Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Empowered Autonomous)

Two Year Post Graduate Degree Program in Computer Science

(Faculty of Science & Technology)

CBCS Syllabus

M.Sc. (Computer Science) Semester -IV

For Department of Computer Science

Tuljaram Chaturchand College, Baramati

Choice Based Credit System Syllabus (2023 Pattern)

(As Per NEP 2020)

To be implemented from Academic Year 2024-2025

(Eligibility: M.Sc. Computer Science)

Programme Outcomes (POs)
for
M.Sc. (Computer Science)

After completing M.Sc. Computer Science Program students will be able to:

PO1: Comprehensive Knowledge and Understanding:
Postgraduates will possess a profound understanding of their field, encompassing foundational theories, methodologies, and key concepts within a multidisciplinary context.

PO2: Practical, Professional, and Procedural Knowledge:
Postgraduates will acquire practical skills and expertise necessary for professional tasks, including industry standards, regulations, and ethical considerations, with effective application in real-world scenarios.

PO3: Entrepreneurial Mindset, Innovation, and Business Understanding:
Postgraduates will cultivate an entrepreneurial mindset, identify opportunities, foster innovation, and understand business principles, market dynamics, and risk management strategies.

PO4: Specialized Skills, Critical Thinking, and Problem-Solving:
Postgraduates will demonstrate proficiency in technical skills, analytical abilities, effective communication, and leadership, adapting and innovating in response to changing circumstances.

PO5: Research, Analytical Reasoning, and Ethical Conduct:
Postgraduates will exhibit observational and inquiry skills, formulate research questions, utilize appropriate methodologies for data analysis, and adhere to research ethics while effectively reporting findings.

P06: Communication, Collaboration, and Leadership:
Postgraduates will effectively communicate complex information, collaborate in diverse teams, demonstrate leadership qualities, and facilitate cooperative efforts toward common goals.

P07: Digital Proficiency and Technological Skills:
Postgraduates will demonstrate proficiency in using ICT, accessing information sources, analyzing data using appropriate software, and adapting to technological advancements.

P08: Multicultural Competence, Inclusive Spirit, and Empathy:
Postgraduates will engage effectively in multicultural settings, respect diverse perspectives, lead diverse teams, and demonstrate empathy and understanding of others' perspectives and emotions.

P09: Value Inculcation, Environmental Awareness, and Ethical Practices:
Postgraduates will embrace ethical and moral values, practice responsible citizenship, recognize and address ethical issues, and promote sustainability and environmental conservation.

P10: Autonomy, Responsibility, and Accountability:
Postgraduates will apply knowledge and skills independently, manage projects effectively, and demonstrate responsibility and accountability in work and learning contexts, contributing to societal well-being.

Programme Specific Outcomes (PSOs)

for

M.Sc. (Computer Science)

After completing M.Sc. Computer Science Program students will be able to:

PSO1: Enrich the knowledge in the areas like Artificial Intelligence, Web Services, Cloud Computing, Paradigm of Programming language, Design and Analysis of Algorithms, Database Technologies Advanced Operating System, Mobile Technologies, Software Project Management and core computing subjects. Choose to study any one subject among recent trends in IT provided in the optional subjects.

PSO2: Students understand all dimensions of the concepts of software application and projects.

PSO3: Students understand the computer subjects with demonstration of all programming and theoretical concepts with the use of ICT.

PSO4: Developed in-house applications in terms of projects.

PSO5: Interact with IT experts & knowledge by IT visits.

PS06: Get industrial exposure through the 6 months Industrial Internship in IT industry.

PS07: To make them employable according to current demand of IT Industry and responsible citizen.
PS08: Aware them to publish their work in reputed journals.

