2												
C208	Engg Mathematics-IV	ECC401	2 2.17				2								1	1	
C209	Electronic Circuits	ECC402	3	2	2 2.3		2										
C210	Controls and	ECC403	3	3			2								2	1	
	Microprocessors	ECC404	3 2.75		2												

Course	Name	Code	PO1	PO2	PO3	PO4	5	PO6	7	8	9	P10	P11	P12	PS1	PS2	
C211	Discrete Structures	ECC405	3												5	1	
C212	Python	ECL404	3		1		1.33									2 1.6	
C213	Mini-project -1 B	ECM401	3	3	2 -		2	3	3	2	3	3	2	3	3	3	
C301	Communication	ECC501	3	2 -			2								2 1.5		
C302	Computer	ECC502	3 2.5	2 2.2	2		2							1.333			
C303	Software Engineering	ECC503	2 1.5	3 2.5	3			3					3	2	2		
C304	Web Technologies	ECC504	2		3		2				3				2 2.333		
C305	Software Testing and	ECCDO50	1	3	3		3					1			3		
C306	Communication	ECL501	3	2	2	2	3			2				2			
C307	Software Engineering	ECL502	1		3		3			3				3	1		
C308	Software Testing and	ECL5031		2	3	1	3 2.5			2	2			1.667			
C309	Professional	ECL504						3		3	3	3					
C310	Mini project - 2A	ECM501	3	3	2		2	3	3	2	3	3		3	3	3	
	Embedded Systems	ECC601		2	3 2.67	2	3	2	2	2				2	2	2022-23
	Artificial Intelligence	ECC602	2	2	2 1.6667	1									1	
C311	Computer Networks	ECC603	3	2	2									2			
C312	Data Warehousing and	ECC604	3	3	3	2	3							2	2		
C313	Machine Learning	ECCDO60	3	3	3	1	2							3	3		
C314	Embedded Systems	ECL601		2	2		3							2	1		
C315	Artificial Intelligence	ECL602	2 2.375	3	3 2.5	3	2			1				3	2		
C316	Data Warehousing and	ECL603	3	3 2.7	3	2	3							2 -		
C317	Skill-based Laboratory	ECL604	3	3	2	2	2							2 -		
C318	Mini Project 2B	ECM601	3	3	2		2	3	3	2	3	3		3	3	3	
C401	VLSI Design	ECC701	3	3	2		2							1	2		
C402	Internet of Things	ECC702	2	1	2 1.6	2 1.6	3				3	3	1	2	2		
C403	Deep Learning	ECC	3 2.8	2 1.6	1					2	3		2	2	1	2	
C404	Big Data Analytics	ECC	2 2.25	1 1.25	2 1.5	1 2 2.33	2		2	2	3	3		2			
C405	Cloud Computing	ECC	2 1.6667	2 1.75	3 2.5	2	2	2	2				3	1	2		
C406	Blockchain	ECC	3 2.5	3 2.5	2 1.75	2 2.25 1.67	2	1	3	3	3		3	1			
C407	Management	ECC			2 1.5		3 2.67	3 2.5	2 1.5	3	2	1	1	3	3		
C408	VLSI Design Lab	ECL701	3	3	3	3											

C409	Internet of Things Lab	ECL702	3		2		3									2	2	
C410	Deep Learning-Lab	ECL7031	3 2.5	₹ 1.5	₹ 1.5	3	₹1.5	0	0	2	2	3		2	2	2	
	Big Data Analytics-	ECL7033	₹ 2.25	₹1.25	1	1	1 -		1	2	3	2	-		1	2	2023-24
	Major Project - I	ECP701	3	₹ 2.66	3	3	1	1	3	3	₹2.25	₹ 2.5	1	2	3	2	
C411	Robotics	ECC801	₹ 1.67	₹ 2.33	2	3 2.5											
C412	Natural Language	ECC	₹ 2.2	₹ 2.8	2	₹ 2.25											
C413	Multimedia and	ECC	3	₹ 2.8	₹2.2	3	3			3	₹ 2.5		3	2	2		
C414	System Security	ECC	3 2.75	₹1.333	1	2	₹ 2.5	2	1	3	3	3	1	3	2		
C415	Project Management	ECC	₹ 1.25	₹1.25	2	2									2		
C416	Finance Management	ECC											3		3	-	
C417	Robotics Lab	ECL801	1	2	2	₹2.67	3								2	2	
C418	Natural Language	ECL802	3	₹ 2.25	₹2.33	2	₹1.5			2	3	3		2	3	3	
C419	Major Project II	ECP 801	3	3	3	₹ 2.5	3	2.5	2	2	₹2.33	₹2.33	2	3	3	3	

Department of Electronics, Fr.Conceicao Rodrigues College of Engineering, Bandra
Course to PO-PSO Batchwise Attainment 2020-21 onwards
Academic Year 2023-24

Batch Attainment

COURSE ID	Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Year
C101	FEC101	3														
C102	FEC102	2														
C103	FEC103	2.59														
C104	FEC104	2.9795	2.9	1.76												
C105	FEC105	2.66	2.84													
C106	FEL105	1.8	2.2	1.67												
C111	FEC201	3														
C112	FEC202	3														2020-21
C113	FEC203	2.59														
C114	FEC204	2.43	0.81	1.62							1.6					
C115	FEC205	2.43	2.4375	2.4375									2.43			
C116	FEC206										3					
C117	FEL206	2.9		2.9		2.9	2.9			2.9						
C201	ECC301	3														
C202	ECC302	1.67	3	3	1.5	3				3	3	3				
C203	ECC303	2.96	3	3		3								3	3	
C204	ECC304	2.44	2.52	2.18		2.48								1.3		
C205	ECC305	2.69	2.68	2.68		2.68				2.98	2.66	2.66	2.65	2.68	2.68	
C206	ECL305	2.28		2.28		2.2									2.3067	
C207	ECM301	3	2.8	1.87	0	1.87	3	2.8	1.73	4.5	2.8	2.8	2.8	2.6	2.6	2021-22
C211	ECC401	3														
C212	ECC402	2.96	3	3		3								3	3	
C213	ECC403	2.75	2.58													
C214	ECC404	2.67		2.73		2.73										

Code	Subject															
C215	ECC405	3														
C216	ECL404	2.28		2.28		2.2										
C217	ECM401	3	2.8	1.82	0	1.87									2.3067	
							3	2.8	1.73	4.5	2.8	2.8	2.8	2.6	2.6	
C301	ECC501	2.68	1.78		1.78											
C302	ECC502	2.7	2.57	2.4	2.6									1.4		
C303	ECC503	2.58	2.58	2.56		2.68							2.58			
C304	ECC504	2.92		2.52		2.6		2.68				2.68	2.68	2.68		
C305	ECCDO50	2.36	2.4	1.99		1.72				2.6				2.55		
C306	ECL501	2.38	1.6	1.61	1.5	2.38						1.8			1.78	
C307	ECL502	2.68		2.68		2.68				1.59				2.38		
C308	ECL5031		1.86	2.8	2.8	2.75				2.68						
C309	ECL504									2.5	2.5			2.6		
							3		3	3	3					
C310	ECM501	2.4	2.2	1.742		1.474	2.4	2.2	1.74	2.6	2.5		2.6	2.4	2.4	2022-23
C311	ECC601		2.49	2.54	2.4	2.4	2.4	2.6	2.6					2.5	2.4	
C312	ECC602	2.34333	2.372	2.26	2.5										2.8	
C313	ECC603	2.54	1.63	1.68										1.68		
C314	ECC604	2.6	2.59	2.53	2.68	2.6										
C315	ECCDO60	2.7	2.4	2.4	2.48	2.5								2.4	2.4	
C316	ECL601		2.56	2.56		2.57										
C317	ECL602	1.256	2.5	2.4	2.5	2.53					2.5			2.5	2.5	
C318	ECL603	2.86	2.85	2.92	2.84	2.84								2.84		
C319	ECL604	3	3	2.92	2.95	2.92										
C320	ECM601	2.6	2.2	1.742		1.474	2.8	2.2	1.74	2.8	3		2.8	2.6	2.4	
C401	ECC701	2.8	2.8	1.8		1.8								0.8	1.8	
C402	ECC702	2.6	2.56	2.55	2.54	2.52				2.52	2.52	2.52		2.52	2.52	
C403	ECC	2.24	2.19	2.2						2.04	2.04	2	2.04	2.15	2.15	
C404	ECC	1.38933	2.25333	2.4	2.44	2.36		2.44	2.44	2.32	2.32	2.32		2.3067	2.3067	
C405	ECC	3	3	3	2.44			3					3			
C406	ECC	2.228	2.218	2.23556	2.16133	2.22	2.215	2.215	2.215	2.215	2.215		2.215	2.22	2.22	

				3			3	3	3	3	2	2	2		
C407	ECC	2.8	2.8	2.8	2.8		3	3							
C408	ECL701	2.56		2.55		2.56								2.8	2.8
C409	ECL702	2.92	2.92	2.95	3	2.97			3	3	3		3	2.55	2.55
C410	ECL7031	2.504	2.62667	2.56	2.44	2.54667	0	2.6	2.44	2.56	2.56		2.56	3	3
	ECL7033	3	2.856	2.76	2.84	2.84	3	2.84	3	2.92	2.904	2.84	2.68	2.52	2.52
	ECP701	2.925	2.8375	2.9025	2.833									2.84	2.88
C411	ECC801	2.872	2.808	2.68	2.60533										
C412	ECC	2.62	2.48	2.01	2.84	2.84				2.84	2.3		2.62	1.89	1.74
C413	ECC	2.21	2.433	2.325	2.62	2	2.325	2.325	2.325	2.325	2.325	2.62	2.325		2.325
C414	ECC	2.8	2.24	2.8	2.8									2.24	
C415	ECC											2.52		2.52	
C416	ECC													2	2
C417	ECL801	3	3	3	3	3									
C418	ECL802	2.82	2.72	2.7	2.6	2.6			2.6	2.6	2.6		2.6	2.6	2.6
C419	ECP 801	2.84	2.84	2.84	2.84	2.84	2.84	2.84	2.52	2.84	2.84	2.84	2.52	2.84	2.84
	Total no of filled	61	48	53	30	40	14	14	15	24	23	14	19	34	29
	SUM	160.81	120.73	129.54	71.89	100.14	36.08	36.54	36.08	66.83	58.984	35.4	48.9	81.51	71.43
Attainmen Indirect Attainment	SUM/N GES	2.6362	2.5153	2.4442	2.3963	2.5036		2.61		2.7846	2.5645	2.5286	2.5737	2.397	2.463
		3	3	2	1	3	2	1	2	3	3	1	3	2	2
Attainment	Events Attainmen	1.3	1	1.1	0.2	0.8	1.3	1.1	1.3	1.2	0.9	1.6	1.5	0.8	0.4
	Average	2.15	2	1.55	0.6	1.9	1.65	1.05	1.65	2.1	1.95	1.3	2.25	1.4	1.2
Attainment		2.5389	2.4122	2.2654	2.0371	2.3829	0.33	2.298	0.33	2.6477	2.4416	2.2829	2.5089	2.198	2.21

2023-24

Lesson Plan

Branch: Mechanical Engineering

Semester: VII

Year: 2023-24

Course Title:	Design of Mechanical Systems 4 Hours–Theory &Oral/PracticalExamination
Total Contact Hours: 48 Hours	Duration of ESE: 3Hrs
ESE Marks: 80 (Theory)+20 (IA)	
Lesson Plan Author: Dr. Ketaki Joshi	Date:
CheckedBy:	Date: 08 07 2024

Prerequisites: Machine Design, Material Science

Syllabus:

Module No.	Topics	Hrs.
1	Methodology & Morphology of design, Optimum design, system concepts in design.	4
2	**Design of Transmission Gear Box:** Single stage and Two stage Gear box with fixed ratio consisting of Design of spur, helical, bevel and worm and worm wheel gear pairs, Gear box housing layout and housing design.	12
3	**Design of Hoisting Mechanism:** Design of Snatch Block Assembly including Rope Selection, Sheave, Hook, Bearing for hook, cross piece, Axle for sheave and shackle plate, Design of rope drum, selection motor with transmission system.	10
4	**Design of Belt Conveyors:** Power requirement, selection of belt, de-sign of tension take-up unit, idler pulley	4
5	**Engine Design (Petrol and Diesel):** Design of cylinder, Piston with pin and rings, connecting rod & crank shaft with bearings	10
6	**Design of Pump:** Design of main components of gear pump. 1 Motor selection 2 Gear design 3 Shaft design and bearing selection 4 Casing and bolt design 5 Sizing of design of suction and delivery pipe	8
	Design of main components of Centrifugal Pump: 1 Motor selection 2 Suction and Delivery pipe 3 Design of Impeller, Impeller shaft 4 Design of Volute Casing	

CourseOutcomes(CO):

On successful completion of course learner will be able to:

MEC701.1. Apply the concept of system design.
MEC701.2. Select appropriate gears for power transmission on the basis of given load and speed
MEC701.3. Design material handling systems such as hoisting mechanism of EOT crane
MEC701.4.Design belt conveyor systems
MEC701.5. Design engine components such as cylinder, piston, connecting rod and crankshaft
MEC701.6.Design pumps for the given applications

CO-POMapping:(BL–BloomsTaxonomy,C–Competency,PI–PerformanceIndicator)

CO	BL	C	PI	PO	Mapping
MEC701.1	3	1.3	1.3.1	PO1	3
		1.4	1.4.1		
		2.1	2.1.2	PO2	3
			2.1.3		
		2.2	2.2.1		
		2.41	2.4.1		
		3.2	3.2.3	PO3	3
		3.3	3.3.2		
		3.4	3.4.1		
MEC701.2	3	1.3	1.3.1	PO1	3
MEC701.3		1.4	1.4.1		
MEC701.4		2.1	2.1.2	PO2	3
MEC701.5			2.1.3		
MEC701.6		2.2	2.2.1		
		2.41	2.4.1		
		3.2	3.2.3	PO3	3
		3.3	3.3.2		
		3.4	3.4.1		
		6.2	6.2.1	PO6	2
		8.2	B.2.2	PO8	2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MEC701.1	3	3	3	-	-	-	-		-	-	-	-
MEC701.2	3	3	3	-	-	2	-	2	-	-	-	-
MEC701.3	3	3	3	-	-	2	-	2	-	-	-	-
MEC701.4	3	3	3	-	-	2	-	2	-	-	-	-
MEC701.5	3	3	3	-	-	2	-	2	-	-	-	-
MEC701.6	3	3	3	-	-	2	-	2	-	-	-	-

CO-PSO Mapping:

	PSO1	PSO2
MEC701.1		2
MEC701.2		2
MEC701.3		2
MEC701.4		2

MEC701.5	2
MEC701.6	2

CO attainment value for students above targets values:

