DHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University)

VISAKHAPATNAM * HYDERABAD * BENGALURU

Accredited by NAAC with A^{++} Grade

GITAM School of Science

CURRICULUM AND SYLLABUS

2 Year Postgraduate Programme
PCSCI02: M.Sc. Data Science

w.e.f. 2025-26 admitted batch

(Updated on July 2025)

Academic Regulations

Applicable for the Postgraduate Programmes in the Schools of Humanities & Social Sciences and Science (except M.C.A)

https://www.gitam.edu/academics/academic-regulations

GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT

Vision

GITAM will be an exceptional knowledge-driven institution advancing on a culture of honesty and compassion to make a difference to the world.

Mission

- Build a dynamic application-oriented education ecosystem immersed in holistic development.
- Nurture valuable futures with global perspectives for our students by helping them find their ikigai.
- Drive impactful integrated research programmes to generate new knowledge, guided by integrity, collaboration, and entrepreneurial spirit.
- Permeate a culture of kindness within GITAM, fostering passionate contributors.

Quality Policy

To achieve global standards and excellence in teaching, research, and consultancy by creating an environment in which the faculty and students share a passion for creating, sharing and applying knowledge to continuously improve the quality of education.

GITAM School of Science

Vision

Nurturing a high-quality Science Education and Research by providing a best learning ecosystem to create world class academicians and researchers.

Mission

- To teach the most renewed curriculum that lay the foundation for students to start exciting careers in academia, research, and industry.
- To foster an environment of healthy curiosity, an innovative mindset, and a strong desire to contribute to the science world.
- To advance our understandings of the natural processes of Physical, Chemical and Biological systems for a better habitable world.
- To inculcate a strong sense of empathy, integrity, and trust in the GITAM Fraternity with a strong commitment towards society and environment.

VISION AND MISSION OF THE DEPARTMENT

VISION

To become a leading hub for education and innovation in computer science, empowering students with emerging technologies for global tech leadership through pioneering research and active community engagement.

MISSION

- Foster a new generation of skilled computer science professionals through a well-structured curriculum that encourages continuous learning and prepares students for diverse, dynamic careers in emerging technologies.

- Conduct robust research in emerging fields of computer science and engage in strategic collaborations with industry and community partners to make significant contributions to society.

- Uphold the highest ethical standards, transparency, and accountability while fostering inclusivity and diversity in pushing the boundaries of technological advancement.

Programme Educational Objectives (PEOs)

PEO 1: Industry Readiness

Graduates will be proficient in applying the principles of data science and analytics to solve industry-relevant problems and demonstrating their ability to handle data driven challenges in diverse sectors.

PEO 2: Research and Innovation

Graduates will engage in continuous learning and research, contributing to the advancement of the data science field through innovative solutions and adaptations of current methodologies.

PEO 3: Professional Skills

Graduates will exhibit strong communication, management, and decision-making skills, preparing themselves to take on leadership roles in their professional careers.

PEO 4: Ethical and Human values

Empower graduates to uphold ethical and human values, nurturing personal growth and enabling positive contributions to society.

PEO Articulation

	PEO1	PEO2	PEO3	PEO4
M1	3	2	3	2
M2	2	3	2	1
M3	1	2	2	3

3 - High Correlation, 2 - Medium Correlation, 1 - Low Correlation

Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

At the end of the Programme the students would be able to demonstrate:

PO1: The graduates should be able to demonstrate the acquisition of:

- advanced knowledge about a specialized field of enquiry with a critical understanding of the emerging developments and issues relating to one or more fields of learning,
- advanced knowledge and understanding of the research principles, methods, and techniques applicable to the chosen field(s) of learning or professional practice,
- procedural knowledge required for performing and accomplishing complex and specialized and professional tasks relating to teaching, and research and development.

PO2: The graduates should be able to demonstrate the acquisition of:

- advanced cognitive and technical skills required for performing and accomplishing complex tasks related to the chosen fields of learning.
- advanced cognitive and technical skills required for evaluating research findings and designing and conducting relevant research that contributes to the generation of new knowledge.
- specialized cognitive and technical skills relating to a body of knowledge and practice to analyze and synthesize complex information and problems.

PO3: The graduates should be able to demonstrate the ability to:

- apply the acquired advanced theoretical and/or technical knowledge about a specialized field of enquiry or professional practice and a range of cognitive and practical skills to identify and analyze problems and issues, including real-life problems, associated with the chosen fields of learning.
- apply advanced knowledge relating to research methods to carry out research and investigations to formulate evidence-based solutions to complex and unpredictable problems.