M.Sc. (Computer Science)-II

Semester – IV

Syllabus

(NEP-2020: 2023 Pattern)

w.e.f. A.Y.2024-25

Course Structure for (M.Sc. (Computer Science) (2023 Pattern)

Sem	Course Type	Course Code	Title of Course	Theory / Pract.	No. of Credits
M.Sc. (Computer Science)-I	Major (Mandatory)	COS-501-MJM	Principles of Programming Language	Theory	4
		COS-502-MJM	Cryptography and Cyber Forensics	Theory	4
		COS-503-MJM	Database Technologies	Practical	2
		COS-504-MJM	Dot Net (Basic)	Practical	2
	Major (Elective)	COS-511-MJE(A)	Design and Analysis of Algorithms	Theory	4
	RM	COS-521-RM	Research Methodology in Computer Science	Theory	4
			Total Credits:		**20**
M.Sc. (Computer Science)-II	Major (Mandatory)	COS-551-MJM	Digital Image Processing	Theory	4
		COS-552-MJM	Data Mining and Data Warehousing	Theory	4
		COS-553-MJM	Python Programming–I (Basic)	Practical	2
		COS-554-MJM	Dot Net(Advanced)	Practical	2
	Major (Elective)	COS-561-MJE (A)	Artificial Intelligence	Theory	4
	OJT/FP	COS-581-OJT/FP	On Job Training / Field Projects	------	4
			Total Credits:		**20**
	Cumulative Credits of Semester – I and II				**40**

Sem	Course Type	Course Code	Title of Course	Theory / Pract.	No. of Credits
M.Sc. (Computer Science)-III	Major (Mandatory)	COS-601-MJM	Software Architecture & Design Pattern	Theory	4
		COS-602-MJM	Machine Learning	Theory	4
		COS-603-MJM	Web API Using Dot Net Framework	Practical	2
		COS-604-MJM	Emerging Technologies- Python Programming.	Practical	2
	Major (Elective)	COS-611-MJE(A)	Data Science & Analytics	Theory	2
		COS-612-MJE(A)	Lab Course on COS-611-MJE(A)	Practical	2
		OR			
		COS-611-MJE(B)	Soft Computing	Theory	2
		COS-612-MJE(B)	Lab Course on COS-611-MJE(B)	Practical	2
	RM	COS-621-RP	Research Projects in Computer Science	Practical	4
			Total Credits Sem-III:		**20**

Sem	Course Type	Course Code	Title of Course	Theory / Pract.	No. of Credits
M.Sc. (Computer Science)-IV	Major (Mandatory)	COS-651-MJM	Industrial Training (IT)	Practical	12
	Major (Elective)	COS-652-MJE	Online/MOOC (Elective Course List)	Theory	2
	Research Project	COS-681-RP	Research Project Work	Practical	6
	Certificate Course	COS-691-SDC	LaTeX Programming(2 Credit)	Theory	-
			Total Credits Semester-IV:		**20**

Teaching Scheme: 4 hours/week

The Industrial Training /Institutional project is equivalent to 4 theory courses of 4 credits each. Marks per 4 credits = 100. The total weightage for Industrial/Institutional training is 400 marks.

Workload: 1. one mentor (Project Guide) to be assigned for 10 students.

2. 4 hours /week to be allotted for 10 students

Guidelines:

- Each student must individually complete minimum 4/5 months full time Industrial training / Institutional project in the 4th semester.
- College should assign a student mentor to every student. The mentor will monitor the progress of the student throughout the semester for continuous assessment.
- Student should submit a valid offer letter and synopsis within two weeks of starting the internship.
- There will be continuous assessment of the work done by the student during the internship period.
- Continuous assessment guidelines:

    1. Student should submit a weekly report in the college to the mentor.
    2. The report should contain the following details:

        Name of student, project title, company name, company mentor, daily activities and results/ output, proposed work for next week.

    3. The weekly report should be duly signed by the student and company mentor/ institute Guide.
    4. Student Mentor should maintain weekly attendance record for every student.
    5. Two presentations should be conducted for each student (first presentation after first month and second presentation after 3rd month)
    6. Student Mentor should take feedback from the Company mentor regarding overall performance of the student.

- At the end of the internship period, each student should prepare a report which should conform to international academic standards.

The report should follow the style in academic journals and books, with contents such as:

Abstract, background, aim, design and implementation, testing, conclusion and full references, Tables and figures should be numbered and referenced to in the report.

Examination and Evaluation guidelines:

- The project done during internship period will be evaluated in the following manner:

  IA - 100 marks + EA-300 marks.

- The final presentation and documentation will be evaluated by three examiners:

  1. Student mentor (appointed by respective college)
  2. External examiner (appointed by the college)
  3. IT expert (appointed by respective college)

IA (100 marks)		
Weekly Attendance and Report	**Pre-Presentation**	**Documentation**
30	30	40

EA (300 marks)		
Mentor	IT Expert	External Examiner
100	100	100

The above evaluation will be converted into GPA (Grade Point Average)

Recommended Documentation contents:

Title page

Company / Institute certificate

Internship completion certificate

Abstract

Introduction: - -motivation, -problem statement. -purpose/ objective and goals, -literature survey, -project scope and limitations.