CO	Tool	Target Value % Marks	Students	Attainment
MEC701.1 MEC701.2 MEC701.3	Test	50%	60 70 80	1 2 3
MEC701.4	ESE	40%	60 70 80	1 2 3
	CES	60%	60 70 80	1 2 3
MEC701.5 MEC701.6	ESE	40%	60 70 80	1 2 3
	CES	60%	60 70 80	1 2 3

	Direct Method					Indirect Method
	Test	Lab	Assignment	ESE (O)	ESE (T)	
MEC701.1	60%				40%	
MEC701.2	60%				40%	
MEC701.3	60%				40%	
MEC701.4	60%				40%	
MEC701.5	-				100%	
MEC701.6	-				100%	

CO Measurement Weightages for Tools:

	Direct Method					Indirect Method
	80%					Course ExitSurvey 20%
	Test	Lab	Assignment	ESE (O)	ESE (T)	
MEC701.1	40%				60%	
MEC701.2	40%				60%	
MEC701.3	40%				60%	
MEC701.4	40%				60%	
MEC701.5	-				100%	
MEC701.6	-				100%	

Attainment:

COMEC701.1:
DirectMethod
$CO_{MEC701.1DM} = 0.4*Test + 0.6*ESE(T)$

Indirect
MethodCO$_{MEC701.}$
$_{1M}$=CES
FinalCOCO$_{MEC701.1}$=0.8*CO$_{MEC701.1DM}$+0.2*CO$_{MEC701.1IM}$

COMEC701.2:
DirectMethod
CO$_{MEC701.2DM}$=0.4*Test+0.6*ESE(T)
Indirect
MethodCO$_{MEC701.}$
$_{2M}$=CES
FinalCOCO$_{MEC701.2}$=0.8*CO$_{MEC701.2DM}$+0.2*CO$_{MEC701.2IM}$

DirectMethod
CO$_{MEC701.3DM}$=0.4*Test+0.6*ESE(T)
Indirect
MethodCO$_{MEC701.}$
$_{3M}$=CES
FinalCOCO$_{MEC701.3}$=0.8*CO$_{MEC701.3DM}$+0.2*CO$_{MEC701.3IM}$

DirectMethod
CO$_{MEC701.4DM}$=0.4*Test+0.6*ESE(T)
Indirect
MethodCO$_{MEC701.}$
$_{4M}$=CES
FinalCOCO$_{MEC701.4}$=0.8*CO$_{MEC701.4DM}$+0.2*CO$_{MEC701.4IM}$

Direct
MethodCO$_{MEC701.5DM}$
=ESE(T)
Indirect
MethodCO$_{MEC701.}$
$_{5M}$=CES
FinalCOCO$_{MEC701.5}$=0.8*CO$_{MEC701.5DM}$+0.2*CO$_{MEC701.5IM}$

Direct
MethodCO$_{MEC701.6DM}$
=ESE(T)
Indirect
MethodCO$_{MEC701.}$
$_{6M}$=CES
FinalCOCO$_{MEC701.6}$=0.8*CO$_{MEC701.6DM}$+0.2*CO$_{MEC701.6M}$

CourseLevelGap(ifany):
-

ContentbeyondSyllabus:
-

LecturePlan:

Week	Duration (Hrs.)	Topic	Module
1 (10.07.23-16.07.23)	3	Module1 Methodology & Morphology of design, Optimum design, system concepts in design.	1
2 (17.07.23-23.07.23)	3	Design of Hoisting Mechanism: Design of Snatch Block Assembly including Rope Selection	3
3 (24.07.23-30.07.23)	4	Sheave, Hook, Bearing for hook, crosspiece, Axle for sheave and shackle plate.	3
4 (31.07.23-06.08.23)	4	Design of rope drum, selection motor with transmission system.	3
5 (07.08.23-13.08.23)	4	Module2 Single stage and Two stage Gear box with fixed ratio consisting of Design of spur Gearbox	3
6 (14.08.23-20.08.23)	2	Housing layout and housing design	3
7 (21.08.23-27.08.23)	4	helical, bevel and worm and worm wheel gear pairs	4
8 (28.08.23-3.09.23)		UnitTest-1	
9 (4.09.23-10.09.23)	4	Design of Belt Conveyors: Power requirement, selection of belt, design of tension takeup unit, idler pulley	5
10 (11.09.23-17.09.23)	4	Engine Design (Petrol and Diesel): Design of cylinder, Piston with pin and rings	5
11 (18.09.23-24.09.23)		Mid Term Break	
12 (25.09.23-1.10.23)	3	Connecting rod & crankshaft with bearings	6
13 (2.10.23-8.10.23)		Unit Test-2	
14 (9.10.23-15.10.23)	4	**Design of main components of gear pump:** 1 Motor selection 2 Gear design 3 Shaft design and bearing selection 4 Casing and bolt design 5 Sizing of design of suction and delivery pipe	6
15 (16.10.23-22.10.23)	4	**Design of main components of Centrifugal Pump:** 1 Motor selection 2 Suction and Delivery pipe 3 Design of Impeller, Impeller shaft 4 Design of Volute Casing	6
16 (23.10.23-29.10.23)		Term End	

Recommended Books:

1 "Machine Design Exercises", S.N.Trikha - New Delhi Khanna Publisher 1978.

2 "Mechanical Engineering Design", Shigley J E and Mischke C R,11th Edition 2019, McGraw Hill, ISBN: 9788184956207.

3 "Mechanical design analysis", MF Spotts, 3rd Edition, Prentice Hall Inc.

4 "Design of Machine Elements", Bhandari VB,5th Edition 2020, TMH,ISBN: 9789390177479

5 "Machine Design", Black PH and O Eugene Adams, 3rd Edition, McGraw Hill ISBN 10: 0070055246

6 "Design Data", P.S.G. College of Technology, Coimbatore. ISBN: 978-8192735504

7 "Engineering Design", Dieter G E, McGraw Hill Inc, ISBN: 9781260113297

8 "Mechanical System Design", SP Patil, 2nd Edition., JAICO Publishing House ISBN: 978-8179923153

9 "Material Handling Equipment", Rudenko,2nd Edition, M.I.R. publishers, Moscow

10 "Machine Design-An Integrated Approach", Robert L. Norton,6th Edition, Pearson Education, ISBN: 9780135184233

11 "Material Handling Equipments", N. Rudenko, Peace Publication

12 "Material Handling Equipments", Alexandrov,5th Edition, Mir Publication ISBN: 9780714717456

13 Machine Desgin", Reshetov, Mir Publication 1978.

14 "Machine Design", R.C.Patel, Pandya, Sikh, Vol -I & II,12th Edition, C. Jamnadas& Co.

15 "Design of Machine Elements", 4th Edition, V. M. Faires, ISBN: 978-0023359507

16 "Pumps: Theory, Design and Applications", G K Sahu, New Age International 2000 ISBN: 9788122412246

17 "Gear Design Handbook", GitinMaitra, 2nd Edition, ISBN: 978-0074602379

18 "Design Data Book- Design of engine parts",Khandare S.S & Kale A.V, 2nd Edition, ISBN: 978-9352654260

Links for online NPTEL/SWAYAM courses:

1. https://onlinecourses.nptel.ac.in/noc22_me62 - Gear And Gear Unit Design: Theory and Practice, IIT Kharagpur

2. https://nptel.ac.in/courses/112/106/112106137/ - Machine Design-II, IIT Madras

EvaluationScheme

CIEScheme
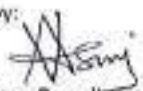
InternalAssessment:20(Averageoftwotests)

InternalAssessmentScheme

Module		Lecture Hours	No.ofquestionsin		
			Test1	Test2	Test3*
1	Module 1	4	10 marks	-	--
2	Module 3	10	10 marks	-	--
3	Module 2	12	-	Theory (10 marks)	--
4	Module 4	4	-	Numericals (10 marks)	--

Note: Four to six questions will be set in the Test paper

Verifiedby:

Programme Coordinator

Subject Expert

Mechanical Engineering
(Academic Year: 2023-2024)

Course Code: MEC701	
Course Name: Design of Mechanical System	
Course Teacher: Dr. Ketaki Joshi	
Course Outcomes (CO): *At the End of the course students will be able to*	
CO1	Apply the concept of system design to mechanical systems
CO2	Select appropriate gears for power transmission on the basis of given load and speed.
CO3	Design hoisting mechanism of EOT crane for the given material handling capacity.
CO4	Design belt conveyor systems for a given application.
CO5	Design engine components including cylinder, piston, connecting rod and crankshaft.
CO6	Design pumps for the given applications.

Dr. Bhushan T. Patil
Professor & Head (Mechanical)
Fr. Conceicao Rodrigues College of Engg.
Bandra (West) Mumbai 400050

Course Lesson Plan

Sr. No.	Proposed Date	Topics	Delivery Mode	CO	Actual Date	Remark
1	11/7	Introduction to the course, COs, Assessment Module 1 Methodology & Morphology of design	Lecture	CO1	11/7	
2	12/7	Optimum design, system concepts in design.	Lecture	CO1	12/7	
3	13/7	Module 3: Design of Hoisting Mechanism: Introduction	Lecture	CO3	13/7 13/7	Extra lecture
4	18/7	Design of Snatch Block Assembly	Lecture	CO3	18/7	
5	19/7	Rope Selection	Lecture	CO3	19/7	
6	20/7	Sheave, Hook	Lecture	CO3	20/7	online (rain)
7	25/7	Bearing for hook, cross piece	Lecture	CO3	25/7	
8	26/7	Axle for sheave and shackle plate	Lecture	CO3	26/7	
9	27/7	Design of rope drum, selection motor with transmission system.	Lecture	CO3	27/7	online (Rain)
10	28/7	Module 4: Design of Belt Conveyors: introduction	Lecture	CO4	28/7	online (Rain)
11	1/8	selection of belt	Lecture	CO4	1/8	
12	2/8	Power requirement,	Lecture	CO4	2/8	
13	3/8	Design of tension take up unit, idler pulley	Lecture	CO4	3/2	
14	4/8	Module 2 Design of Transmission Gear Box: Introduction	Lecture	CO2	4/8	
15	8/8	Single stage and Two stage Gear box with fixed ratio	Lecture	CO2	8/8	
16	9/8	Design of spur Gear box	Lecture	CO2	9/8	
17	10/8	Design of helical gear pairs	Lecture	CO2	10/8	
18	11/8	Design of helical and Bevel gear pairs	Lecture	CO2	11/8	
	15/8	Independence Day				

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Phone : (022) 6711 4000, 6711 4101, 6711 4104

Website : www.frcrce.ac.in • Email : crce@fragnel.edu.in

	16/8	Parsi New Year				
20	17/8	Design of worm and worm wheel	Lecture	CO2	17/81	
21	18/8	Gear box housing layout and housing design	Lecture	CO2	18/81	
22	22/8	Gear box for machine tools introduction	Lecture	CO2	22/8	
23	23/8	Gear box for machine tools	Lecture	CO2	23/8	
24	24/8	Revision	Lecture	CO1,3	24/8	
25	25/8	Revision	Lecture	CO1,3	25/8	
	29/8	Unit Test-1				
	30/8	Unit Test-1				
	31/8	Unit Test-1				
	1/9	Unit Test-1				
26	5/9	Numericals on Gear box for machine tools	Lecture	CO2	5/9	
27	6/9	Numericals on Gear box for machine tools	Lecture	CO2	6/9	
28	7/9	Module 5: Engine Design (Petrol and Diesel): Introduction	Lecture	CO5	8/9	
29	8/9	Design of cylinder	Lecture	CO5	8/9	
30	12/9	Design of Piston with pin and rings	Lecture	CO5	12/9	
31	13/9	Design of connecting rod	Lecture	CO5	13/9	
32	14/9	Design of crank shaft	Lecture	CO5	15/9	
33	15/9	Design of bearings	Lecture	CO5	15/9	
	19/9	Shri Ganesh Chaturthi				
	20/9	Mid-term break				
	21/9	Mid-term break				
	22/9	Mid-term break				
34	26/9	Module 6: Design of Gear Pump	Lecture	CO6	27/9	mambush on 26/9
35	27/9	1 Motor selection 2 Gear design	Lecture	CO6	29/9	
	28/9	Anant Chaturdashi				
36	29/9	3 Shaft design and bearing selection 4 Casing and bolt design	Lecture	CO6	5/10	Holiday on 29/9

Dr. Bhushan T. Patil
Professor & Head (Mechanical)
Fr. Conceicao Rodrigues College of Engg.
Bandra (West) Mumbai 400050

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37	3/10	5 Sizing of design of suction and delivery pipe	Lecture	CO6	3|10	? tgi
38	4/10	Design of Centrifugal Pump	Lecture	CO6	4|10	
39	5/10	1 Motor selection 2 Suction and Delivery pipe	Lecture	CO6	5|10	
40	6/10	3 Design of Impeller, Impeller shaft 4 Design of Volute Casing	Lecture	CO6	5|10	AVSE Debate on 6|10
	10/10	Unit Test-2				
	11/10	Unit Test-2				
	12/10	Unit Test-2				
	13/10	Unit Test-2				
41	16/10	Remedial Classes	Lecture	CO2		
42	17/10	Remedial Classes	Lecture	CO3,4		
43	18/10	Remedial Classes	Lecture	CO5,6		
44	29/10	Remedial Classes	Lecture	CO6		
	24/10	Dussehra				Synergy
		University ESE Examination				

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Text Books :

1 "Machine Design Exercises", S.N.Trikha - New Delhi Khanna Publisher 1978.
2 "Mechanical Engineering Design", Shigley J E and Mischke C R,11th Edition 2019, McGraw Hill, ISBN: 9788184956207.
3 "Design of Machine Elements", Bhandari VB,5th Edition 2020, TMH,ISBN: 9789390177479
4 "Mechanical System Design", SP Patil, 2nd Edition., JAICO Publishing House ISBN: 978- 8179923153
5 "Machine Design", R.C.Patel, Pandya, Sikh, Vol -I & II,12th Edition, C. Jamnadas& Co.
6 "Pumps: Theory, Design and Applications", G K Sahu, New Age International 2000 ISBN: 9788122412246
7 "Design Data", P.S.G. College of Technology, Coimbatore. ISBN: 978-8192735504
8 "Design of Engine Parts", Kale, Khandare, Rainbow Publications, Nagpur

Reference Books :

