

**GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)**

(Deemed to be University)

VISAKHAPATNAM \* HYDERABAD \* BENGALURU

Accredited by NAAC with A<sup>++</sup> Grade

**GITAM School of Science**



**CURRICULUM AND SYLLABUS**

**4 Year Undergraduate Programme**

**UMATH05: B.Sc. Mathematics**

w.e.f. 2025-26 admitted batch  
(Updated on July 2025)

# **Academic Regulations**

**Applicable for the Undergraduate Programmes in the  
Schools of Business (except B.Com.), Humanities & Social Sciences  
and Science (except B.Sc.(CSCS), B.Optomety, B.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 provide quality education and research in Mathematical Sciences by creating an enabling and enjoyable learning experiences and fostering a community of passionate learners.

### **MISSION**

- Inculcate an application-oriented education in mathematical sciences, preparing students for successful careers in academia, research, and industry.
- Conduct innovative research in mathematics and statistics, including mathematical modelling and interdisciplinary problems, to advance knowledge and benefit communities.
- Identify and nurture students' strengths, fostering curiosity, innovation, and a commitment to contributing to the science world.
- Promote a diverse and inclusive environment, ensuring equity, fairness, and empathy in all academic and professional endeavours, with a strong commitment to society and the environment.

### Programme Educational Objectives (PEOs)

- PEO 1:** To apply basic knowledge of mathematics and science to understand the real world problems.
- PEO 2:** To develop complex problem-solving techniques using mathematical tools.
- PEO 3:** To establish the methodologies for core mathematical problems.
- PEO 4:** To implement computer solution methods for large systems.
- PEO 5:** To imbibe professional and ethical responsibility towards the society

### PEO Articulation

	PEO1	PEO2	PEO3	PEO4	PEO5
<b>M1</b>	3	3	2	2	3
<b>M2</b>	3	3	1	2	3
<b>M3</b>	3	3	3	2	2
<b>M4</b>	2	2	2	2	3

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

## UMATH05: B.Sc. Mathematics

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

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

- PO1:** Complex problem-solving:
- To solve different kinds of problems in familiar and non-familiar contexts and apply the learning to real-life situations.
- PO2:** Critical thinking:
- Apply analytic thought to a body of knowledge, including the analysis and evaluation of policies, and practices, as well as evidence, arguments, claims, beliefs, and the reliability and relevance of evidence.
  - Identify relevant assumptions or implications and formulate coherent arguments.
  - Identify logical flaws and holes in the arguments of others.
  - Analyze and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.
- PO3:** Creativity:
- Create, perform, or think in different and diverse ways about the same objects or scenarios.
  - Deal with problems and situations that do not have simple solutions.
  - Innovate and perform tasks in a better manner.
  - View a problem or a situation from multiple perspectives.
  - Think 'out of the box' and generate solutions to complex problems in unfamiliar contexts.
  - Adopt innovative, imaginative, lateral thinking, interpersonal skills and emotional intelligence.
- PO4:** Communication Skills:
- Listen carefully, read texts and research papers analytically and present complex information in a clear and concise manner to different groups / audiences.
  - Express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media.
  - Confidently share views and express herself / himself.
  - Construct logical arguments using correct technical language related to a field of learning, work/vocation, or an area of professional practice, and convey ideas, thoughts, and arguments using language that is respectful and sensitive to gender and other minority groups.
- PO5:** Analytical reasoning/thinking:
- Evaluate the reliability and relevance of evidence.
  - Identify logical flaws in the arguments of others.
  - Analyze and synthesize data from a variety of sources-draw valid conclusions and support them with evidence and examples, and address opposing viewpoints.
- PO6:** Research-related skills:
- A keen sense of observation, inquiry, and capability for asking relevant/ appropriate questions.
  - The ability to problematize, synthesize, and articulate issues and design research proposals.
  - The ability to 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.