System analysis: -

-Comparative study of Existing systems, - scope and limitations of existing systems, -project perspective, features, -stakeholders, -Requirement analysis, - Functional requirements, performance requirements, security requirements etc.

System Design: -

- Design constraints, - System Model: UML diagrams, - Data Model, -User interfaces.

Implementation details: - -Software/hardware specifications, etc.

Reports

Testing: -Test Plan, Black Box Testing or Data Validation Test Cases, White Box Testing or Functional Validation Test cases and results

Conclusion and Recommendations

Future Scope

Bibliography and References

Class: M.Sc. (Computer science) (Semester-IV) **Paper Code: COS-651-MJM**
Title of Paper: Industrial Training (Internship) / Institutional Project (IT) **Paper: I (IT Project)**
Credit: 12 **No. of Practicals: 12**

- The Project can be platform, language and technology independent.
- Project will be evaluated by the project guide.
- Assessment will be done weekly in the respective batch guide.
- Evaluation will be on the basis of weekly progress of project work, progress report, oral, results and documentation and demonstration.
- You should fill your status of project work on the progress report and get the signature of project guide regularly.
- Progress report should sharply focus how much time you have spent on specific task? You should keep all sign progress report.
- Project will not be accepted, if progress report is not submitted and all the responsibilities remain with student.

The format of Progress Report is:

Roll No. & Name of Student:	
Title of the Project:	
Project Guide Name:	

Sr. No.	**Date**	**Details of Project Work**	**Project Guide Sign (With Date)**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Head
Department of Computer Science

SYLLABUS (CBCS as per NEP 2020) FOR M. Sc. (Computer Science)

(w. e. f A.Y 2024-25)

Name of the Programme	:	M.Sc. (Computer Science)
Program Code	:	PSCOS
Class	:	M.Sc. (Computer Science)-II
Semester	:	IV
Course Type	:	Major (Elective)
Course Name	:	Online- MOOC Courses
Course Code	:	COS-652-MJE
No. of Credits	:	02

Course Objectives:

1. Provide an overview of the course's primary aim.
2. Clearly articulate what learners will be able to do by the end of the course.
3. Develop objectives that can be assessed through quizzes, assignments, or projects.
4. Design objectives that encourage active participation and practical application.
5. Encourage learners to apply concepts critically and solve complex problems.

Course Outcome:

CO1: Learners will understand and apply fundamental programming concepts of related course.
CO2: Learners will develop algorithms to solve programming problems and implement them in code, demonstrating logical thinking and problem-solving abilities.
CO3: Learners will complete a programming project that integrates course concepts, showcasing their ability to build and document a working software application.
CO4: Learners will able to write clear, maintainable code with proper documentation
CO5: learners will able to gain practical skills and knowledge applicable to their relevant course.
CO6: Learners will develop innovative solutions to real-world problems, utilizing skills acquired throughout the course.
CO7: Learners will effectively communicate their findings, insights, and solutions through written reports, presentations, or other forms of documentation.

Following is the suggestive list for MOOC Courses on SWAYAM - NPTEL platform.

Sr.No.	**MOOC Courses**
1	Python for Data Science
2	Google Cloud Computing Foundations
3	Introduction to Machine Learning
4	Cyber Security and Privacy
5	Introduction to Internet of Things
6	Ethical Hacking
7	Deep Learning for Computer Vision

To remove rigid boundaries and facilitate new possibilities for learners in education system, study webs of active learning for young aspiring minds is India's Nation Massive Open Online Course (MOOC) platform. Massive Open Online Courses (MOOCs) are online courses which are designed to achieve the three cardinal principles of India's education policy: Access, Equity and Quality. MOOCs provide an affordable and flexible way to learn new skills, career development, changing careers, supplemental learning, lifelong learning, corporate eLearning & and deliver quality educational experiences at scale and more.

Note:

- The student is required to choose one MOOC course of 2 credits at PG level as per his or her preference/choice from Swayam portal or any other online educational platform approved by the UGC / regulatory body from time to time.
- After completing the course, the student has to produce successful course completion certificate for claiming the credit.
- The course chosen by the student should be intimated to the MOOC Coordinator of the respective institution.