1 "Mechanical design analysis", MF Spotts, 3rd Edition, Prentice Hall Inc.
2 "Machine Design", Black PH and O Eugene Adams, 3rd Edition, McGraw Hill ISBN 10: 0070055246
3 "Engineering Design", Dieter G E, McGraw Hill Inc, ISBN: 9781260113297
4 "Material Handling Equipment", Rudenko,2nd Edition, M.I.R. publishers, Moscow
5 "Machine Design-An Integrated Approach", Robert L. Norton,6th Edition, Pearson Education, ISBN: 9780135184233
6 "Material Handling Equipments", N. Rudenko, Peace Publication
7 "Material Handling Equipments", Alexandrov,5th Edition, Mir Publication ISBN: 9780714717456
8 Machine Design", Reshetov, Mir Publication 1978.
9 "Design of Machine Elements", 4th Edition, V. M. Faires, ISBN: 978-0023359507 16

Course Instructor: Dr. Ketaki Joshi

Dr. Bhushan I. Patil
Professor & Head (Mechanical)
Fr. Conceicao Rodrigues College of Engg
Bandra (West) Mumbai 400050

Fr. Conceicao Rodrigues College of Engineering
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Department of Mechanical Engineering

Design of Mechanical System-Theory

Assessment Tool	UT1		UT2		ESE
	Q.1	Q.2	Q.1	Q.2/3	
Mapping	CO1	CO1,3	CO1,2,4	CO1,2,4	ALL
Total Number of Students	64				
Target Set	5	4	5	4	32
Number of Students above target	58	46	57	50	50
Percent of Students above target	90.63	71.88	89.06	78.13	78.13
Attainment	3	2	3	2	2

Design of Mechanical System-Lab

	A1	A2	A3	A4	A5	dwg1	dwg2	courseP	UNIV_PR
	CO1,2	CO1,3	CO1	CO5	CO4	CO1,2	CO1	ALL	ALL
Total Number of Students	64								
Target Set	6	6	6	6	6	6	6	6	13
Number of Students above target	64	64	64	64	64	64	64	64	63
Percent of Students above target	100	100	100	100	100	100	100	100	98.44
Attainment	3	3	3	3	3	3	3	3	3

Theory

CO#	ATTAINMENT				
CO1	UT	ESE	CES	DIRECT	FINAL
	2	2	3	2	2.2
CO2	UT	ESE	CES	DIRECT	FINAL
	3	2	3	2.4	2.52
CO3	UT	ESE	CES	DIRECT	FINAL
	2	2	3	2	2.2
CO4	UT	ESE	CES	DIRECT	FINAL

		3		2		3		2.4		2.52
CO5			ESE		CES		DIRECT		FINAL	
			2		3		2		2.2	
CO6			ESE		CES		DIRECT		FINAL	
			2		3		2		2.2	

Practical

CO#	ATTAINMENT				
CO1	LAB	ESE	CES	DIRECT	FINAL
	3	3	3	3	3
CO2	LAB	ESE	CES	DIRECT	FINAL
	3	3	3	3	3
CO3	LAB	ESE	CES	DIRECT	FINAL
	3	3	3	3	3
CO4	LAB	ESE	CES	DIRECT	FINAL
	3	3	3	3	3
CO5	LAB	ESE	CES	DIRECT	FINAL
	3	3	3	3	3

Design of Mechanical System-Theory	Target	Co Attainment
MEC701.1.Apply the concept of system design.	2	2.2
MEC701.1.Select appropriate gears for power transmission on the basis of given load and speed	2	2.52
MEC701.1.Design material handling systems such as hoisting mechanism of EOT crane	2	2.2
MEC701.1.Design belt conveyor systems	2	2.52
MEC701.1.Design pumps for the given applications	2	2.2
MEC701.1.Design engine components such as cylinder, piston, connecting rod and crankshaft MEC701.6.Design pumps for the given applications	2	2.2

Design of Mechanical System-Lab	Target	Co Attainment
MEL701.1. Apply the concept of system design.	2.5	3
MEL701.2. Design of hoisting mechanism of EOT crane,	2.5	3
MEL701.3. Design belt conveyor systems	2.5	3
MEL701.4. Design pumps for the given applications	2.5	3
MEL701.5. Design engine components such as cylinder, piston, connecting rod and crankshaft	2.5	3

Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
FEC101	3	-	-	-	-	-	-	-	-	-	-	-	-	-
FEC102	3	-	-	-	-	-	-	-	-	-	-	-	-	-
FEC103	2.79	-	-	-	-	-	-	-	-	-	-	-	-	-
FEC104	2.95	2.96	2.96	-	-	-	-	-	-	-	-	-	-	-
FEC105	2.68	2.77	-	-	-	-	-	-	-	-	-	-	-	-
FEL103	2.98	2.98	2.97	-	-	-	-	-	-	-	-	-	-	-
FEC201	3	-	-	-	-	-	-	-	-	-	-	-	-	-
FEC202	3	-	-	-	-	-	-	-	-	-	-	-	-	-
FEC203	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-
FEC204	2.33	2.33	2.33	-	-	-	-	-	-	2.33	-	-	-	-
FEC205	2.4	2.41	2.41	-	-	-	-	-	-	-	-	2.4	-	-
FEC206	-	-	-	-	-	-	-	-	-	3	-	-	-	-
FEL105/ FEL206	2.9	-	2.9	-	2.9	2.9	-	-	2.9	-	-	-	-	-
FEL203	3	3	3	-	3	-	-	-	-	3	-	-	-	-
MEC301	3	-	-	-	-	-	-	-	-	-	-	-	-	-
MEC302	3	3	3	3	-	-	-	-	-	-	-	-	3	-
MEC303	3	3	3	-	3	-	-	-	-	-	-	3	3	-
MEC304	3	3	3	3	-	-	-	-	-	-	-	-	3	-
MEC305	2.68	2.7	2.68	-	-	-	-	-	-	-	-	-	-	-
MEL301	3	3	3	3	3	-	-	-	-	-	-	-	3	-
MEL302	3	-	3	-	3	-	-	-	-	-	-	-	3	-
MESBL301	3	3	3	3	-	-	-	-	-	3	3	-	-	-
MEPBL301	3	3	3	3	3	3	3	3	3	3	3	3	3	3
MEC401	2.83	-	-	-	-	-	-	-	-	-	-	-	-	-
MEC402	3	3	-	-	-	-	-	-	-	-	-	3	-	-
MEC403	2.92	2.92	2.76	-	-	-	-	-	-	-	-	-	-	-
MEC404	3	3	-	-	3	-	-	3	-	-	3	-	3	3
MEC405	2.53	-	2.6	-	-	-	-	-	-	-	-	-	2.53	-
MEL401	3	-	-	-	-	-	-	-	-	-	-	-	-	-
MEL402	3	3	3	-	-	-	-	-	-	-	-	-	-	-
MEL403	2.28	2.33	2.33	-	2.6	-	-	-	2.6	2.6	-	-	-	-
MESBL401	3	3	3	-	-	-	-	-	-	-	-	3	3	-
MEPBL401	3	3	3	3	3	3	3	3	3	3	3	3	3	3

PO - PSO Attainment.

2023-24 batch

MEC501	2.89	2.92	3	3	2.83	-	-	-	-	-	-	-	2.87	2.87
MEC502	1.1	1.1	-	-	-	1.1	1.1	-	-	-	-	1.1	-	-
MEC503	2.6	2.6	2.68	2.68	2.68	-	-	-	-	-	-	-	2.68	-
MEC504	2.49	2.49	2.52	2.52	2.52	-	-	-	-	-	-	-	2.49	-
MEDLO5011	3	2.88	-	2.87	-	-	-	-	3	-	-	-	2.94	2.94
MEDLO5012	2.34	2.34	2.34	-	2.34	-	-	-	-	-	-	-	2.34	-
MEL501	2.8	2.8	2.8	-	-	2.8	2.8	-	-	-	-	2.8	-	-
MEL502	3	3	3	3	3	-	-	-	-	-	-	-	-	-
MEL503	3	3	3	3	3	-	-	-	-	-	-	3	-	-
MESBL501	-	-	-	-	-	3	-	3	3	3	-	-	-	-
MEPBL501	3	3	3	3	3	3	3	3	3	3	3	3	3	3
MEC601	2.84	2.84	2.84	-	-	-	-	-	-	-	-	-	-	2.84
MEC602	2.41	2.41	-	-	-	2.41	-	-	-	-	-	2.41	2.41	2.41
MEC603	1.8	1.7	2.1	-	-	-	2.1	-	-	-	-	2.1	-	-
MEC604	2	1.84	2	2	2	-	-	-	-	-	-	-	2	2
MEDLO6021	3	3	3	-	-	-	-	-	-	-	-	-	-	3
MEDLO6023	2.49	2.49	2.49	-	-	-	-	-	-	-	-	-	2.48	-
MEL601	3	3	3	-	3	-	-	-	-	-	-	-	-	3
MEL602	3	3	3	-	-	3	-	-	-	-	-	3	-	-
MEL603	3	3	3	3	-	3	3	3	-	3	-	3	-	-
MESBL601	2.37	2.37	2.37	2.4	2.3	-	-	-	-	-	-	2.37	-	-
MEPBL601	3	3	3	3	3	3	3	3	3	3	3	3	3	3
MEC701	2.31	2.31	2.31	-	-	-	-	2.33	-	-	-	-	-	-
MEC702	-	1.85	1.4	1.4	2.2	1.67	2.6	-	1.4	2.07	2.6	2.6	-	-
MEDLO7031	2.59	-	2.6	-	-	2.6	2.6	2.6	2.59	-	-	2.6	2.6	2.6
MEDLO7032	1.75	1.83	1.83	-	-	2.2	1.85	-	-	-	-	-	-	-
MEDLO7041	2	2	-	-	-	-	-	-	-	-	-	2	2	-
ILO7013	-	-	2.04	-	-	2.04	2.04	2.04	2.04	2.04	2.04	2.04	-	-
ILO7017	3	3	-	-	-	-	3	-	-	-	-	-	-	-
ILO7015	2	2	-	2	-	-	-	-	2	2	2	2	2	2
MEL701	3	3	3	-	3	-	-	-	3	-	-	-	-	-
MEL702	3	3	3	-	3	-	-	-	-	-	-	-	3	-
MEL703	-	-	-	-	-	-	-	3	3	3	-	3	-	-
MEP701	3	3	3	3	3	3	3	3	3	3	3	3	3	3

MEC801	-	2.2	2.2	2.2	2.2	2.2	2.2	-	2.2	2.2	2.2	2.2	-	-
MEDLO8012	2.36	2.36	2.36	-	2.33	2.33	2.33	2.33	2.2	2.2	-	2.36	-	2.36
MEDLO8052	2.04	2.04	-	-	-	-	-	-	-	-	-	-	2.04	2.04
ILO8021	-	2	2	2	-	2	-	-	-	-	2	2	-	-
ILO8022	-	-	-	-	-	-	-	-	-	-	2.48	-	2.48	-
ILO8029	-	-	3	3	3	3	3	-	-	-	3	3	-	-
MEL801	3	3	3	-	3	3	3	3	3	3	-	3	-	3
MEL802	2.68	-	-	-	2.7	2.6	2.6	-	-	-	-	2.68	-	-
MEP801	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Direct Attainment	2.73	2.66	2.71	2.71	2.79	2.6	2.61	2.82	2.68	2.72	2.69	2.62	2.71	2.74
Indirect Attainment	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Final Attainment	2.78	2.73	2.77	2.77	2.83	2.68	2.69	2.86	2.74	2.78	2.75	2.7	2.77	2.79

SUBJECT	CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSD1	PSO2
Engineering Mathematics - I (FEC101)	FEC101	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Engineering Physics - I (FEC102)	FEC102	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Engineering Chemistry - I (FEC103)**	FEC103	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Engineering Mechanics (FEC104)	FEC104	3	2	2	-	-	-	-	-	-	-	-	-	-	-
(FEC105)	FEC105	3	2	-	-	-	-	-	-	-	-	-	-	-	-
FEL103	FEL103	2	2	2	-	-	-	-	-	-	-	-	-	-	-
Engineering Mathematics-II FEC201	FEC201	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Engineering Physics-II (FEC202)	FEC202	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Engineering Chemistry -II (FEC203)	FEC203	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Engineering Graphics (FEC204)	FEC204	3	1	2	-	-	-	-	-	-	2	-	-	-	-
C-Programming FEC205	FEC205	3	1	1	-	-	-	-	-	-	-	-	3	-	-
Professional Communication and Ethics 1 F	FEC206	-	-	-	-	-	-	-	-	-	2	-	-	-	-
BASIC WORKSHOP PRACTICE 1 & 2	FEL105/ FEL206	1	-	1	-	1	2	-	-	2	-	-	-	-	-
Engineering Graphics Lab FEL203	FEL203	3	1	2	-	3	-	-	-	-	2	-	-	-	-
MEC301 Engineering Mathematics-III	MEC301	3	-	-	-	-	-	-	-	-	-	-	-	-	-
MEC302 Strength of Materials	MEC302	3	3	3	2	-	-	-	-	-	-	-	-	2	-
MEC303 Production Processes	MEC303	2	2	2	-	3	-	-	-	-	-	-	2	2	-
MEC304 Materials and Metallurgy	MEC304	3	2	3	3	-	-	-	-	-	-	-	-	2	-
MEC305 Thermodynamics	MEC305	3	3	2	-	-	-	-	-	-	-	-	-	-	-
MEL301 Materials Testing	MEL301	3	3	3	3	3	-	-	-	-	-	-	-	2	-
MEL302 Machine Shop Practice	MEL302	1	-	1	-	1	-	-	-	-	-	-	-	1	-
MESBL301 CAD –Modeling	MESBL301	3	2	2	2	-	-	-	-	-	2	1	-	-	-
MEPBL301 Mini Project - 1A	MEPBL301	3	3	3	3	2	3	3	1	3	3	3	3	3	3
MEC401 Engineering Mathematics-IV	MEC401	2	-	-	-	-	-	-	-	-	-	-	-	-	-
MEC402 Fluid Mechanics	MEC402	3	3	-	-	-	-	-	-	-	-	-	1	-	-
MEC403 Kinematics of Machinery	MEC403	3	3	2	-	-	-	-	-	-	-	-	-	-	-
MEC404 CAD/CAM	MEC404	3	3	-	-	3	-	-	3	-	-	3	-	3	3
MEC405 industrial Electronics	MEC405	3	-	2	-	-	-	-	-	-	-	-	-	1	-
MEL401 Industrial Electronics Lab	MEL401	3	-	-	-	-	-	-	-	-	-	-	-	-	-
MEL402 Kinematics of Machinery Lab	MEL402	3	3	2	-	-	-	-	-	-	-	-	-	-	-
MEL403 Python Programming Lab	MEL403	2	2	2	-	2	-	-	-	2	2	-	-	-	-
MESBL401 CNC and 3D Printing	MESBL401	3	2	3	-	-	-	-	-	-	-	-	-	2	3	-
MEPBL401 Mini Project 1B	MEPBL401	3	3	3	3	2	3	3	1	3	3	3	3	3	3