- The capacity to develop appropriate methodology and tools for data collection.
  - The appropriate use of statistical and other analytical tools and techniques.
  - The ability to plan, execute and report the results of an experiment or investigation, the ability to acquire the understanding of basic research ethics and skills in practicing/doing ethics in the field/ in personal research work, regardless of the funding authority or field of study.
- PO7:** Coordinating/collaborating with others:
- Work effectively and respectfully with diverse teams.
  - Facilitate cooperative or coordinated effort on the part of a group.
  - Act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
- PO8:** Leadership readiness/qualities:
- Mapping out the tasks of a team or an organization and setting direction.
  - Formulating an inspiring vision and building a team that can help achieve the vision, motivating and inspiring team members to engage with that vision.
  - Using management skills to guide people to the right destination.
- PO9:** Learning how to learn skills:
- Acquire new knowledge and skills, including 'learning how to learn skills, that are necessary for pursuing learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social, and cultural objectives, and adapting to changing trades and demands of the workplace, including adapting to the changes in work processes in the context of the fourth industrial revolution, through knowledge / skill development / re-skilling.
  - Work independently; identify appropriate resources required for further learning.
  - Acquire organizational skills and time management to set self-defined goals and targets with timelines.
  - Inculcate a healthy attitude to be a lifelong learner.
- PO10:** Digital and technological skills:
- Use ICT in a variety of learning and work situations.
  - Access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data.
- PO11:** Multicultural competence and inclusive spirit:
- The acquisition of knowledge of the values and beliefs of multiple cultures and a global perspective to honour diversity.
  - Capability to effectively engage in a multicultural group/society and interact respectfully with diverse groups.
  - Capability to lead a diverse team to accomplish common group tasks and goals.
  - Gender sensitivity and adopting a gender-neutral approach, as also empathy for the less advantaged and the differently-abled including those with learning disabilities.
- PO12:** Value inculcation:
- Embrace and practice constitutional, humanistic, ethical, and moral values in life, including universal human values of truth, righteous conduct, peace, love, non-violence, scientific temper, citizenship values.
  - Practice responsible global citizenship required for responding to contemporary global challenges, enabling learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies.
  - Formulate a position/argument about an ethical issue from multiple perspectives.
  - Identify ethical issues related to work, and follow ethical practices, including avoiding unethical behavior such as fabrication, falsification or misrepresentation of data, or committing plagiarism, and adhering to intellectual property rights.
  - Recognize environmental and sustainability issues and participate in actions to promote sustainable development.
  - Adopt an objective, unbiased, and truthful actions in all aspects of work.



- Instill integrity and identify ethical issues related to work, and follow ethical practices.

**PO13:** Autonomy, responsibility, and accountability:

- Apply knowledge, understanding, and/or skills with an appropriate degree of independence relevant to the level of the qualification.
- Work independently, identify appropriate resources required for a project, and manage a project through to completion.
- Exercise responsibility and demonstrate accountability in applying knowledge and/or skills in work and/or learning contexts appropriate for the level of the qualification, including ensuring safety and security at workplaces.

**PO14:** Environmental awareness and action:

- Ability to apply the knowledge, skills, attitudes, and values required to take appropriate actions for.
- Mitigating the effects of environmental degradation, climate change, and pollution.
- Effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.

**PO15:** Community engagement and service:

- To participate in community-engaged services/ activities for promoting the wellbeing of society.

**PO16:** Empathy:

- To identify with or understand the perspective, experiences, or points of view of another individual or group, and to identify and understand other people's emotions.

**PSO1: Mastery of Mathematical Fundamentals and Techniques:** Acquire a strong command over fundamental mathematical concepts, theories, and techniques including calculus, algebra and differential equation enabling the application of mathematical principles in various domains.

**PSO2: Problem-Solving and Analytical Skills:** Develop advanced problem-solving abilities, employing logical reasoning and mathematical methods to solve complex mathematical problems, and critically analyze

**PSO3: Mathematical Modeling and Interdisciplinary Proficiency:** Apply math principles, modeling techniques, and tools effectively to solve practical problems across disciplines. Demonstrate interdisciplinary skills, research, and proficiency in mathematical concepts.

**PSO4: Stochastic and Financial Engineering Proficiency:** Gain foundational finance knowledge with the application of statistics and mathematics. Explore financial engineering to innovate, manage risk, and develop advanced models using mathematical and statistical methods