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	3	2	1	2	3	3	3	3
CO2	3	2	3	2	1	3	3	3	3	3
CO3	2	3	3	3	2	3	3	3	3	3
CO4	2	2	2	2	1	2	3	3	3	3
CO5	2	2	2	2	2	3	3	3	3	3
CO6	2	2	2	2	1	3	3	3	3	3
CO7	2	2	2	2	1	2	3	3	3	2

Justification:

Mapping PO1 to all COs:

CO1: This CO is strongly related to PO1 as it covers fundamental programming concepts that are foundational across many of the areas listed in PO1, such as AI, Cloud Computing, and Database Technologies.

CO2: Developing algorithms and implementing them is directly related to many areas mentioned in PO1, including Design and Analysis of Algorithms and Paradigm of Programming Language.

CO3: Completing a project that integrates course concepts relates moderately to PO1. It demonstrates practical application of various subjects but is less directly tied to specific areas like AI or Cloud Computing.

CO4: Writing maintainable code with documentation supports the overall quality of software development, which is relevant but not as directly tied to all aspects of PO1.
CO5: Gaining practical skills and knowledge is strongly related to PO1 as it covers various core computing subjects and recent trends in IT.
CO6: Developing innovative solutions aligns moderately with PO1, as it reflects the application of knowledge to real-world problems, which is relevant to many of the areas listed.
CO7: Effective communication of findings and solutions is relevant to the course outcomes but less directly tied to the specific technical areas listed in PO1

Mapping PO2 to all COs:
CO1: Understanding and applying fundamental programming concepts is moderately related to understanding all dimensions of software applications and projects. While fundamental programming is crucial, it is only one part of the broader software application and project lifecycle.
CO2: Developing algorithms and solving problems is moderately related as it involves key aspects of software development, but it does not encompass all dimensions of software projects.
CO3: Completing a programming project that integrates course concepts is strongly related to PO2. It involves understanding various aspects of software development and application, including design, implementation, and documentation.
CO4: Writing clear, maintainable code with proper documentation is moderately related. It is important for software projects but focuses more on code quality rather than all dimensions of software application.
CO5: Gaining practical skills and knowledge is moderately related. It supports the understanding of software applications and projects but does not cover all dimensions by itself.
CO6: Developing innovative solutions to real-world problems involves applying skills to software projects, but it is a part of the broader understanding of software applications.
CO7: Effectively communicating findings and solutions is moderately related to understanding software projects. Communication is crucial in software development but is only one aspect of understanding all dimensions.

Mapping PO3 to all COs:
CO1: Understanding and applying fundamental programming concepts is strongly related to PO3, as it covers essential programming concepts and theories, directly aligning with the outcome of demonstrating programming and theoretical knowledge using ICT.
CO2: Developing algorithms and solving problems is strongly related, as it involves both programming and theoretical concepts, and often involves the use of ICT tools for implementation and testing.
CO3: Completing a programming project that integrates course concepts is strongly related to PO3. It demonstrates a comprehensive understanding of both programming and theoretical concepts, often utilizing ICT for project development and presentation.
CO4: Writing clear, maintainable code with proper documentation is moderately related to PO3. While it involves practical programming skills and ICT tools, it focuses more on code quality rather than a broader understanding of theoretical concepts.
CO5: Gaining practical skills and knowledge is moderately related. It supports understanding through practical application but does not fully encompass the demonstration of all theoretical concepts and their use with ICT.

CO6: Developing innovative solutions to real-world problems is moderately related. It involves applying knowledge and skills acquired throughout the course, but it focuses more on practical problem-solving rather than demonstrating all theoretical concepts.
CO7: Effectively communicating findings and solutions is moderately related. It involves using ICT for documentation and presentations but does not fully cover the understanding of programming and theoretical concepts.