PO4: The graduates should be able to demonstrate the ability to:

Listen carefully, read texts and research papers analytically and present complex information in a clear and concise manner to different groups/audiences

- communicate, in a well-structured manner, technical information and explanations, and the findings/results of the research studies undertaken in the chosen field of study,
- present in a concise manner view on the relevance and applications of the findings of recent research and evaluation studies in the context of emerging developments and issues.
- meet one's own learning needs relating to the chosen fields of learning, work/vocation, and an area of professional practice,
- pursue self-paced and self-directed learning to upgrade knowledge and skills, including research-related skills, required to pursue a higher level of education and research.
- problematize, synthesize, and articulate issues and design research proposals,
- define problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict cause-and-effect relationships,
- develop appropriate tools for data collection for research,
- use appropriate statistical and other analytical tools and techniques for the

analysis of data collected for research and evaluation studies,

- plan, execute, and report the results of an investigation,
- follow basic research ethics and skills in practicing/doing ethics in the field/ in one's own research work.
- make judgements and take decisions regarding the adoption of approaches to solving problems, including real-life problems, based on the analysis and evaluation of information and empirical evidence collected.
- make judgement across a range of functions requiring the exercise of full responsibility and accountability for personal and/or group actions to generate solutions to specific problems associated with the chosen fields/subfields of study, work, or professional practice.

PO5: The graduates should be able to demonstrate the willingness and ability to:

- embrace and practice constitutional, humanistic, ethical, and moral values in one's life,
- adopt objective and unbiased actions in all aspects of work related to the chosen fields/subfields of study and professional practice,
- participate in actions to address environmental protection and sustainable development issues,
- support relevant ethical and moral issues by formulating and presenting coherent arguments,
- follow ethical principles and practices in all aspects of research and development, including inducements for enrolling participants, avoiding unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.

PO6: The graduates should be able to demonstrate the acquisition of knowledge and skill sets required for:

- adapting to the future of work and responding to the demands of the fast pace of technological developments and innovations that drive the shift in employers' demands for skills, particularly with respect to t h e transition towards more technology-assisted work involving the creation of new forms of work and rapidly changing work and production processes.
- exercising full personal responsibility for the output of own work as well as for group/team outputs and for managing work that is complex and unpredictable requiring new strategic approaches.

PSO1: Technical Proficiency

Graduates will proficiently use advanced programming languages, statistical methods data visualization tools, and to solve real world problems by using big data analytics.

PSO2: Problem-Solving Skills

Graduates will design and solve complex data science related problems using mathematical models, computational techniques and Artificial Intelligence.

PSO3: Research and Development

Graduates will independently conduct and communicate research using scientific methods, producing scholarly work that contributes new insights or improvements in data science .

PSO4: Ethics and Privacy

Graduates will ethically manage and govern data with an emphasis on compliance, privacy, security, and integrity to maintain confidentiality of sensitive information.

Curriculum Structure

(Flexible Credit System)

Minimum Credit Requirements to Award Degree Under Each Category

Duration & Name of the Programme				S.No	Course Category		Minimum Credit Requirement		
Programme	Eligibility	Programme	Eligibility				2 Year PG (2nd year- Course Work alone)	2 Year PG (2nd year - Course Work and Research)	2 Year PG (2nd year - Research alone)
2-year PG Degree (with exit option at the end of first year)	3-year UG Degree	1 year & PG Diploma	3-year UG Degree	1	Programme Core Courses & Labs	PC	28	28	28
				2	Programme Electives Courses	PE	8	8	8
				3	Research Methodology	FC	4	4	4
				4	Seminar	FC	1	1	1
				5	Term Paper	FC	1	1	1
				6	Internship	FC	4	4	4
				Total (At the end of I Year)			46	46	46
		1 year & PG Degree	4-year UG Degree	7	Programme Core Courses	PC	40	20	0
				8	Programme Electives Courses	PE			
				9	Research Project	FC	0	20	0
				10	Research Dissertation	FC	0	0	40
				Total (At the end of II Year)			86	86	86

2 Year PG programme:

Semester I and II: Common Structure for Course Work, Course Work & Research and Research Alone