Course - PO/PSO Mapping

Course	Code	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
MEC501 Mechanical Measurements and	MEC501	2	2	3	3	2	-	-	-	-	-	-	-	2	2
MEC502 Thermal Engineering	MEC502	3	2	-	-	-	1	2	-	-	-	-	1	-	-
MEC503 Dynamics of Machinery	MEC503	3	3	3	3	2	-	-	-	-	-	-	-	2	-
MEC504 Finite Element Analysis	MEC504	3	3	3	3	3	-	-	-	-	-	-	-	3	-
MEDLO5011 Optimization Techniques	MEDLO5011	3	3	-	3	-	-	-	-	2	-	-	-	2	2
MEDLO5012 Design of Experiments	MEDLO5012	3	3	3	-	3	-	-	-	-	-	-	-	3	-
MEL501 Thermal Engineering	MEL501	3	2	2	-	-	1	2	-	-	-	-	1	-	-
MEL502 Dynamics of Machinery	MEL502	3	2	1	3	2	-	-	-	-	-	-	-	-	-
MEL503 Finite Element Analysis	MEL503	3	3	3	3	3	-	-	-	-	-	-	3	-	-
MESBL501 Professional communication	MESBL501	-	-	-	-	-	2	-	2	2	3	-	-	-	-
Mini Project 2A	MEPBL501	3	3	3	3	2	3	3	1	3	3	3	3	3	3
MEC601 Machine Design	MEC601	3	3	3	-	-	-	-	-	-	-	-	-	-	2
MEC602 Turbo Machinery	MEC602	3	2	-	-	-	1	-	-	-	-	-	1	1	1
MEC603 Heating, Ventilation, Air conditi	MEC603	3	3	3	-	-	-	3	-	-	-	-	1	-	-
MEC604 Automation and Artificial Intelli	MEC604	2	2	3	3	3	-	-	-	-	-	-	-	2	2
MEDLO6021 Press Tool Design	MEDLO6021	3	3	3	-	-	-	-	-	-	-	-	-	-	2
MEDLO6023 Metal Forming Technology	MEDLO6023	3	3	3	-	-	-	-	-	-	-	-	-	1	-
MEL601 Machine Design	MEL601	3	3	3	-	2	-	-	-	-	-	-	-	-	2
MEL602 Turbo Machinery	MEL602	3	2	2	-	-	1	-	-	-	-	-	1	-	-
MEL603 Heating, Ventilation, Air conditi	MEL603	2	3	2	2	-	3	3	3	-	3	-	2	-	-
MESBL601 Measurements and Automat	MESBL601	2	2	2	2	3	-	-	-	-	-	-	2	-	-
Mini Project 2B	MEPBL601	3	3	3	3	2	3	3	1	3	3	3	3	3	3
MEC701 Design of Mechanical System	MEC701	3	3	3	-	-	-	-	2	-	-	-	-	-	-
MEC702 Logistics and Supply Chain Ma	MEC702	-	3	2	3	2	3	3	-	2	2	2	2	-	-
MEDLO7031 Automotive Power System	MEDLO7031	2	-	2	-	-	2	2	2	2	-	-	2	1	2
MEDLO7032 Renewable Energy Syste	MEDLO7032	3	2	3	-	-	2	3	-	-	-	-	-	-	-
MEDLO7041 Machinery Diagnostics	MEDLO7041	3	3	-	-	-	-	-	-	-	-	-	2	3	-
ILO7013.1 Managarial Information Syste	ILO7013	-	-	2	-	-	3	3	2	3	2	1	1	-	-
ILO7017 Disaster Management and Miti	ILO7017	2	2	-	-	-	-	2	-	-	-	-	-	-	-
ILO7015 Operations Research	ILO7015	3	3	-	3	-	-	-	-	2	2	2	2	2	2
MEL701 Design of Mechanical System	MEL701	3	3	3	-	3	-	-	-	2	-	-	-	-	-
MEL702 Maintenance Engineering Lab	MEL702	3	3	3	-	2	-	-	-	-	-	-	-	2	-
MEL703 Industrial Skills Lab	MEL703	-	-	-	-	-	-	-	3	2	3	-	2	-	-
Major Project-1	MEP701	3	3	3	3	3	3	3	3	3	3	3	3	3	3
MEC801 Operations Planning and Contr	MEC801	-	3	2	3	2	3	3	-	2	2	2	2	-	-

Course	Code														
		3	3	3	-	2	2	2	2	2	2	-	2	-	2
MEDLO8012 Product Design and Devel	MEDLO8012	3	3	3	-	-	-	-	-	-	-	-	-	3	3
MEDLO8052 Smart Materials	MEDLO8052	3	2	-	-	-	1	-	-	-	-	3	3	-	-
ILO8021 Project Management	ILO8021	-	1	2	2	-	1	-	-	-	-	3	-	3	-
ILO8022 Finance Management	ILO8022	-	-	-	-	-	-	-	-	-	-	2	3	-	-
ILO8029 Environmental Management	ILO8029	-	-	2	2	2	1	3	-	-	-	2	2	-	2
MEL801 Product Design and Developm	MEL801	3	3	3	-	2	2	2	2	2	2	-	2	-	2
MEL802 IOT Lab	MEL802	3	-	-	-	3	2	2	-	-	-	-	3	-	-
Major Project-2	MEP801	3	3	3	3	3	3	3	3	3	3	2	3	3	3

6 Course Outcomes(CO) & CO-PI(Performance Indicators) Mapping

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Course Code: CSC503	Course Name: Artificial Intelligence

Prerequisite Courses:
Programming / Python Programming
Data Structures and Algorithms
Analysis of Algorithms

Course Educational Objectives:
o gain perspectives of AI and its foundation
o study different agent architectures and properties of the environment
o understand the basic principles of AI towards problem solving, inference, perception, knowledge representation, and learning
o investigate probabilistic reasoning under uncertain and incomplete information
o explore the current scope, potential, limitations, and implications of intelligent systems

	Course Outcomes: Student will be able to	Bloom's Level
CO1	Identify the characteristics of the environment and differentiate between various agent architectures	2
CO2	Apply a suitable search strategy to design problem solving agents	3
CO3	Design knowledge-based agents using knowledge representation and inference rules.	3
CO4	Apply a probabilistic model for reasoning under uncertainty	3
CO5	Describe various learning techniques	2

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
1.1	Demonstrate competence in mathematical modeling	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems					
		1.1.2	Apply the concepts of probability, statistics and queuing theory in modeling of computer-based system, data and network protocols.				YES	
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem		YES			
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals					
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of Artificial Intelligence and Data science engineering to solve an engineering problem	YES	YES	YES	YES	YES

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O 2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Articulate problem statements and identifies objectives					
		2.1.2	Identify proceses/modules/algorithms of AI based system and parameters to solve the problems					YES
		2.1.3	Identify mathematical algorithmic knowledge that applies to a given problem				YES	
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Re-frame the AIDS based sytem into interconnected sub-systems					
		2.2.2	Identify, functionailties and computing resources					
		2.2.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions					
		2.2.4	Compare and contrast alternative solution/methods to select the best methods		YES			
		2.2.5	Compare and contrast alternative solution processes to select the best process					
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Apply AI&DS principles to formulate model of a system with required applicability and performance			YES		
		2.3.2	Identify design constraints for required performance criteria					
2.4	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Applies engineering mathematics to implement the solution				YES	
		2.4.2	Analyze and interpret the results using contemporary tools		YES			
		2.4.3	Identify the limitations of the solution and sources/causes of error		YES			
		2.4.4	Arrive at conclusion with resect to objectives		YES			

O3: Design/Development of Solutions: Design solutions for complex engineering problems and design system

No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
3.1	Demonstrate an ability to define a complex/ open-	3.1.1	Define a precise problem statement with objectives and scope					
		3.1.2	Identify and document system requirements from stake- holders					
		3.1.3	Review state-of-the-art literature to synthesize system requirements					

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3.1	ended problem in engineering terms	3.1.4	Choose appropriate quality attributes as defined by ISO/IEC/IEEE standard					
		3.1.5	Explore and synthesize system requirements from larger social and professional concerns					
		3.1.6	Develop software requirement specifications (SRS)					
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Explore design alternatives					
		3.2.2	Produce a variety of potential design solutions suited to meet functional requirements					
		3.2.3	Identify suitable non-functional requirements for evaluation of alternate design solutions					
3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Perform systematic evaluation of the degree to which several design concepts meet the criteria					
		3.3.2	Consult with domain experts and stakeholders to select optimal engineering design solution for further development					
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)					
		3.4.2	Implement and integrate the modules					
		3.4.2	Verify the functionalities and validate the design					

PO4: Conduct investigations of complex 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

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem, its scope and importance for purposes of investigation					
		4.1.2	choose appropriate procedure/algorithm, dataset and test cases.					
		4.1.3	choose appropriate hardware/software tools to conduct the experiment.					
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives					
4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data					
		4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations					
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions		YES			

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		PI No.		CO1	CO2	CO3	CO4	CO5
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions					

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities		YES			
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems		YES			
5.2	Demonstrate an ability to select and apply discipline-specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv)					
		5.2.2	Demonstrate proficiency in using discipline-specific tools					
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources					
		5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use					

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health,

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at the global, regional and local level					
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public					

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity					
		7.1.2	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability					

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C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development					
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline					

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives					
8.2	Demonstrate an ability to apply the Code of Ethics	8.2.1	Identify tenets of the CSI professional code of ethics					
		8.2.2	Examine and apply moral & ethical principles to known case studies					

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams,

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team					
		9.1.2	Implement the norms of practice {e.g. rules, roles, charters, agendas, etc.} of effective team work, to accomplish a goal					
9.2	Demonstrate effective individual and team operations-- communication, problem-solving, conflict resolution	9.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills					
		9.2.2	Treat other team members respectfully					
		9.2.3	Listen to other members					
		9.2.4	Maintain composure in difficult situations					
9.3	Demonstrate success in a team-based project	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts					

PO10: Communication: Communicate effectively on complex engineering activities with the engineering

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
10.1	Demonstrate an ability to comprehend technical literature and document	10.1.1	Read, understand and interpret technical and non-technical information					
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents					

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				CO1	CO2	CO3	CO4	CO5
	...rature and document project work	10.1.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear					
10.2	Demonstrate competence in listening, speaking, and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others					
		10.2.2	Deliver effective oral presentations to technical and non-technical audiences					
10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations					
		10.3.2	Use a variety of media effectively to convey a message in a document or a presentation					

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity					
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze different forms of financial statements to evaluate the financial status of an engineering project					
		11.2.2	Analyze and select the most appropriate proposal based on economic and financial considerations.					
11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks					
		11.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget					

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent

C. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the requirement for continuing professional development					
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap					
12.2	Demonstrate an ability to identify changing trends in	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current					

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	engineering knowledge and practice	12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field					
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information					
		12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc					

SO: The graduates of BE in artificial intelligence and data science program will have a strong foundation and bility to use cutting edge tools and techniques to innovate and develop new solutions

. No.	Competencies	PI No.	Performance Indicators	CO1	CO2	CO3	CO4	CO5
13.1	Demonstrate competence in AI and DS fundamentals	13.1.1	Able to apply principles of Artificial intelligence to solve any complex problem	YES	YES	YES	YES	
		13.1.2	Able to perform data analysis, data mining, data visualization for any real world database		YES		YES	
13.2	Demonstrate an ability to use cutting edge tools	13.2.1	Able to code in latest AI&DS software tools		YES			
13.3	Demonstrate an ability to innovate and develop new solution	13.3.1	Design and develop AI based solution for any real world problem		YES		YES	
		13.3.2	Get meaning insights of data for business decision making and strategic planning				YES	YES

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Artificial Intelligence & Data Science
(Academic Year :2023-2024)

Course Code: CSC503	
Course Name: Artificial Intelligence	
Course Teacher: Prof. Saurabh Kulkarni	
Course Outcomes (CO): *At the End of the course students will be able to*	
CO.1	Identify the characteristics of the environment and differentiate between various agent architectures
CO.2	Apply a suitable search strategy to design problem solving agents
CO.3	Design knowledge-based agents using knowledge representation and inference rules.
CO.4	Apply a probabilistic model for reasoning under uncertainty
CO.5	Describe various learning techniques

Course Lesson Plan

Sr. No.	Proposed Date	Topics	Delivery Mode	CO	Assessment Tool	Ref. book	Actual Date	Remark
1	11/7	Information about syllabus, assessment and course outcomes, Introduction to AI	Lecture	--	--	1	11/7/23	
2	12/7	AI Perspectives, Acting and thinking humanly, Acting and thinking rationally	Lecture	CO1	UT1, Q1	1	12/7/23	
3	14/7	History of AI, Applications of AI, The present state of AI, Ethics in AI, **Quiz 1: MCQ based quiz as a part of the flipped classroom**	Lecture	CO1	UT1, Q1	1	14/7/23	
4	18/7	Introduction to agents, Structure of intelligent agent	Lecture	CO1	UT1	1	18/7/23	
5	19/7	characteristics of intelligent agents , types of agents: Simple reflex	Lecture	CO1	UT1	1	19/7/23	
6	21/7	Model-based agents	Lecture	CO1	UT1	1	21/7/23	
7	24/7	Types of agents: Goal-based, utility-based	Lecture	CO1	UT1	1	23/7/23	
8	27/7	Definition of search and state space representation	Lecture	CO2	UT1, A1	1	27/7/23	Cancelled due to quiz given to solve
9	28/7	Problem as state space search, problem formulation	Lecture	CO2	UT1, A1	1,2	29/7/23	Cancelled due to Rain Adjusted for admissionwork
10	31/7	Well-defined problems	Lecture	CO2	UT1, A1	1,2	31/7/23	
11	03/8	Solving problems by searching	Lecture	CO2	UT1, A1	1,2	3/8/23	For 27/7 lecture taken on 2/8/23
12	04/8	Performance evaluation of search strategies, time complexity, space complexity, completeness, optimality	Lecture	CO2	UT1, A1	1	4/8/23	