Mapping PO4 to all COs :
CO1: Understanding and applying fundamental programming concepts is moderately related to PSO4. While essential for building applications, it represents only a part of the overall project development process.
CO2: Developing algorithms and solving problems is moderately related. It is crucial for the development of applications but is one part of the project process.
CO3: Completing a programming project that integrates course concepts is strongly related to PO4. It directly aligns with developing in-house applications by showcasing the ability to build and document software applications.
CO4: Writing clear, maintainable code with proper documentation is moderately related. It is important for the quality and maintainability of in-house applications but is a specific aspect of the overall project development.
CO5: Gaining practical skills and knowledge is moderately related. It supports the development of applications but does not fully encompass the project development process.
CO6: Developing innovative solutions to real-world problems is moderately related. It involves applying skills to projects but does not cover all aspects of project development.
CO7: Effectively communicating findings and solutions is moderately related. Communication is important for presenting and documenting projects but is not the primary focus of developing in-house applications.

Mapping PO5 to all COs:
CO1: Understanding and applying fundamental programming concepts is partially related to interacting with IT experts.While foundational knowledge is important, it does not directly involve interaction with IT professionals or the insights gained from such interactions.
CO2: Developing algorithms and solving problems is partially related. This CO focuses on problem-solving skills rather than interaction with IT experts, though it could benefit from industry insights.
CO3: Completing a programming project that integrates course concepts is moderately related. Projects can be influenced by insights gained from IT visits, such as industry best practices and emerging technologies.
CO4: Writing clear, maintainable code is partially related. While good coding practices are crucial, this CO is less directly influenced by interactions with IT experts.
CO5: Gaining practical skills and knowledge is moderately related. Exposure to IT experts and industry knowledge through visits can enhance practical skills and provide real-world context.
CO6: Developing innovative solutions is partially related. Innovation can be inspired by industry interactions but is not directly related to the CO's focus on solving problems using course concepts.

CO7: Communicating findings and solutions is partially related. Effective communication is important but does not directly tie into the interaction with IT experts or the knowledge gained from such interactions.

Mapping PO6 to all COs:

CO1: Understanding and applying fundamental programming concepts is moderately related. While fundamental knowledge is crucial, the direct impact of an internship on these concepts might be less compared to other aspects.

CO2: Developing algorithms and solving problems is strongly related. The internship provides real-world problems that require algorithm development and implementation, enhancing practical problem-solving skills.

CO3: Completing a programming project is strongly related. Internships often involve working on real projects, which integrate course concepts and require building and documenting software applications.

CO4: Writing clear, maintainable code is moderately related. Internships require producing quality code, which aligns with this CO, but it is just one aspect of the broader experience gained during an internship.

CO5: Gaining practical skills and knowledge is strongly related. The industrial internship directly enhances practical skills and knowledge by applying coursework to real-world scenarios.

CO6: Developing innovative solutions to real-world problems is strongly related. Internships provide opportunities to tackle real challenges, fostering innovation and practical application of course skills.

CO7: Effectively communicating findings and solutions is moderately related. While important, the focus of an internship is more on applying and integrating skills rather than primarily on communicatio

Mapping PO7 to all COs:

CO1 - CO6 have a strong relationship (3) with PSO7, as they directly contribute to enhancing employability by focusing on essential technical skills and problem-solving abilities required by the IT industry.

CO7 has a moderate relationship (2) with PSO7 because, while communication skills are important, they are secondary to technical and problem-solving skills in terms of employability in the IT field.

Mapping PO8 to all COs:

CO1- CO7 Writing clear, maintainable code is moderately related. Internships require producing quality code, which aligns with this CO, but it is just one aspect of the broader experience gained during an internship.

Mapping PO9 to all COs:

CO1- CO7 Gaining practical skills and knowledge is strongly related. The industrial internship directly enhances practical skills and knowledge by applying coursework to real-world scenarios. Developing innovative solutions to real-world problems is strongly related. Internships provide opportunities to tackle real challenges, fostering innovation and practical application of course skills.

Mapping PO10 to all COs:

CO1- CO7 Understanding and applying fundamental programming concepts is partially related to interacting with IT experts. While foundational knowledge is important, it does not directly involve interaction with IT professionals or the insights gained from such interactions.

SYLLABUS (CBCS as per NEP 2020) FOR M. Sc. (Computer Science)
(w. e. f A.Y 2024-25)

Name of the Programme	:	M.Sc. (Computer Science)
Program Code	:	PSCOS
Class	:	M.Sc. (Computer Science)-II
Semester	:	IV
Course Type	:	Research project
Course Name	:	Research project Work
Course Code	:	COS-681-SDC
No. of Credits	:	02

Course Objectives:

1. To teach students how to define a research topic, understand its scope and form relevant research question or hypotheses.
2. To guide students in identifying research gaps and understanding the significant of addressing these gaps within their research.
3. To enable students to search for relevant literature, evaluates and select credible source, analyze and synthesize information.
4. To instruct students on the components of research project proposal, including instruction literature review, study area, objective, hypothesis, methodology, significance, expected outcomes, chapter scheme, and hypotheses.