## **Curriculum Structure** *(Flexible Credit System)*

**Minimum Credit Requirements to Award Degree Under Each Category**

S.No.	Course Category and Category Code		Minimum Credit Requirement					
			3 Year Undergraduate		4 Year Undergraduate (Hons.)		4 Year Undergraduate (Hons.) with Research	
			Credits	(%)	Credits	(%)	Credits	(%)
1	Multidisciplinary Core Courses	MDC	12	9.83	12	7.41	12	7.41
2	Major Core	MC	45	36.88	77	47.53	65	40.12
3	Major Electives	ME	15	12.30	15	9.26	15	9.26
4	Minor	MI	24	19.67	32	19.75	32	19.75
5	Internship	INT	04	3.28	04	2.47	04	2.47
6	Ability Enhancement Courses – University Core	UC	10	8.20	10	6.17	10	6.17
7	Skill Enhancement Courses – University Core	UC	08	6.56	08	4.94	08	4.94
8	Value Added Courses – University Core	UC	04	3.28	04	2.47	04	2.47
9	Research Project / Dissertation	PROJ	--	00	--	00	12	7.41
<b>Total</b>			<b>122</b>	<b>100</b>	<b>162</b>	<b>100</b>	<b>162</b>	<b>100</b>

**Multi-disciplinary Core Courses (MDC): 12 credits**

Course Code	Level	Course Title	L	T	P	S	J	C
Basket - Business (Minimum 4 credits)								
ODHR1011	100	<a href="#">Principles of Management*</a>	2	0	0	0	0	2
IENT1061	100	<a href="#">Introduction to Business Environment</a>	2	0	0	0	0	2
INFS1011	100	<a href="#">Technology and Business</a>	2	0	0	0	0	2
STGM1011	100	<a href="#">Introduction to Business Organization</a>	2	0	0	0	0	2
Basket - Humanities and Social Sciences (Minimum 4 Credits)								
SOCY1071	100	<a href="#">Introduction to the Humanities</a>	2	0	0	0	0	2
SOCY1081	100	<a href="#">Foundations of Social Sciences</a>	2	0	0	0	0	2
MSTU1081	100	<a href="#">Media and Communication</a> (Offered in Hyderabad Campus alone)	2	0	0	0	0	2
FPEA1221	100	<a href="#">Performing Arts in Indian Cinema</a>	2	0	0	0	0	2
LANG1261	100	<a href="#">The Art of Storytelling</a>	2	0	0	0	0	2
Basket - Science (Minimum 4 Credits)								
PHYS1371	100	<a href="#">Introduction to Astronomy and Astrophysics</a>	2	0	0	0	0	2
LFSC1001	100	<a href="#">Essentials of Life Processes</a>	2	0	0	0	0	2
LFSC1011	100	<a href="#">Fundamentals of Natural and Chemical Sciences</a>	2	0	0	0	0	2
MATH1371	100	<a href="#">Conceptual Mathematics</a>	2	0	0	0	0	2
CSCI1341	100	<a href="#">Fundamentals of Computer Science</a>	2	0	0	0	0	2
Total Credits			12					

**Major Core (MC): 45 credits**

Course Code	Level	Course Title	L	T	P	S	J	C
MATH1301	100	<a href="#">Linear Algebra I</a>	3	0	0	0	0	3
MATH1311	100	<a href="#">Advanced Calculus and Differential Equations</a>	3	0	0	0	0	3
MATH2391	200	<a href="#">Vector Calculus</a>	3	0	0	0	0	3
MATH2401	200	<a href="#">Algebra I</a>	3	0	0	0	0	3
MATH2411	200	<a href="#">Linear Algebra II</a>	3	0	0	0	0	3
MATH2421	200	<a href="#">Algebra II</a>	3	0	0	0	0	3
MATH2451	200	<a href="#">Introduction to probability</a>	3	0	0	0	0	3
MATH2511	200	<a href="#">Real Analysis I</a>	3	0	0	0	0	3
MATH2521	200	<a href="#">Real Analysis II</a>	3	0	0	0	0	3
MATH3002	300	<a href="#">Numerical Methods</a>	3	0	0	0	0	3
MATH3102	300	<a href="#">Applied Statistics</a>	3	0	0	0	0	3
MATH3341	300	<a href="#">Measure and Integration</a>	3	0	0	0	0	3
MATH3371	300	<a href="#">Ordinary Differential Equations</a>	3	0	0	0	0	3
MATH3381	300	<a href="#">Partial Differential Equations</a>	3	0	0	0	0	3
MATH3451	300	<a href="#">Introduction to Topology</a>	3	0	0	0	0	3
Total Credits			45					

**Major Electives (ME): 15 credits**

Minimum number of credits to be earned: 15.