Course Code	Category	Level	Course Title	L	T	P	S	J	C
Semester - I									
25MATH6331	PC	600	Statistics for Data Science	4	0	0	0	0	4
25CSCI6001	PC	600	Relational And NOSQL Database Management Systems	4	0	0	0	0	4
25CSCI6011	PC	600	Python Programming For Problem Solving	4	0	0	0	0	4
25CSCI6021	PC	600	Python Programming Laboratory for Problem Solving	0	0	4	0	0	2
25CSCI6031	PC	600	Relational And NOSQL Database Management Systems Laboratory	0	0	4	0	0	2
Choose any one of the following electives:									
25MATH6341	PE	600	Fundamentals of Mathematics for Data Science	4	0	0	0	0	4
25CSCI6041	PE	600	Data Structures using C++	4	0	0	0	0	4
25CSCI6051	PE	600	Web Programming	4	0	0	0	0	4
25CSCI6061	PE	600	Operating Systems and Computer Networks	4	0	0	0	0	4
			Total Credits						**20**
Semester - II									
25CSCI6071	PC	600	Foundations of Data Mining and Data Science	4	0	0	0	0	4
25CSCI6081	PC	600	Foundations of Artificial Intelligence and Machine Learning	4	0	0	0	0	4
25CSCI6091	PC	600	Foundations of Java Programming Laboratory	0	0	4	0	0	2
25CSCI6101	PC	600	Machine Learning Implementation Laboratory	0	0	4	0	0	2
25CSCI6444	FC	600	Research Methodology	4	0	0	0	0	4
25CSCI6777	FC	600	Term Paper	0	0	0	0	2	1
25CSCI6666	FC	600	Seminar	0	0	0	0	2	1
25CSCI6333	FC	600	Internship	0	0	0	0	8	4
Choose any one of the following electives:									
25CSCI6111	PE	600	Cloud Computing Principles and Applications	4	0	0	0	0	4
25CSCI6121	PE	600	Cryptography and network security	4	0	0	0	0	4
25CSCI6131	PE	600	Object-Oriented Software Engineering	4	0	0	0	0	4
25CSCI6141	PE	600	Time Series Analysis and Forecasting	4	0	0	0	0	4
			Total Credits						**26**

2nd Year - Research alone:

Course Code	Category	Level	Course Title	L	T	P	S	J	C
Semester - III									
25CSCI7888	FC	700	Research Dissertation - I	0	0	0	0	40	20
			Total Credits						**20**
Semester – IV									
25CSCI7999	FC	700	Research Dissertation - II	0	0	0	0	40	20
			Total Credits						**20**

2nd Year – 'Course Work alone' & 'Coursework and Research':

Semester – III (Common Structure for 'Course Work alone' & 'Course Work and Research')									
Course Code	**Category**	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
25CSCI7001	PC	700	Foundations and Applications of Deep Learning	4	0	0	0	0	4
25CSCI7011	PC	700	Big Data Analytics	4	0	0	0	0	4
25CSCI7021	PC	700	Deep Learning Implementation Laboratory	0	0	4	0	0	2
25CSCI7031	PC	700	Big Data Analytics Laboratory	0	0	4	0	0	2
Choose any two of the following electives:									
25CSCI7041	PE	700	Reinforcement Learning	4	0	0	0	0	4
25CSCI7051	PE	700	Evolutionary Algorithms	4	0	0	0	0	4
25CSCI7061	PE	700	Prompt Engineering	4	0	0	0	0	4
25CSCI7071	PE	700	Natural Language Processing	4	0	0	0	0	4
25CSCI7081	PE	700	Recommender systems	4	0	0	0	0	4
25CSCI7091	PE	700	Agile Software Development	4	0	0	0	0	4
			Total Credits						**20**

Course Work alone

Semester - IV									
Course Code	**Category**	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
25CSCI7101	PC	700	Generative AI and LLM	4	0	0	0	0	4
25CSCI7111	PC	700	Principles, Architecture and Applications of Blockchain Technology	4	0	0	0	0	4
25CSCI7121	PC	700	Generative AI and LLM Laboratory	0	0	4	0	0	2
25CSCI7131	PC	700	Blockchain Technology Laboratory	0	0	4	0	0	2
Choose any two of the following electives:									
25CSCI7141	PE	700	Web Analytics	4	0	0	0	0	4
25CSCI7151	PE	700	Quantum Machine Learning	4	0	0	0	0	4
25CSCI7161	PE	700	Social Network Analytics	4	0	0	0	0	4
25CSCI7171	PE	700	Regression Analysis and Predictive Models	4	0	0	0	0	4
25CSCI7181	PE	700	Data Science in Bio Informatics	4	0	0	0	0	4
25CSCI7191	PE	700	Applied Multivariate Statistical Analysis	4	0	0	0	0	4
			Total Credits						**20**

Coursework and Research

Semester – IV									
Course Code	**Category**	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
25CSCI7555	FC	700	Research Project	0	0	0	0	40	20
			Total Credits						**20**

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