No	Date	Topic	Type	CO		No	Date	Remarks
			Lecture	CO2	UT1, A1	1	07/8/23	
13	07/8	Uninformed search: DFS	Lecture	CO2	UT1, A1	1	10/8/23	
14	10/8	Iterative deepening and bi-directional search						
15	11/8	BFS, uniform cost search, comparison of all the uninformed search techniques	Lecture	CO2	UT1, A1	1	11/8/23	
16	14/8	Informed search: Heuristic function, Admissible heuristic	Lecture	CO2	UT1, A1	1	14/8/23	
	15/8	**Independence Day**						
	16/8	**Parsi New Year**						
17	17/8	Greedy best first search	Lecture	CO2	UT1, A1	1	17/8/23	
18	18/8	A* search	Lecture	CO2	UT1, A1	1	18/8/23	
19	21/8	Informed search with example	Lecture	CO2	UT1, A1	1	21/8/23	
20	24/8	Local search: Hill climbing	Lecture	CO2	UT1, A1	1	31/8/23	Conducted due to absent
21	25/8	Simulated annealing, genetic algorithm	Lecture	CO2	UT1, A1	1	01/09/23	completed due to absent
	28/8	**Unit Test-1**		CO1,2				
	29/8	**Unit Test-1, Mid-Term Feedback**		CO1,2				
22	31/8	Adversarial search: Mini Max Technique	Lecture	CO2	A1	1	04/09/23	
23	01/9	Adversarial search: Mini Max with alpha beta pruning	Lecture	CO2	A1	1	04/09/23	
	02/9	**Assignment 1: Coding assignment**						
24	04/9	Definition and importance of knowledge, issues in knowledge representation, knowledge representation systems, properties of knowledge representation systems	Lecture	CO3	UT2, Q2	1	06/09/23	
25	07/9	Propositional logic- syntax, semantics, formal connectives, truth tables	Lecture	CO3	UT2, Q2	1	08/09/23	
26	08/9	Tautology, validity, well-formed formula, Prolog introduction	Lecture	CO3	UT2, Q2	1, R1	14/9/23	
27	11/9	Predicate logic- FOPL, syntax, semantics, quantification	Lecture	CO3	UT2, Q2	1	15/9/23	
28	14/9	Inference rules in FOPL	Lecture	CO3	UT2, Q2	1	18/9/23	2 lectures
29	15/9	Forward chaining, backward chaining	Lecture	CO3	UT2, Q2	1	25/9/23	conducted due to mid term break
	16/9	Remedial session		CO1,C				

				O2				
30	18/9	CNF (Pre-requisite to understand Resolution)	Lecture	CO3	UT2, Q2	1,2	25/4/23	
	19/9	Shri Ganesh Chaturthi						
31	21/9	Resolution in FOPL **Quiz 2: Online Quiz**	Lecture	CO3	UT2, Q2	1	05/10/23	
32	22/9	Handling uncertain knowledge, random variables	Lecture	CO4	UT2, Q3	1	06/10/23	
33	25/9	Prior and posterior probability	Lecture	CO4	UT2, Q3	1	04/10/23	
	28/9	Anant Chaturdashi						
34	29/9	Full joint distribution	Lecture	CO4	UT2, Q3	1	13/10/23	Holiday declared
	02/10	Gandhi Jayanti						
35	05/10	Bayes rule and its use	Lecture	CO4	UT2, Q3	1	13/10/23	
36	06/10	Bayesian belief network and inference **Quiz 3: Online quiz**	Lecture	CO4	UT2, Q3	1,3	13/10/23	
	09/10	Unit Test-2		CO3,4				
	10/10	Unit Test-2		CO3,4				
37	12/10	The planning problem, partial order planning, total order planning	Lecture	CO5	A2	1,3	18-10-23	
38	13/10	Assignment 2: pre-requisite (concept of supervised, unsupervised, semi supervised, reinforcement learning, ensemble learning)	Lecture	CO5	A2	1,3	19-10-23	
39	16/10	Expert system- concepts and components	Lecture	CO5	A2	1,3	26-10-23	
40	19/10	**Assignment 2- Coding assignment on machine learning**		CO5	A2	1	21-10-23	Theory assignment was given instead of coding
41	23/10	Course end and remedial session	Lecture	CO3,4,5		1		Synergy
	30/10	Dashahera						
		University ESE Examination						

Text Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach", Pearson Education, 2nd edition.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill Education Pvt. Ltd., 3rd edition.
3. George F Luger, "Artificial Intelligence", Pearson Education., 4th edition.

Reference Books:

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2. D. W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall.
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4. Davis E. Goldberg, "Genetic algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
5. Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley, Third Edition
6. N. P. Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press

Course Instructor: Prof. Saurabh Kulkarni

Society of St. Francis Xavier, Pillar's

Fr.Conceicao Rodrigues College of Engineering

Fr. Agnel Ashram, Bandstand, Bandra(West), Mumbai-400050

Course Outcomes (CO) Program Outcome (PO) Mapping:

PO	PO1			PO2			PO3			PO4			PO5			PO6			PO7			PO8			PO9			PO10			PO11			PO12			PSO1			PSO2		
CO	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG	TPI	MPI	MG
CO1	5	1	0.2																																		5	1	0.2			
CO2	5	2	0.4	14	4	0.35				8	1	0.1	6	2	0.3																						5	4	0.8			
CO3	5	1	0.2	14	1	0.07																															5	1	0.2			
CO4	5	2	0.4	14	2	0.34																															5	4	0.8			
CO5	5	1	0.2	14	1	0.07																															5	1	0.2			
CO6																																										

TPI: Total Performance Indicators
MPI: Mapped Performance Indicators
MG: Mapping Grade

Threshold	% Level
3	>=67%
2	66% to 34%
1	<34%

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	1												1
CO2	2	2		1	2								3
CO3	1	1											1
CO4	2	1											3
CO5	1	1											1
Avg	1	1.25		1	2								2

Society of St. Francis Xavier, Pillar's
Fr.Conceicao Rodrigues College of Engineering
Fr. Agnel Ashram, Bandstand, Bandra(West), Mumbai-400050

		Unit Test		Extra				Internal	External			CO Attainment				
		1	2	A1	A2	Q1	Q2	IA	Oral/practical	ESE	EA	Int. (A)	Ext. (B)	Direct (C) (0.4A+0.6B)	Indirect (D)	Overall (0.8C+0.2D)
5	CO1	51						51	45	52	48.5	2	2	2	3	2.2
6	CO2	35		71				53	45	52	48.5	2	2	2	3	2.2
7	CO3		51					51	45	52	48.5	2	2	2	3	2.2
8	CO4		60					60	45	52	48.5	2	2	2	3	2.2
9	CO5		72		77			74.5	45	52	48.5	3	2	2.4	3	2.52

Corelation from CO-PO	Weight
1	0.3
2	0.6
3	1

PO Attainment=Weight X CO Attainment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
													0.66
CO1	0.66												2.2
CO2	1.32	1.32		0.66	1.32								0.66
CO3	0.66	0.66											2.2
CO4	1.32	0.66											0.76
CO5	0.76	0.76		0.66	1.32								6.48
Sum=	4.72	3.4		0.66	1.32								1.296
Avg=	0.94	0.85		0.66	1.32								

for Gaurav 24/9/24

Fr. Conceicao Rodrigues College of Engineering
Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50
Department of Artificial Intelligence and Data Science
PO-Attainment (2023-2024)

CO NUM	COURSE OUTCOME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	CO Attainment
CO NUM	COURSE OUTCOME	Engg Know	Ana	Desi	Proj	Tool	Engg soci	Env	Etics	Ind Team	Comm	PM	Life Long	AI-DS applications	
	Engineering Mathematics - I (FEC101)														
FEC101.1	solve the given system of homogeneous and	3													3
FEC101.2	obtain roots of complex numbers using De Moivre's theorem and also real and imaginary parts of a given complex number.	2													3
FEC101.3	extremum value of the given function of two or three variables.	3													3
FEC101.4	function using Leibnitz theorem [Successive differentiation).	2													3
	TOTAL	10													
	CO-PO MATRIX	2.5													

PO ATTAINMENT	3																		
Engineering Physics - I (FEC102)																			
FEC102.1	Quantum mechanics and its application.	3																3	
FEC102.2	planes, X-ray diffraction and its application.	3																3	
FEC102.3	level in semiconductors and applications of semiconductors in electronic devices.	3																3	
FEC102.4	Interference in thin films and its various applications	3																3	
FEC102.5	Illustrate the basic knowledge of Superconductors and super capacitors.	3																3	
FEC102.6	Engineering materials and applications.	3																Not Includ	
TOTAL	18																		
CO-PO MATRIX	2.4																		
PO ATTAINMENT	3																		

	Engineering Chemistry - I (FEC103)**																		
FEC103.1	chemistry in terms of atomic and molecular orbital theory and relate it to diatomic molecules	2																**2.6**	
FEC103.2	Describe the concept of aromaticity and interpret it with relation to specific aromatic systems.	2																**3**	
FEC103.3	transformations using thermodynamics	2																**3**	
FEC103.4	Illustrate the knowledge of polymers, fabrication methods, conducting polymers in variousindustrial fields.	2																**2.68**	

Code	Description	P1	P2	P3													Attain
FEC103.5	Analyze the quality of water and suggest suitable methods of treatment.	3															**2.44**
	TOTAL	11															
	CO-PO MATRIX	2.2															
	PO ATTAINMENT	**2.59**															
	Engineering Mechanics (FEC104)																
FEC104.1	moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD	3	3	2													2.968
FEC104.2	Centroid and its significance and locate the same.	3	3	2													3
FEC104.3	Correlate real life application to specific type of friction and estimate required force to overcome friction	1	1	1													3
FEC104.4	and acceleration of a particle and analyze the motion by plotting the relation	3	3	2													3
FEC104.5	and establish Kinematic relations for a rigid body	2	2	2													3
FEC104.6	Analyze particles in motion using force and acceleration, work-energy and impulsemomentum principles	3	2	2													2.78
	TOTAL	15	14	11													
	CO-PO MATRIX	2.5	2.33	2													
	PO ATTAINMENT	2.96	2.96	3													
	Basic Electrical & Electronics Engineering (FEC105)																
FEC105.1	determine the circuit response/behavior.	3	3														3

FEC105.2	circuit.	3	2															2.8
FEC105.3	Analyze three phase circuit.	3	2															2.4
FEC105.4	and operation of single phase Transformer.	2																2.3
FEC105.5	single phase and three phase machines.	2																2.8
	TOTAL	13	7															
	CO-PO MATRIX	2.6	2.33															
	PO ATTAINMENT	2.66	2.84															
	Engineering Mathematics-II FEC201																	
FEC201.1	Solve first order and higher order differential equations	3																3
FEC201.2	Apply Beta-Gamma functions to solve integration problems.	2																3
FEC201.3	Rectify the given curve using Cartesian, polar form)	2																3
FEC201.4	integrals to find area of the given region	3																3
	TOTAL	10																
FEC201	**CO-PO MATRIX**	2.5																
	PO ATTAINMENT	3																
	Engineering Physics-II (FEC202)																	
FEC202.1	Illustrate the knowledge of diffraction through slits and its applications.	3																3
FEC202.2	lasers and their applications in different fields, the concepts of optical fibre and its applications in communication system.	3																3
FEC202.3	electrodynamics with required mathematical concepts.	3																3

FEC202.4	Explain fundamentals of relativity.	3																3
FEC202.5	Discuss knowledge of synthesis, characterisation and applications of nonmaterials	3																3
FEC202.6	Illustrate the knowledge of working principles of various sensors.	3																Not Includ
	TOTAL	18																
	CO-PO MATRIX	2.4																
	PO ATTAINMENT	3																
Engineering Chemistry -II (FEC203)																		
FEC203.1	electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.	2																2.8
FEC203.2	Explain the concept of electrode potential and nernst theory and relate it to electrochemical cells.	2																2.8
FEC203.3	and suggest control measures in industries.	2																2.6
FEC203.4	chemistry and study environmental impact	3																2.4
FEC203.5	the quality of fuel and quantify the oxygen required for combustion of fuel	3																2.4
	TOTAL	12																
	CO-PO MATRIX	2.4																
	PO ATTAINMENT	2.53																
Engineering Graphics (FEC204)																		
FEC204.1	Learners will be able to apply the basic principles of projections in Projection of Lines and Planes	3	1	2							2							2.42

FEC204.2	Learners will be able to apply the basic principles of projections in Projection of Solids.	3	1	2								2				2.45
FEC204.3	Learners will be able to apply the basic principles of sectional views in Section of solids.	3	1	2								2				2.38
FEC204.4	Learners will be able to apply the basic principles of projections in converting 3D view to 2D drawing.	3	1	2								2				2.42
FEC204.5	drawing.	3	1	2								2				2.42
FEC204.6	Learners will be able to visualize an object from the given two views	3	1	2								2				2.5
	TOTAL	18	6	12								12				
	CO-PO MATRIX	3	1	2								2				
	PO ATTAINMENT	2.43	2.43	##								2.43				
C-Programming FEC205																
FEC205.1	arithmetic, logical problems and translate them to programs in C language	3											3			2.5
FEC205.2	Implement, test and execute programs comprising of control structures.	3	1	1									3			2.56
FEC205.3	Decompose a problem into functions and synthesize a complete program.	3	1	1									3			2.54
FEC205.4	Demonstrate the use of arrays, strings and structures in C language.	3	1	1									3			2.5
FEC205.5	Understand the concept of pointers	3	1	1									3			2.5
	TOTAL	15	4	4									15			
	CO-PO MATRIX	3	1	1									3			
	PO ATTAINMENT	2.52	2.53	3									2.52			
Professional Communication and Ethics I FEC206																

CO	Statement	1	2	3	4	5	6	7	8	9	10	11	12	Avg
FEC206.1	Effectively use their LSRW skills in the communication process									3				3
FEC206.2	correspondences									2				3
FEC206.3	To expand their vocabulary in correct grammatical form									1				3
FEC206.4	technical and industry-oriented passages									2				3
FEC206.5	To write technical expositions									2				3
	TOTAL									10				
	CO-PO MATRIX									2				
	PO ATTAINMENT									3				
BASIC WORKSHOP PRACTICE 1 & 2 [FEL105 & FEL206]														
FEL105.1/2026.1	Students will be able to develop the necessary skill required to handle/use different fitting tools.	1		1		1				1				2.9
FEL105.2/2026.2	Students will be able to develop skill required for hardware maintenance.	1		1		1				1				2.9
FEL105.3/2026.3	Students will be able to install an operating system and system drives.	1		1		2								2.9
FEL105.4/2026.4	Students will be able to identify the network components and perform basic networking and crimping.	1		1		2								2.9
FEL105.5/2026.5	Students will be able to demonstrate the turning operation with the help of a simple job.	1		1		1				2				2.9
FEL105.6/2026.6	Students will be able to develop the necessary skill required to handle/use different carpentry tools.	1		1		1								2.9
FEL105.7/2026.7	Students will be able to identify and understand the safe practices to adopt in electrical environment.	2		1		1	2							2.9