Course Code	Level	Course Title	L	T	P	S	J	C
MATH2312	200	<a href="#">Number Theory</a>	3	0	0	0	0	3
MATH2551	200	<a href="#">Graph Theory and Combinatorics</a>	3	0	0	0	0	3
MATH3211	300	<a href="#">Calculus of Variations</a>	3	0	0	0	0	3
MATH3221	300	<a href="#">Commutative Algebra</a>	3	0	0	0	0	3
MATH3251	300	<a href="#">Elements of Stochastic Processes</a>	3	0	0	0	0	3
MATH3311	300	<a href="#">Introduction to Mathematical Finance</a>	3	0	0	0	0	3
MATH3351	300	<a href="#">Operations Research</a>	3	0	0	0	0	3
MATH3361	300	<a href="#">Optimization Techniques</a>	2	0	2	0	0	3
MATH3401	300	<a href="#">Representation Theory of Finite Groups</a>	3	0	0	0	0	3
MATH3421	300	<a href="#">Scientific Computing Using MATLAB</a>	3	0	0	0	0	3

**Internship (INT): 4 credits**

Course code	Level	Course Title	L	T	P	S	J	C
MATH3444	300	Internship	0	0	0	0	8	4

**University Core (UC): 22 credits**

Course code	Level	Course Title	L	T	P	S	J	C
<b>Ability Enhancement Courses</b>								
LANG1042	100	<a href="#">Academic Writing</a>	2	0	0	0	0	2
LANG1201	100	<a href="#">Critical Thinking</a>	2	0	0	0	0	2
IENT1051	100	<a href="#">Fundamentals of Entrepreneurship</a>	2	0	0	0	0	2
LANG1242	100	<a href="#">Communicative English - I</a>	0	0	4	0	0	2
LANG1252	100	<a href="#">Communicative English - II</a>	0	0	4	0	0	2
<b>Skill Enhancement Courses</b>								
CSCI1302	100	<a href="#">Introduction to Programming</a>	0	0	4	0	0	2
CSCI1312	100	<a href="#">Introduction to Data Science</a>	0	0	4	0	0	2
GCGC1041	100	<a href="#">Introduction to Core Competencies</a>	0	0	2	0	0	1
GCGC1051	100	<a href="#">Professional Communication and Analytical Skills Development</a>	0	0	2	0	0	1
GCGC1061	100	<a href="#">Applied Communication and Aptitude Skills</a>	0	0	2	0	0	1
GCGC1071	100	<a href="#">Preparation for Campus Placements</a>	0	0	2	0	0	1
<b>Value Added Courses</b>								
ENVS1003	100	<a href="#">Environmental Studies *</a>	3	0	0	0	0	3
POLS1051	100	<a href="#">The Indian Constitution *</a>	1	0	0	0	0	1
<b>Pass / Fail Courses (Mandatory)</b>								
FINA1081	100	<a href="#">Personal Financial Planning *</a>	1	0	0	0	0	1
PHPY1011	100	<a href="#">Gandhi and the Contemporary World * / UHV</a>	1	0	0	0	0	1
<b>Pass / Fail Courses (Any one course to be chosen)</b>								
DOSP1181	100	<a href="#">Yogasana</a>	0	0	0	2	0	1
MFST1002	100	<a href="#">Health and Wellbeing *</a>	0	0	2	0	0	1
DOSL1081	100	<a href="#">Student Life Activities (Participant)</a>	0	0	0	2	0	1
DOSL1091	100	<a href="#">Student Life Activities (Organizer)</a>	0	0	0	2	0	1
DOSL1101	100	<a href="#">Student Life Activities (Competitor)</a>	0	0	0	2	0	1
DOSL1111	100	<a href="#">Foundations of Student (Leadership)</a>	0	0	0	2	0	1
DOSL1042	100	<a href="#">Community Services – Volunteer</a>	0	0	2	0	0	1
DOSL1052	100	<a href="#">Community Services – Mobilizer</a>	0	0	2	0	0	1
DOSP1003	100	<a href="#">Badminton</a>	0	0	0	2	0	1
DOSP1033	100	<a href="#">Football</a>	0	0	0	2	0	1
DOSP1043	100	<a href="#">Volleyball</a>	0	0	0	2	0	1
DOSP1053	100	<a href="#">Kabaddi</a>	0	0	0	2	0	1
DOSP1073	100	<a href="#">Table Tennis</a>	0	0	0	2	0	1
DOSP1083	100	<a href="#">Handball</a>	0	0	0	2	0	1
DOSP1093	100	<a href="#">Basketball</a>	0	0	0	2	0	1
DOSP1113	100	<a href="#">Throw ball</a>	0	0	0	2	0	1
DOSP1142	100	<a href="#">Cricket</a>	0	0	0	2	0	1
DOSP1132	100	<a href="#">Functional Fitness</a>	0	0	0	2	0	1
DOSP1171	100	<a href="#">Martial Arts/Self Defence</a>	0	0	0	2	0	1