Course Outcome:

CO1. Clearly define a research topic, articulate its scope, and formulate appropriate research questions or hypotheses.

CO2. Identify gaps in existing research and understanding the importance of addressing these gaps in their studies.

CO3. Conduct a comprehensive literature reviews, including searching for relevant sources, evaluating their credibility and synthesizing information into a coherent review.

CO4. Prepare a detailed research project proposal, demonstrating understanding of its various components, such as objective, methodology and expected outcome.

CO5. Develop a clear and effective research methodology that aligns with their research objective and is appropriate for their study.

CO6. Enhance their academic writing skills, enabling them to produce well-structured and coherent research proposals and literature reviews.

CO7. To present their research proposals effective, both in written format and oral presentation, demonstrating clarity, coherence, and academic rigor.

Unit	Content	Teaching Hours
1.	**Planning of fieldwork for data collection** 1.1Planning of fieldwork 1.2Preparation of questionnaires 1.3Carrying out fieldwork /survey for primary data collection 1.4Filling up questionnaires/collection of sample 1.5Secondary data collection	30
2.	**Data Analysis** 2.1Sample analysis 2.2Data entry and data rectification 2.3Statistical analysis of the data 2.4Representation of the data 2.5Interpretation of the data	70
3.	**Research project writing** 3.1Introduction 3.2 literature Review 3.3Study area 3.4Objectives 3.5Hypothesis 3.6Methodology 3.7Chapter Scheme 3.8References	60

Mapping of this course with Programme Outcomes

Course Outcomes	Programme Outcomes (POs)									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	3	3	3	2	2	2	2	3
CO2	3	2	3	3	3	2	2	3	3	3
CO3	3	3	2	3	3	2	3	2	3	3
CO4	3	3	2	3	3	2	3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3
CO6	2	2	3	3	2	2	3	3	3	3
CO7	2	3	2	3	2	2	2	3	3	3

Justification of PO1 to ALL COs:

These directly involve understanding and applying research skills, forming hypotheses, methodology design, and critical literature review, which core components of comprehensive knowledge in a discipline.

Justification of PO2 to ALL COs:

Defining a research topic and identifying gaps in existing research relate more to theoretical foundations, but they still moderately impact practical and professional applications.

Justification of PO3 to ALL COs:

Defining a research topic and identifying gaps in existing research foster critical thinking and opportunity recognition, both key aspects of an entrepreneurial mind set. These are strongly related to innovation and business understanding.

Justification of PO4 to ALL COs:

Conducting a literature review includes assessing the credibility of sources and considering ethical implications, making it strongly related to ethical practices and environmental awareness

Justification of PO5 to ALL COs:

Enhancing academic writing skills involves communicating ethical research practices, but the connection to environmental and value inculcation is less direct

Justification of PO6 to ALL COs:

Defining a research topic and formulating research questions are individual skills, but they involve some level of collaboration, particularly in interdisciplinary research or receiving feedback, so this is moderately related to communication and collaboration.

Justification of PO7 to ALL COs:

Refining a research topic and formulating research questions requires some use of digital tools (e.g., research databases, software for brainstorming.

Justification of PO8 to ALL COs:

Defining a research topic and formulating research questions moderately relates to multicultural competence, as it can include understanding diverse perspectives, but this depends on the topic chosen.

Justification of PO9 to ALL COs:

Preparing a research proposal, particularly in fields related to environmental issues or ethical dilemmas, strongly relates to developing ethical practices and value inculcation.

Justification of PO10 to ALL COs:

Conducting a comprehensive literature review requires autonomy in searching and synthesizing sources, along with accountability in evaluating credibility and relevance, making this strongly related.