CO NUM	COURSE OUTCOME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	CO Attainm
FEL105.8/206.8	the wiring practices for the connection of simple electrical load/ equipment.	2		1		1	2								2.9
FEL105.9/206.9	Students will be able to design, fabricate and assemble pcb.	1		2		2	2								2.9
FEL105.10/206.10	to use different sheet metal and brazing tools.	1		1		1				2					2.9
	TOTAL	12		11		13	6			6					
	CO-PO MATRIX	1.2		1		1.3	2			1.5					
	PO ATTAINMENT	2.9		3		2.9	2.9			2.9					
	ENGINEERING MECHANICS LAB														
FEL103.1	Verify equations of equilibrium of coplanar force system	2	2	2											3
FEL103.2	Verify law of moments	2	3	2											3
FEL103.3	lamina	3	3	2											3
FEL103.4	between the different surfaces in contact.	1	1	1											3
FEL103.5	collision/impact and determine corresponding coefficient of restitution.	1	2	2											2.86
FEL103.6	Differentiate the kinematics and kinetics of a particle...			1											2.96
	TOTAL	9	11	10											
	CO-PO MATRIX	1.80	2.20	##											
	PO ATTAINMENT	2.99	2.98	##											
CO NUM	COURSE OUTCOME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	CO Attainm
CO NUM	COURSE OUTCOME	Engg Know	Ana	Desi	Proj	Tool	Engg soci	Env	Etics	Ind Team	Comm	PM	Life Long	AI-DS applicatio	
	Engineering Mathematics III (CSC301)														

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
CSC301.1	Evaluate the Laplace Transform of a given piecewise continuous function	3	2	2										2	2	2.3
CSC301.2	Transform of a given bounded function	3	2	2										2	2	2.1
CSC301.3	Expand the given periodic function as a Fourier series	3	2	2										2	2	1.75
CSC301.4	Apply complex variable theory in finding the orthogonal trajectory of the given family of curves	3	2	2										2	2	2.2
CSC301.5	Regression to engineering problems in data science, machine learning, and AI.	3	2	2										2	2	2.55
CSC301.6	expectation for getting the spread of the data and distribution of probabilities.	3	2	2										2	2	2.65
	TOTAL	18	12	12										12	12	
	CO-PO MATRIX	3	2.00	2										2	2	
	PO ATTAINMENT	2.258	2.26	2										2.26	2.26	

Discrete Structures and Graph Theory (CSC302)

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
CSC302.1	Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem	3									3				3	2.36
CSC302.2	Ability to reason logically.	3	3	3	3		2			3	3			2	3	2.2
CSC302.3	Ability to understand relations, functions, Diagraph and Lattice.	3	3	3	3	2				3	3	3		2	3	1.88
CSC302.4	Ability to understand and apply concepts of graph theory in solving real world	3	3	3	3	2				3	3	3		2	3	2.2
CSC302.5	Demonstrate use of groups and codes in Encoding-Decoding (Analyze)	3	3	3	2	2				3	3	3		2	3	2.52

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
CSC302.6	Analyze a complex computing problem to find solution using principles of discrete mathematics	3	3	3	3	2			3	3	3	2			3	2.68
	TOTAL	18	15	15	14	8	2		15	18	12	10		18		
	CO-PO MATRIX	3.00	2.50	##	2.3	1.3	0.33		2.5	3	2	1.67		3.00		
	PO ATTAINMENT	2.307	2.3	2	2.3	2.3	2.2		2.3	2.307	2.32	2.3		2.31		

Data Structure (CSC303)

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
CSL303.1	Able to implement Linear and Non-	3												3	3	2.6
CSL303.2	Able to handle various operations like	3												3	3	2.2
CSL303.3	Able to explain various data	3	1		4									3	3	2.6
CSL303.4	Able to choose appropriate data	3	3	2										3	3	2.6
CSL303.5	Able to analyze and Implement	3	3	2										3	3	2.4
CSL303.6	Able to demonstrate the ability to	3	3	2										3	3	2.6
	TOTAL	18	10	6	4									18	18	
	CO-PO MATRIX	3	2	1	1									3	3	
	PO ATTAINMENT	2.58	1.76	1	2.7									2.58	2.58	

Digital Logic & Computer Architecture (CSC304)

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
CSC304.1	and basic structure of computer	2													3	2.5
CSC304.2	algorithms.	2	1												3	2.5
CSC304.3	digital components and processor	2		1											3	2.5
CSC304.4	signals of computer	2													3	2.5
CSC304.5	organization	2	1												3	2.5
CSC304.6	processing and different Buses.	2	1	1											3	2.5
	TOTAL	12	3	2											18	
	CO-PO MATRIX	2	1	1											3	
	PO ATTAINMENT	2.5	2.5	3											2.5	

Computer Graphics (CSC305)

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
CSC305.1	Compute pixel positions for a given	3	2												3	2.87

Code	CO	1	2	3	4	5	6	7	8	9	10	11	12	Avg
CSC305.2	Apply 2D &3D transformations on	3	2	3									3	2.75
CSC305.3	Apply clipping algorithms on 2D	3	2	3									3	2.65
CSC305.4	Explain viewing and modelling	3	2	3									3	2.65
CSC305.5	applied to 3D objects.	3	2	2									3	2.54
	TOTAL	15	10	11									15	
	CO-PO MATRIX	3	2	2									3	
	PO ATTAINMENT	2.7	2.3	2.3									2.40	
	Data Structure Lab (CSL301)													
CSL301.1	Implement various linear data	3										3	3	2.4
CSL301.2	Implement various non linear data	3										3	3	2.6
CSL301.3	Implement appropriate searching	3	1						3			3	3	2
CSL301.4	Choose appropriate data structure and	3	3	2				2	3		1	3	3	2.5
	TOTAL	12	4	2				2	6		1	12	12	
	CO-PO MATRIX	3	1	1				0.5	1.5		0.25	3	3	
	PO ATTAINMENT	2.375	2.38	3				2.5	2.25		2.5	2.38	2.38	
	Digital Logic & Computer Architecture Lab (CSL302)													
CSL302.1	To understand the basics of digital	3	2		3								2	2.75
CSL302.2	computer: ALU, registers, CPU and	3	2		3								2	2.75
CSL302.3	systems in computer architecture	3	2		3								2	2.5
CSL302.4	arithmetic operations	3	2		3								2	2
	TOTAL	12	8		12								8	
	CO-PO MATRIX	3	2		3								2	
	PO ATTAINMENT	2.5	2.5		2.5								2.5	
	Computer Graphics Lab (CSL 303)													

CO	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	Avg
CSL303.1	primitive algorithms.	3	2											3	2.8
CSL303.2	clipping algorithms on graphical	3	2											3	2.8
CSL303.3	generation methods.	3	2											3	2.6
CSL303.4	application/animation based on the	3	2	3	2	3			2	3	3	3		3	2.7
	TOTAL	12	8	3	2	3			2	3	3	3		12	
	CO-PO MATRIX	3	2	1	0.5	0.8			0.5	0.75	0.75	0.75		3	
	PO ATTAINMENT	3	3.00	##	3	3			3	3	3	3		3.00	

Skill base Lab course: Object Oriented Programming with Java (CSL304)

CO	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	Avg
CSL304.1	To apply fundamental programming	3	3	3										3	2.2
CSL304.2	To illustrate the concept of packages, classes and objects.	3	3	3										3	2.1
CSL304.3	To elaborate the concept of strings,	3	3	3										3	2.4
CSL304.4	To implement the concept of	3	3	3										3	2.2
CSL304.5	To implement the concept of exception handling and	3	3	3										3	1.97
CSL304.6	To develop OOP based application.	3	3	3		3				3	3	2	3	3	2.1
	TOTAL	18	18	18		3				3	3	2	3	18	
	CO-PO MATRIX	3	3	3		0.5				0.5	0.5	0.33	0.5	3	
	PO ATTAINMENT	2.162	2.16	2	###	2.1	####	####	####	2.1	2.1	2.1	2.1	2.16	

Mini Project – 1 A (CSM 301)

CO	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	Avg
CSM 301.1	Identify problems based on societal	3	2											2	2.5
CSM301.2	Develop interpersonal skills to work	3	2											2	2.5
CSM301.3	Draw the proper inferences from	3	2		2									2	2.5
CSM301.4	Analyze the impact of solutions in	3	2		2									2	2.5
CSM301.5	Demonstrate project management	3	2	3										2	2
	TOTAL	15	10	3	4									10	
	CO-PO MATRIX	3	2	1	0.8									2	
	PO ATTAINMENT	2.50	2.50	##	###									2.4	

Engineering Mathematics IV (CSC401)

CSC401.1	eigen vectors to diagonalise the given square matrix	2																	2.43
CSC401.2	Evaluate the line integral of a given complex variable function	2																	2.55
CSC401.3	Execute the Z-transform and the inverse Z-transform	2																	1.98
CSC401.4	Classify the hypothesis testing for large and small samples	3																	2.44
CSC401.5	problem (LPP) to obtain the optimal solution	2																	2.65
CSC401.6	problem (NLPP) to obtain the optimal solution	2																	2.4
	TOTAL	13																	
	CO-PO MATRIX	2.17																	
	PO ATTAINMENT	2.411																	
	Analysis of Algorithm (CSC402)																		
CSC402.1	Analyze the running time and space	3	3	2	3										2		3	2.4
CSC402.2	complexity of divide and conquer	3	3	3	2												3	2.2
CSC402.3	complexity of greedy strategy.	3	3	3	2												3	2.4
CSC402.4	Describe, apply and analyze the	3	3	3	2												3	2.4
CSC402.5	Explain and apply backtracking,	3	3	3	2												3	2.4
CSC402.6	techniques.	3	3	3	2												3	2.4
	TOTAL	18	18	17	13										2		18	
	CO-PO MATRIX	3.0	3.0	3.0	3.0										1.0		3.0	
	PO ATTAINMENT	2.49	2.49	##	###										1.29		2.49	
	(CSC403)																		
CSC403.1	management system	3								3	3	2						2.23
CSC403.2	life applications	3	3	3											2			2.4

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
CSC403.3	relational algebra queries.	3	3	3										2		2.21
CSC403.4	Formulate SQL queries	3	3		3									2	3	2.1
CSC403.5	relational database design.	3	3													2.23
CSC403.6	concurrency and recovery.	3													3	2.4
	Total	18	12	6	3				3	3	2			6	6	
	CO-PO MATRIX	3	2	1	0.5				0.5	0.5	0.33			1	1	
	PO ATTAINMENT	1.667	1.6	2	1.6				2.04	2.04	2.04			1.72	1.56	
Operating System (CSC404)																
CSC404.1	Understand the objectives ,functions	3	2		2										3	2.86
CSC404.2	Analyze the concept of process	3	2		2										3	2.65
CSC404.3	Understand and apply concepts of	3	2		2										3	2.52
CSC404.4	Evaluate performance of memory	3	2		2										3	2.52
CSC404.5	Understand the concepts of file	2	2		2										3	2.4
CSC404.6	Apply concepts of I/O management	2	2		2										3	2.4
	TOTAL	16	12		12										18	
	CO-PO MATRIX	2.67	2		2										3	
	PO ATTAINMENT	2.6	2.52		2.5										2.43	
Microprocessor (CSC405)																
CSL405.1	Describe core concepts of 8086	3	2		3										2	2.5
CSL405.2	write assembly language programs.[	3	2		3										2	2
CSL405.3	Design 8086 based system using	3	2		3										2	2.5
CSL 405.4	processor.	3	2		3										2	2.5
	TOTAL	12	8		12										8	
	CO-PO MATRIX	3	2		3										2	
	PO ATTAINMENT	2.375	2.375		2.4										2.38	
Analysis of Algorithm Lab (CSL401)																

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	Att
Analysis of Algorithm (CSC402)															
CSC402.1	Analyze the running time and space	3	3	2	3							2		3	2.5
CSC402.2	complexity of divide and conquer	3	3	3	2									3	2.2
CSC402.3	complexity of greedy strategy.	3	3	3	2									3	2.4
CSC402.4	Describe, apply and analyze the	3	3	3	2									3	2.4
CSC402.5	Explain and apply backtracking,	3	3	3	2									3	2.4
CSC402.6	techniques.	3	3	3	2									3	2.4
	TOTAL	17	18	17	13							2		18	
	CO-PO MATRIX	3.0	3.0	3.0	2.0							1.0		3.0	
	PO ATTAINMENT	2.20	2.49	##	###							1.29		2.49	
Lab(CSL402)															
CSL402.1	Design ER/EER diagram and convert	3	2	3	3					3	3	3		2	2.78
CSL402.2	Apply DDL,DML,DCL and TCL	3	2		3	3								2	2.82
CSL402.3	Write simple and complex queries	3	2		3	3								2	2.9
CSL402.4	Use PL/SQL constructs	3	2		3	3								2	2.93
CSL402.5	Demonstrate the concept of	3	2		2	3								2	2.9
	TOTAL	15	10	3	14	12				3	3	3		10	
	CO-PO MATRIX	3	2	1	2.8	2.4				0.6	0.6	0.6		2	
	PO ATTAINMENT	2.952	2.95	3	1.8	2.9				3	3	3		2.95	
Operating System Lab(CSL403)															
CSL403.1	Demonstrate basic operating system	2								3	3			3	
CSL403.2	Implement various process scheduling	1	1							3	3			3	
CSL403.3	Implement and analyse concepts of	1	2							3	3			3	
CSL403.4	Implement various memory	1	2							3	3			3	
CSL403.5	virtual memory.	1	2							3	3			3	
CSL403.6	file management and I/O management	1	2							3	3			3	
	TOTAL	7	9							18	18			18	
	CO-PO MATRIX	1.16	1.5							3	3			3	
	PO ATTAINMENT	2.34	2.3							2.2	2.25			2.25	

		c1	c2	c3	c4	c5	c6	c7	c8	c9	c10	c11	c12	c13	Avg
Microprocessor Lab (CSL404)															
CSL404.1	Use appropriate instructions to	3	2			3								2	2.5
CSL404.2	Develop the program in assembly/	3	2			3								2	2.5
CSL404.3	Demonstrate the execution and	3	2			3								2	2.5
	TOTAL	9	6			9								6	
	CO-PO MATRIX	3	2			3								2	
	PO ATTAINMENT	2.5	2.5			###								2.50	
Skill Base Lab Course: Python Programming (CSL405)															
CSL405.1:	Demonstrate basic concepts of python such as control statements, basic data	3	3											1	2.2
CSL405.2:	Explore file handling and text	3	3											1	2.2
CSL405.3:	Develop program for data structure	3	3											1	2.76
CSL405.4:	Develop python based GUI and	3	3			3				2	3			2	2.28
CSL 405.5:	Develop real world application using frameworks/ libraries in python.	3	3											1	2.2
	TOTAL	15	15			3				2	3			6	
	CO-PO MATRIX	3	3			1				1	1			2	
	PO ATTAINMENT	2.5	2.94			###				1.5	2.3			2.15	
Mini Project 1-B (CSM401)															
CSM 401.1	Identify problems based on societal	2	3	3	3	3	3	3	3	3	3	3	3	3	2.75
CSM401.2	Develop interpersonal skills to work	2	3	2	3		3	3	3	3	3	3	3	3	2.75
CSM401.3	Draw the proper inferences from	2	2	3		3			3	3	3	3	2	2	2.55
CSM401.4	Analyze the impact of solutions in	2	2	2		3			3	3	3	3	2	2	2.5
CSM401.5	Demonstrate project management	2	2	2	3	3		3	3	3	3	3	2	2	2.65
	TOTAL	10	12	12	9	12	6	12	15	15	15	15	12	12	
	CO-PO MATRIX	2	2	2	2	2	1	2	3	3	3	3	2	2	
	PO ATTAINMENT	2.1	2.1	1.9	1.9	2.0	0.7	2.1	3.0	3.0	2.8	2.8	1.9	1.9	
Computer Network (CSC501)															