SYLLABUS (CBCS as per NEP 2020) FOR M. Sc. (Computer Science)

(w.e.f. A.Y. 2024-25)

Name of the Programme	: M.Sc. Computer Science
Program Code	: PSCOS
Class	: M.Sc. (Computer Science)
Semester	: IV
Course Type	: Skill Development (Theory)
Course Name	: LaTeX Programming
Course Code	: COS-691-SDC
No. of Lectures	: 30
No. of Credits	: 02

Course Objectives:

1. To understand the basics of document formatting.
2. To learn the symbols and commands in LaTeX.
3. To gain knowledge about lists.
4. To learn how to use mathematical environment.
5. To understand the tables in LaTeX.
6. To be able to create presentations using Beamer.
7. To prepare book, project report in LaTeX.

Course Outcomes:

After successfully completing the course students will be able to

CO1: Understand the Fundamental Concepts of document formatting.

CO2: Apply formatting to the output document.

CO3: Create ordered and unordered lists in document.

CO4: Understand how to use mathematical environment.

CO5: Understand the concept of table in LaTeX.

CO6: Create presentations using Beamer.

CO7: Create book, project report in LaTeX.

Unit	Title and Contents	No. of lectures
Unit-I	**Installation of LaTeX** Introduction and brief history of LaTeX Installation on Windows Basics of a LaTeX file Text, Symbols and Commands: Command names and arguments Special characters	08
Unit-II	**Formatting of output document** Document class, page style, parts of the document, table of contents Fonts, symbols, indenting, paragraphs, line spacing, word spacing, titles, subtitles Lists: Ordered and Unordered Text in Boxes Tables	10
Unit-III	**Mathematical Formulae** Mathematical environment, math mode, mathematical symbols Creating presentations in LaTeX with Beamer Preparing book, project report in LaTeX	12

Reference Book

Guide to LaTeX, Helmut Kopka and Patrick W. Daly, Fourth Edition, Addison-Wesley, Pearson Education, 2004.

Web link

https://www.latex-project.org/

Mapping of this course with POs

Course Outcomes	Programme Outcomes(POs)									
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	2	1	2	2	2	3	1	1	2
CO2	2	3	1	3	2	2	3	1	1	2
CO3	2	2	1	2	1	1	2	2	1	1
CO4	3	2	1	3	3	2	3	1	2	3
CO5	3	2	1	2	3	2	3	2	2	3
CO6	2	3	2	3	2	3	3	3	2	3
CO7	3	3	2	3	3	3	3	3	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Mapping of PO1 to All COs

CO1 provides foundational concepts essential for PO1.

CO2 applies skills that enhance understanding but focuses less on theory.

CO3 develops a specific skill relevant to document formatting.

CO4 includes key knowledge necessary for specialized contexts.

CO5 covers important structural elements crucial for comprehensive understanding.

CO6 applies knowledge in a specific context, highlighting practical skills.

CO7 integrates various methodologies demonstrating a profound understanding of document creation.

Mapping of PO2 to All COs

CO1 provides useful knowledge but lacks direct application for professional tasks.

CO2 emphasizes critical practical skills for producing professional documents.

CO3 focuses on specific skills that support broader professional tasks.

CO4 contributes to practical capabilities in a specialized area.

CO5 enhances understanding of a key document element relevant in professional contexts.

CO6 highlights the application of skills crucial for effective presentations in professional environments.

CO7 integrates various skills necessary for comprehensive document creation, essential in many professional settings.

Mapping of PO3 to All COs

CO1 to CO5 are all partially related as they provide technical knowledge without direct links to entrepreneurial or business concepts.

CO6 and CO7 are moderately related because they involve presentation and reporting skills useful in business contexts, albeit without a direct emphasis on fostering an entrepreneurial mindset or innovation.

Mapping of PO4 to All COs

CO1 is moderately related as it provides a base for critical thinking but lacks direct application.

CO2 and **CO4** are strongly related for their emphasis on technical skills and problem-solving in practical contexts.

CO3 and **CO5** support skills development but are less comprehensive in fostering critical thinking.

CO6 and **CO7** highlight effective communication and adaptability, essential for specialized skills and leadership.

Mapping of PO5 to All COs

CO1: Understanding document formatting contributes moderately to the ethical reporting of research.

CO2: Applying formatting techniques enhances the clarity and ethical presentation of research findings.

CO3: Creating lists is partially related to structuring reports, aiding in organized inquiry and reporting.

CO4: The mathematical environment strongly supports analytical reasoning and precise reporting in research.

CO5: Understanding tables is crucial for presenting analyzed data clearly and ethically.

CO6: Creating presentations in Beamer contributes moderately to the effective and ethical dissemination of research findings.

CO7: Creating comprehensive documents like books and reports is strongly related to reporting research with adherence to ethical guidelines.

Mapping of PO6 to All COs

CO1: Understanding document formatting moderately helps in structuring communication, which is essential for clear team interactions.

CO2: Applying formatting techniques improves the professional presentation of information, supporting effective communication in a leadership role.

CO3: Creating ordered and unordered lists is partially related to organizing team discussions or reports, aiding collaboration.

CO4: Using a mathematical environment helps moderately in conveying complex quantitative data to team members and stakeholders.

CO5: Understanding tables moderately enhances the presentation of data, facilitating clearer team discussions and decision-making.

CO6: Creating presentations in Beamer is strongly related to effectively communicating complex information and demonstrating leadership through presentations.
CO7:Creating a book or project report in LaTeX is strongly related to leadership in documenting and presenting group work and collaborative projects.

Mapping of PO7 to All COs

CO1: Understanding document formatting is strongly related to demonstrating proficiency in digital tools for professional documentation.
CO2: Applying formatting is strongly related to effectively using ICT tools for producing well-structured digital documents.
CO3: Creating ordered and unordered lists moderately demonstrates the ability to organize information using digital tools.
CO4: Using a mathematical environment is strongly related to proficiency in software tools for presenting and analyzing complex mathematical data.
CO5: Understanding tables is strongly related to using software for effective data analysis and presentation.
CO6: Creating presentations in Beamer strongly relates to proficiency in digital tools and software for professional presentations.
CO7: Creating a book or project report in LaTeX is strongly related to proficiency in advanced document creation software, essential for digital literacy.

Mapping of PO8 to All COs

CO1: Understanding document formatting is partially related to presenting information in a way that respects diverse perspectives.
CO2: Applying formatting is partially related to ensuring inclusivity in document presentation, enhancing readability for diverse audiences.
CO3: Creating ordered and unordered lists moderately contributes to organizing information in a clear and inclusive way for diverse teams.
CO4: Using a mathematical environment is partially related to ensuring clarity in presenting quantitative data, but less directly linked to multicultural competence.
CO5: Understanding tables moderately helps in presenting data that can be interpreted by people from different backgrounds.
CO6: Creating presentations in Beamer strongly supports multicultural competence by facilitating clear communication and leadership in diverse settings.
CO7: Creating books or project reports in LaTeX strongly supports the effective documentation of diverse perspectives and inclusive team collaboration.

Mapping of PO9 to All COs

CO1: Understanding document formatting is partially related to ensuring clarity and ethical presentation of information, but less directly linked to values or environmental awareness.

CO2: Applying formatting is partially related to responsible and ethical communication, but not directly tied to promoting sustainability or values.
CO3: Creating ordered and unordered lists is partially related to organizing information ethically but has a limited connection to environmental awareness or value inculcation.
CO4: Using a mathematical environment moderately helps in the ethical analysis and presentation of data, supporting responsible practices.
CO5: Understanding tables moderately supports the ethical presentation of data, contributing to transparency and responsible citizenship.
CO6: Creating presentations in Beamer moderately supports the ethical dissemination of information, allowing for responsible communication in promoting environmental awareness.
CO7: Creating books or project reports in LaTeX is strongly related to documenting ethical practices, promoting sustainability, and addressing value inculcation in detailed reports or projects.

Mapping of PO10 to All COs
CO1: Understanding document formatting moderately supports independent work by enabling the creation of well-structured documents, reflecting responsibility in presentation.
CO2: Applying formatting to documents demonstrates responsibility in producing polished and professional outputs, which is essential for effective project management.
CO3: Creating ordered and unordered lists is partially related to organizing information, which helps in managing tasks but has limited direct relevance to accountability.
CO4: Using the mathematical environment strongly supports autonomy and responsibility in accurately presenting quantitative data, essential for accountable work.
CO5: Understanding tables is strongly related to the responsible management of data, ensuring clear and accountable presentation of information.
CO6: Creating presentations in Beamer strongly supports autonomous project management and responsible communication in professional settings.
CO7: Creating books or project reports in LaTeX is strongly related to demonstrating responsibility and accountability in producing high-quality, detailed, and independently managed work.