CSC501.1	networks and working of various	3	2												2	2.5
CSC501.2	of protocols design while delving into	3	2												2	2.5
CSC501.3	weaknesses of various routing	3	2		2										2	2.5
CSC501.4	and application layer protocols	3	2		2										2	2.5
CSC501.5	given user requirements in an	3	2	3											2	2
	TOTAL	15	10	3	4										10	
	CO-PO MATRIX	3	2	1	0.8										2	
	PO ATTAINMENT	2.50	2.50	##	###										2.4	
	Web Computing (CSC502)															
CSC502.1	Select protocols or technologies	3	2												2	
CSC502.2	Apply JavaScript to add functionality	3	3	3						3					2	
CSC502.3	Design front end application using	3	3	3		3				3					2	
CSC502.4	Construct web based Node.js	3	3	3		3				3					2	
CSC502.5	Design back-end applications using	3	3	3		3				3					2	
CSC502.6	Construct React-Node based web real	3	3	3	2	3			2	3	3	2	3		3	
		18	17	15	2	12			2	15	3	2	3		13	
	CO-PO MATRIX	3	2.83	3	0.3	2	0	0	0.33	2.5	0.5	0.33	0.5		2.17	
	PO ATTAINMENT	2.83	2.82	3	2.8	2.7	0	0	2.84	2.79	2.84	2.84	2.84		2.83	
	Artificial Intelligence (CSC503)															
CSC503.1	Identify the characteristics of the	0.66													0.66	2.2
CSC503.2	Apply a suitable search strategy to	1.32	1.32		0.7	1.3									2.2	2.2
CSC503.3	Design knowledge-based agents using	0.66	0.66												0.66	2.2
CSC503.4	Apply a probabilistic model for	1.32	0.66												2.2	2.2
CSC503.5	Describe various learning techniques	0.76	0.76												0.76	2.52
	TOTAL	4.72	3.4		0.7	1.3									6.48	
	CO-PO MAPPING															
	PO ATTAINMENT	0.94	0.85		0.7	1.3									1.3	
	Data Warehousing & Mining (CSC504)															

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Avg
CSL503.1	Build data warehouse to organize	2	3	3													3	2.24
CSL503.2	Analyze data using OLAP operations	2	3	2	2	3									2		3	2.3
CSL503.3	Apply data exploration and data	2	3			3									3		2	2.1
CSL503.4	Apply the appropriate data mining	2	3	2	2	3									2		2	2.1
CSL503.5	Measure the performance of different	2	3	2	2	3											3	2.4
CSL503.6	Explain different web mining			2	2	2											2	2.71
	TOTAL	10	15	9	8	12									7		13	
	CO-PO MATRIX	1.667	2.5	2	1.3	2									1.17	0	2.17	
	PO ATTAINMENT	2.77	2.77	3	2.4	2.9									2.16		2.56	

Department Level Optional Course- 1 (Statistics for Artificial Intelligence & Data Science) CSDLO5011

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Avg
.1	Apply Exploratory Data Analysis	2	2		2												2	2.52
.12	Use discrete and continuous	3															2	2.61
.1 3	Apply hypothesis testing techniques	2	2		2												2	2.3
.14	Explain analysis of Variance by	2	2														3	2.6
.15	Calculate and interpret simple and	2			2												2	2.12
	TOTAL	11	6		6												13	
	CO-PO MATRIX	2	2		2												3	
	PO ATTAINMENT	2.446	2.48		2.3												2.07	

Department Level Optional Course- 1 (Distributed Computing) CSDLO50

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Avg
CSDLO5O.1	To provide students with	3		2														2.5
CSDLO5O.2	To explore the various methods used	3		2	2	2												2.5
CSDLO5O.3	To provide skills to measure the	3	2	2	2													2.5
CSDLO5O.4	To provide knowledge of resource	3		2	2													2.5
CSDLO5O.5	To learn issues involved in	3	3	2														2.5
CSDLO5O.6	To equip students with skills to	3	3		2													2.5
	TOTAL	18	8	10	8	2												
	CO-PO MATRIX	3	1.33	2	1.3	0.3												

	PO ATTAINMENT	2.5	25	3	2.5	2.5										
	Web Computing and Network Lab (CSL501)															
CSL501.1	Identify and apply the appropriate	3				3									3	2.63
CSL501.2	Identify and apply the appropriate	3	3	3	2	3				2	2	2	2		3	2.44
CSL501.3	Construct responsive websites using	3	3	3	2	3				2	2	2	2		3	2.1
CSL501.4	Use JavaScript to develop interactive	3	3	3	2	3				2					3	2.33
CSL501.5	Construct front end applications using			2						3				2	2	2.5
CSL501.6	Use simulator for CISco packet	2			3					3			2	2		2.4
	TOTAL	14	9	11	6	15	0	0	0	9	7	4	8	0	16	
	CO-PO MATRIX	3	3	3	2	3				2	2	2	2		3	
	PO ATTAINMENT	2.036	1.51	3	0.7	2.4				2.88	1.297	1.22	2.36		2.55	
	Artificial Intelligence Lab (CSL502)															
CSL502.1	given AI problem.	3	3							3	3				**1**	2.2
CSL502.2	and rules.	3	3	2		2									**2**	2.2
CSL502.3	for problem solving agent.	3	3	2	1	2									**2**	2.2
CSL502.4	knowledge representation and	3	2												**3**	2.2
CSL502.5	for a given problem and draw	3	3			2									**3**	1.88
CSL502.6	Discuss the components of real-world	3	2												**2**	2.2
	TOTAL	4.43	3.77	1	3.2	3.8									8.04	
	CO-PO MATRIX															
	PO ATTAINMENT	0.74	0.75	1	1.1	1.3									1.34	
	Data Warehousing & Mining Lab (CSL503)															
CSL503.1	Build a data warehouse	2	-	3		3				3	3	3	3		2	2.54
CSL503.2	so as to take strategic decisions.	2	3	3		2				3	3	3	3		2	2.52
CSL503.3	importance of data mining	2	3	3		3				3	3		3		2	2.44
CSL503.4	for data mining using pre	2	3	3		3				3	3		3		2	2.41
CSL503.5	data to be used for mining.	2	3	3		3				3	3		3		2	2.5
CSL503.6	mining methods like classification,	2	3	3		3				3	3		3		2	2.43

	Total	12	15	18		17				18	18	6	18	12	
	CO-PO MATRIX	2	2.5	3		2.8				3	3	1	3	2	
	PO ATTAINMENT	2.473	2.46	2		2.5				2.47	2.473	2.53	2.47	2.47	
	Business Communication and Ethics-II (CSL504)														
ITC505.1	correct language and style									2	1	2	3		3
ITC505.2	Frame a technical and business									2	1	2	3		3
ITC505.3	Demonstrate interpersonal skills with									3	3	3	3		3
ITC505.4	efficiently									2	2	2	3		3
ITC505.5	Prepare for campus placement and									2	1	2	3		3
	TOTAL									11	8	11	3		
	CO-PO MATRIX									1.8	1.3	1.8	3		
	PO ATTAINMENT									0.82	3	3	3.00		
	Mini Project : 2A (CSM501)														
CSM501.1	Identify	2	3			3	3	3	3	3				2	3
CSM501.2	Identify Methodology for solving	2	3	3	3	1			2	3	3			2	3
CSM501.3	Validate, Verify the results using test	2	3		3	3				3	3			2	3
CSM501.4	Use standard norms of engineering	2					3	3	3	3	3	3	3	2	3
CSM501.5	Demonstrate capabilities of self-	2	2								3			2	3
CSM301.6	Develop interpersonal skills to work								3	3	3	3		2	3
	TOTAL	10	11	3	6	7	6	6	11	15	15	6	3	12	
	CO-PO MATRIX	1.7	1.8	0.5	1.0	1.2	1.0	1.0	1.8	2.5	2.5	1.0	0.5	2.0	
	PO ATTAINMENT	3	3	3	3	3	3	3	3	3	3	3	3	3	
	Data Analytics and Visualization (CSC601)														
CSC601.1	Comprenhend basics of data analytics				1	1								1	2.52
CSC601.2	Apply various regression models on a		2		2									2	2.52
CSC601.3	Demonstarte advance understanding					2								2	2.16
CSC601.4	Analyze text data and gain insights					2								2	1.88
CSC601.5	Experiment with different analytics						2							3	2.52

Code	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	Att
CSC601.6	Experiment with different analytics					2								3	2.36
	TOTAL	2	2		5	5								13	
	CO-PO MATRIX	0.333	0.33		0.8	0.8								2.2	
	PO ATTAINMENT	2.00	2		1.8	16								2.33	

Cryptography and System Security (CSC602)

Code	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	Att
CSC602.1	and apply classical encryption	3	3											2	1.72
CSC602.2	decryption techniques to solve	3	3											2	1.56
CSC602.3	evaluate the performance of different	3	3	2										2	1.56
CSC602.4	algorithms to achieve authentication	3	3											2	1.72
CSC602.5	secure system assets like OS and	2	3											2	1.24
CSC602.6	security to web applications	2	3											2	2.04
	TOTAL	16	18	2										12	
	CO-PO MATRIX	1.8	3	3										2	
	PO ATTAINMENT	1.6	1.64	2										1.64	1.64

Software Engineering and Project Management (CSC603)

Code	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	Att
CSC603.1	in software engineering	3	-	-	-	3	2	-						3	1.4
CSC603.2	prepare models.	3	3	-	-	3	-	-						3	1.4
CSC603.3	of the projects	2	-	3	2	3	-	-						3	2.04
CSC603.4	solutions for the growth of society	3	-	3	-	3	-	-						3	1.4
CSC603.5	software solutions	3	-	2	3	3	-	3						3	1.4
CSC603.6	construct, design and develop	3	-	-	2	3	-	-						3	2.04
	TOTAL	17	3	8	7	18	2	3						18	
	CO-PO MATRIX	2.833	0.5	1	1.2	3	0.33	0.5						3	
	PO ATTAINMENT	1.588	1.4	2	1.8	1.6	1.4	1.4						1.61	

Machine Learning (CSC604)

Code	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	Att
CSC604.1	Learning		3			3								3	2.6
CSC604.2	machine learning		3											3	2.2

CO	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	Avg
CSC604.3	models	3	3	3	2	3				2					3	2.4
CSC604.4	Select suitable Machine learning	3	3	3	2	3				2	2	2	2	3	2.5
CSC604.5	Build Neural Network based models	3	3	3	2	3				2	2	2	2	3	2
CSC604.6	Apply Dimensionality Reduction	3	3	3	2	3				2	3	2		3	2.3
	TOTAL	18	12	12	8	15				8	7	6	4	18	
	CO-PO MATRIX	3	3	3	2	3				1.3	1.2	1.0	0.7	3.0	
	PO ATTAINMENT	1.95	0	1	1.1	1.9				2.3	2.271	2.27	2.25	2.33	
Data Analytics and Visualization Lab (CSL601)															
CSC601.1	and visualization.					3								2	3
CSC601.2	given data set and perform prediction.		2			2								2	3
CSC601.3	of Time series concepts and analysis		2			2								2	3
CSC601.4	Analyze Text data and gain insights.		2			2								2	3
CSC601.5	techniques and visualization using R.					3								3	3
CSC601.6	techniques and visualization using					3								3	3
	TOTAL		6			15								14	
	CO-PO MATRIX		2			2.5								2.33	
	PO ATTAINMENT		3			3								3	
(CSL602)															
CSL602.1	symmetric cryptography problems.	2	1			2								2	1.4
CSL602.2	implement block ciphers.	2	1			2								2	1.72
CSL602.3	hashing algorithms.	2	1			2								2	1.72
CSL602.4	reconnaissance tools to gather	2	1			2								2	1.72
CSL602.5	scanners and other related tools for	1	1			2								1	2.04
CSL602.6	Apply different application security	1	1			2								1	2.04
	TOTAL	18	15			15								12	
	CO-PO MATRIX	3	2.5			2.5								2	
	PO ATTAINMENT	1.4	1.47			1.8								1.72	

Software Engineering and Project Management Lab (CSL603)

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CSL603.1	To understand the fundamentals of	3		3	3	3								3	3
CSL603.2	―version control system‖ to	3		3	3	3								3	3
CSL603.3	Understand the importance of	3	3	3	3	3								3	3
CSL603.4	Jenkins to Build and deploy Software	3	3	3	3	3								3	3
CSL603.5	containerization and Analyze the	3	3	3	3	3								3	3
CSL603.6	and provisioning using Ansible.	3		3	3	3								3	3
	TOTAL	18	9	18	18	18								18	
	CO-PO MATRIX	3	1.5	3	3	3								3	
	PO ATTAINMENT	3	2.67	3	3	3								3	

Machine Learning Lab (CSL604)

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CSC604.1	Learning	3		3	3	3								3	3
CSC604.2	machine learning	3		3	3	3								3	3
CSC604.3	models	3	3	3	3	3								3	3
CSC604.4	Select suitable Machine learning	3	3	3	3	3								3	3
CSC604.5	Build Neural Network based models	3	3	3	3	3								3	3
CSC604.6	Apply Dimensionality Reduction	3		3	3	3								3	3
	TOTAL	18	9	18	18	18								18	
	CO-PO MATRIX	3	1.5	3	3	3								3	
	PO ATTAINMENT	3	2.67	3	3	3								3	

Skill base Lab Course: Cloud Computing (CSL605)

CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CSL605.1	Implement different types of	3	2			3			3					3	
CSL605.2	service models and implement them	3	3	3		3			3					3	
CSL605.3	Design and develop real world web	3	3	3	3	3			3	3	3	3		3	
CSL605.4	Explain major security issues in the	3	2	2		3			3					3	
CSL605.5	Explore various commercially	3	3	3		3			3					3	
CSL605.6	containerization	3	3	3		3			3					3	
	TOTAL	18	16	14	3	18			18	3	3	3		18	
	CO-PO MATRIX	3	2.67	2	0.5	3			3	0.5	0.5	0.5		3	

Code	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	Avg
	PO ATTAINMENT	3.00	3.00	##	###	###				3.00	3.00	3.00	3.00		3.00	
	Mini Project Lab: 2B (CSM601)															
CSM601.1	Validate, Verify the results using test	2	3	3	3	3	2	2	3	3	3	3	2		3	3
CSM601.2	Analyze and evaluate the impact of		3	3	3	3	3	3	3	3	3	3	2		3	3
CSM601.3	Use standard norms of engineering	2	3	3	3	3	3	3	3	3	3	3	3		3	3
CSM601.4	Communicate through technical		3	3	3	3				3	3	3	3		3	3
CSM601.5	Gain technical competency towards		3	3	3	3				3	2	3			3	3
CSM601.6	Demonstrate capabilities of self-		3	3	3	3				3	3	3	3		3	3
CSM601.7	Develop interpersonal skills to work		3	3	3	3	3	3	3	3	3	2	3		3	3
	Total	4	21	21	21	21	11	11	21	20	21	17	19		21	
	CO-PO MATRIX	0.571	3	3	3	3	1.57	1.57	3	2.86	3	2.43	2.71	0	3	
	PO ATTAINMENT	3	3	3	3	3	3	2.18	3	3	3	3	3		3	
	Deep Learning (CSC701)															
CSC701.1	Recognize the trend in neural network	3	2												1	2.2
CSC701.2	and regularization techniques on a	3	3	1	2	1					1				3	2.2
CSC701.3	Solve well-defined problems using	3	2												2	2.2
CSC701.4	deep learning through a proper	3	1	1						2	1				3	2.52
	TOTAL	8.8	5.6	1	1.3	0.7				1.51	1.42				6.7	
	CO-PO MATRIX															
	PO ATTAINMENT	2.2	1.4	1	1.3	0.7				1.51	0.71				1.68	
	Big Data Analytics (CSC702)															
CSC702.1	Discuss the key issues in big data		1												2	2.34
CSC702.2	Illustrate problem solving using	2	2												2	2.36
CSC702.3	Describe the features and Design the	1	1	1											2	2.2
CSC702.4	Interpret business models and	1	2												2	2.41
CSC702.5	Describe the concepts of Finding	2	2												2	2.6
CSC702.6	Illustrate real time Big Data Models	2	2												2	2.5
	TOTAL	8	10	1											12	

Code	Description	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	Avg
	CO-PO MATRIX	1.6	1.67	1										2	
	PO ATTAINMENT	2.441	2.43	2										2.4	
	(CSDO7011) Natural Language														
CSDO7011.1	Describe the steps of natural language	2												2	2.56
CSDO7011.2	Design language model for word level	3												2	2.34
CSDO7011.3	Demonstrate various POS tagging	2	2		2									2	2.67
CSDO7011.4	Do semantic and pragmatic analysis	2	2											3	2.2
CSDO7011.5	Formulate the discourse segmentation	2			2									2	2.3
	TOTAL	11	4		4									11	
	CO-PO MATRIX	2	2		2									2	
	PO ATTAINMENT	2.407	2.44		###									2.39	
	(CSDO7022)														
CSDO7022.1	Describe the basic concept of	1												1	2.04
CSDO7022.2	network, nodes, keys, wallets and	1			1									1	2.04
CSDO7022.3	Implement smart contracts in		2			1								1	1.88
CSDO7022.4	Develop applications in permissioned						1							1	2.04
CSDO7022.5	Interpret different Crypto assets and		2											1	1.84
CSDO7022.6	AI, IoT and Cyber Security using case	1	1		1									1	2.04
	TOTAL	3	5		2	1	1							6	
	CO-PO MATRIX	0.5	0.83		0.3	0.2	0.17							1	
	PO ATTAINMENT	2.04	1.9		2	1.9	2.04							1.98	
	(ILO7013)														
ILO7013.1	Explain how information systems		2	2	3				2	2	3	3	3	2	2.55
ILO7013.2	Identify the impact information systems		2	3		2				2	3		2	3	2.32
ILO7013.3	Describe IT infrastructure and its		2	2	3	3			2	2			2	3	2.8
ILO7013.4	Understand the principal tools and		2	2	2					2	3	3	3	3	2.65
ILO7013.5	Identify the types of systems used for		2	2		2			2	2	3		2	2	2.1

Code	CO / Description															
	TOTAL	3	5	11	2	1	1		4	10	14	6	12		13	
	CO-PO MATRIX	0.5	0.83	2	0.3	0.2	0.17		0.57	1.43	2	0.86	1.71		1.86	
	PO ATTAINMENT	2.04	1.9	2	2	1.9	2.04		2.33	2.48	2.461	2.6	2.5		2.51	
	Deep Learning Lab (CSL701)															
CSL701.1	model for a given a problem.	2.52	0.76		1.5	0.8									2.52	2.52
CSL701.2	network using various learning	2.2	1.32	1	2.2	1.3									2.2	2.2
CSL701.3	for given problem.	1.13	1.13		1.1	1.1									1.88	1.88
	TOTAL	5.85	3.21	1	4.8	3.2									6.6	
	CO-PO MATRIX															
	PO ATTAINMENT	1.95	1.07	1	1.6	1.1									2.2	
	Big Data Analytics Lab (CSL702)															
CSL702.1	Solve simple Big Data problems		2												2	2.84
CSL702.2	Collect, Store, Manage and Query Big		2	2		3									2	2.36
CSL703.3	Implement algorithms of streaming		2	3	2	2			1	1					2	2.68
CSL704.4	Analyse and Visualise data for			2		1									2	2.2
CSL705.5	Solve real world problems in decision		3	2	3	2			1	2					2	2.5
	TOTAL		9	9	5	8			2	3					10	
	CO-PO MATRIX		1.8	2	1	1.6			0.4	0.6					2	
	PO ATTAINMENT		2.58	2	2.6	2.5			2.59	2.56					2.52	
	Department Level Optical Course-3 Lab (CSDOL7011)															
CSDOL7011	Apply various pre-processing		2			3									3	2.65
CSDOL7011	Implement language model to do		3			3									3	2.7
CSDOL7011	Get grammatical structure details of		2			3									3	2.6
CSDOL7011	Realize semantics and pragmatic		3												3	2.34
CSDOL7011	To design and implement appropriate		3	3	3	3									3	2.81
	Total		13	3	3	12									15	
	CO-PO MATRIX															
	PO ATTAINMENT		2.62	3	2.8	2.7									2.62	

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Department Level Optical Course-4 Lab (CSDOL7022)															
.1	Develop and test smart contracts on	1												1	3
.2	Develop and test smart contracts on	1			1									1	3
.3	Write and deploy smart contracts		2		1									1	3
.4	Design and develop Cryptocurrency.					1								1	3
.5	Write and deploy chain code in		2											1	3
.6	Develop and test a Full-fledged DApp	1	1		1									1	3
	TOTAL	3	5		2	1	1							6	
	CO-PO MATRIX	0.5	0.83		0.3	0.2	0.17							1	
	PO ATTAINMENT	3.00	3.00		###	###	3.00							3	
Major Project1 (CSP701)															
CSM501.1	Identify	2	3				3	3	3	3	3			2	3
CSM501.2	Identify Methodology for solving	2	3	3	3	1			2	3	3			2	3
CSM501.3	Validate, Verify the results using test	2	3	3	3	3				3	3			2	3
CSM501.4	Use standard norms of engineering	2		3		3	3	3	3	3	3	3		2	3
CSM501.5	Demonstrate capabilities of self-	2	2									3		2	3
CSM301.6	Develop interpersonal skills to work								3	3	3		3	2	3
	TOTAL	10	11	9	6	7	6	6	11	15	15	6	3	12	
	CO-PO MATRIX	1.7	1.8	1.5	1.0	1.2	1.0	1.0	1.8	2.5	2.5	1.0	0.5	2.0	
	PO ATTAINMENT	3	3	3	3	3	3	3	3	3	3	3	3	3	
Advanced Artifical Intelligence															
CSC801.1	Solve well-defined problems using	3	2			2								3	2.2
CSC801.2	Improve the performance of AI	3	2		2	2					1			3	2.2
CSC801.3	Enhance the predictive performance	3	2			2								3	2.2
CSC801.4	Discuss the nascent applications of AI	1	1	1						2	1			1	2.52
	TOTAL	8.8	5.6	1	1.3	0.7				1.51	1.42			6.7	
	CO-PO MATRIX														
	PO ATTAINMENT	2.2	1.4	1	1.3	0.7				1.51	0.71			1.68	
Department Level Optional Course -5	RS														

Code	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	Avg
CSDO8022.1	Analyze the field of Recommendation	3	-	-	-	3	-	-						2	2.68
CSDO8022.2	In-depth Knowledge of the	3	3	2	-	3	-	-						2	2.68
CSDO8022.3	Interpret the architecture and working	-	3	2	3	3	-	-						2	2.36
CSDO8022.4	nterpret the architecture and basics of	-	-	2	3	3	-	-						2	2.36
CSDO8022.5	Analyze hybrid and ensemble	-	-	2	-	3	-	-						2	2.36
CSDO8022.6	Evaluation of recommendation	-	-	-	-	3	-	-						2	2.36
	TOTAL	6	6	8	6	18								12	
	CO-PO MATRIX	1	1	1	1	3								2	
	PO ATTAINMENT	2.68	2.52	2	2.4	2.5								2.47	
Department Level Optional Course -6															
CSDO8023.1	Explain Concept of Social Media		3			2								2	2.68
CSDO8023.2	Compute network measures of a	2	3		3	3								2	2.68
CSDO8023.3	Analyze the effectiveness and privacy		3		3	3	2		2					2	3
CSDO8023.4	Apply information filtering for		3		3	3								2	2.36
CSDO8023.5	Review social media analytics layers		3		3	2				3				2	2.52
	TOTAL	2	15		12	13	2		2	3				10	
	CO-PO MATRIX	0.4	3		2.4	2.6	0.4		0.4	0.6				2	
	PO ATTAINMENT	2.68	2.65		2.6	2.7	3		3	2.52				2.65	
Institute Level Optional Courses - 2															
ILO8022.1	corporate finance	3	2	3	2			3	2	2	2	2		2	2.8
ILO8022.2	dividend decisions	3	2	3		3			2	2		2		2	2.7
	TOTAL	6	4	6	2	3		3	4	4	2	4		4	
	CO-PO MATRIX	1.0	0.7	1.0	0.3	0.5		0.5	0.7	0.7	0.3	0.7		0.7	
	PO ATTAINMENT	2.75	2.75	3	2.8	2.7		2.8	2.75	2.75	2.8	2.75		2.75	
Advanced Artifical Intelligence Lab															
CSL801.1	Design and build generative and	3	2		2	2								3	2.2
CSL801.2	Improve the performance of AI	3	2		2	2								3	2.2
CSl801.3	Enhance the predictive performance	3	2		2	2								3	2.2
CSL801.4	Develop application using AI	3	2		2	2								3	2.52
	TOTAL	8.8	5.6	1	1.3	0.7				1.51	1.42			6.7	

Code	Description	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	PSO	ATT
	CO-PO MATRIX														
	PO ATTAINMENT	2.2	1.4	1	1.3	0.7				1.51	0.71			1.68	
	Department Level Optional Course -5 (CSDOL8022) RS														
CSDOL8022	Understand mathematics and	3	2		2	-	-							2	2.65
CSDOL8022	Design, implement and analyze	3	3	2	3	-	-							2	2.55
CSDOL8022	Design, implement and analyze		3	2	3	3	-	-						2	2.55
CSDOL8022	Design, implement and analyze			2	3	3	-	-						2	2.4
CSDOL8022	Understanding feature engineering	2	3		3	-	-								2
CSDOL8022	To solve real world problems using	3	2		3	-	-							2	2.32
	TOTAL	11	13	6	6	17								10	
	CO-PO MATRIX	1.8	2.2	1.0	1.0	2.8								1.7	
	PO ATTAINMENT	1.782	2.4	3	2.5	2.4								2.49	
	Department Level Optional Course -6 (CSDOL8023) SMA														
CSDOL8023	Acquire hands on skills needed to		3		3	3				3	3			2	3
.2	Demonstrate data collection from		3		3	3				3	3			2	3
.3	Analyse & Visualize social media		3		3	3				3	3			2	3
.4	Develop content and structure based		3		3	3				3	3			2	3
.5	Review of research paper.				3	2				3	3			2	3
	TOTAL		12		15	14				15	15			10	
	CO-PO MATRIX		2.4		3	2.8				3	3			2	
	PO ATTAINMENT		3		2.4	3				3	3			3	
	5 (CSDO801X)	AIFBA													
CSDO8011.1	Gain knowledge of technology's	3	-	-	-	3	-	-						2	2.68
CSDO8011.2	Understand the applications of	3	-	2	-	3	-	-						2	2.68
CSDO8011.3	Recognize digital money transfer	-	3	2	2	3	-	-						2	2.36
CSDO8011.4	Evaluate the advantages of	-	-	-	2	3	-	-						2	2.36
CSDO8011.5	Analyze enterprise software solutions	-	3	2	2	3	-	-						2	2.36
CSDO8011.6	Explore the integration of AI in	-	-	-	-	3	-	-						2	2.36
	TOTAL	6	6	6	6	18								12	
	CO-PO MATRIX	1	1	1	1	3								2	

		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
	PO ATTAINMENT	2.68	2.36	2	2.4	2									2.5	
	Major Project-2 (CSP801)															
CSM601.1	Validate, Verify the results using test	2	3	3	3	3	2	2	3	3	3	3	2		3	3
CSM601.2	Analyze and evaluate the impact of		3	3	3	3	3	3	3	3	3	3	2		3	3
CSM601.3	Use standard norms of engineering	2	3	3	3	3	3	3	3	3	3	3	3		3	3
CSM601.4	Communicate through technical		3	3	3	3	2		3	3	3	3	3		3	3
CSM601.5	Gain technical competency towards		3	3	3	3	2	2	3	2	3		3		3	3
CSM601.6	Demonstrate capabilities of self-		3	3	3	3			3	3	3	3	3		3	3
CSM601.7	Develop interpersonal skills to work		3	3	3	3	3	3	3	3	3	2	3		3	3
	Total	4	21	21	21	21	15	13	21	20	21	17	19		21	
	CO-PO MATRIX	0.571	3	3	3	3	2.14	1.86	3	2.86	3	2.43	2.71	0	3	
	PO ATTAINMENT	3	3	3	3	3	3	1.85	3	3	3	3	3		3	

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