\* Massive Open Online Course (MOOC)

*Students pursuing 4<sup>th</sup> year of the Programme need to choose the courses from the respective basket of Honours or Honours with Research*

### Honours Courses

Minimum number of credits to be earned: 32.

Course Code	Level	Course Title	L	T	P	S	J	C
<b>Any Eight of the following courses</b>								
MATH4001	400	<a href="#">Advanced Complex Analysis</a>	4	0	0	0	0	4
MATH4031	400	<a href="#">Advanced Graph Theory</a>	4	0	0	0	0	4
MATH4041	400	<a href="#">Advanced Linear Algebra</a>	4	0	0	0	0	4
MATH4051	400	<a href="#">Advanced Numerical Methods</a>	4	0	0	0	0	4
MATH4061	400	<a href="#">Advanced Ordinary differential equations</a>	4	0	0	0	0	4
MATH4071	400	<a href="#">Advanced Statistics</a>	4	0	0	0	0	4
MATH4081	400	<a href="#">Algebraic Number Theory</a>	4	0	0	0	0	4
MATH4121	400	<a href="#">Complex Analysis</a>	4	0	0	0	0	4
MATH4171	400	<a href="#">Fluid Dynamics</a>	4	0	0	0	0	4
MATH4181	400	<a href="#">Functional Analysis</a>	4	0	0	0	0	4
MATH4191	400	<a href="#">Galois Theory</a>	4	0	0	0	0	4
MATH4201	400	<a href="#">Introduction to Algebraic Geometry</a>	4	0	0	0	0	4
MATH4221	400	<a href="#">Mathematical Modeling and Simulation</a>	4	0	0	0	0	4
MATH4301	400	<a href="#">Statistical Learning Using R</a>	4	0	0	0	0	4
MATH4351	400	<a href="#">Advanced Partial Differential Equations</a>	4	0	0	0	0	4
MATH4361	400	<a href="#">Differential Geometry of Curves and Surfaces</a>	4	0	0	0	0	4
MATH4371	400	<a href="#">Financial Engineering</a>	3	0	2	0	0	4
MATH4381	400	<a href="#">Riemannian Geometry</a>	4	0	0	0	0	4

### Honours with Research Courses

Minimum number of credits to be earned is 32 out of which 12 credits must be earned through Research Project / Dissertation

Course Code	Level	Course Title	L	T	P	S	J	C
<b>Any Five of the following courses</b>								
MATH4001	400	<a href="#">Advanced Complex Analysis</a>	4	0	0	0	0	4
MATH4031	400	<a href="#">Advanced Graph Theory</a>	4	0	0	0	0	4
MATH4041	400	<a href="#">Advanced Linear Algebra</a>	4	0	0	0	0	4
MATH4051	400	<a href="#">Advanced Numerical Methods</a>	4	0	0	0	0	4
MATH4061	400	<a href="#">Advanced Ordinary differential equations</a>	4	0	0	0	0	4
MATH4071	400	<a href="#">Advanced Statistics</a>	4	0	0	0	0	4
MATH4081	400	<a href="#">Algebraic Number Theory</a>	4	0	0	0	0	4
MATH4121	400	<a href="#">Complex Analysis</a>	4	0	0	0	0	4
MATH4171	400	<a href="#">Fluid Dynamics</a>	4	0	0	0	0	4
MATH4181	400	<a href="#">Functional Analysis</a>	4	0	0	0	0	4
MATH4191	400	<a href="#">Galois Theory</a>	4	0	0	0	0	4
MATH4201	400	<a href="#">Introduction to Algebraic Geometry</a>	4	0	0	0	0	4
MATH4221	400	<a href="#">Mathematical Modeling and Simulation</a>	4	0	0	0	0	4
MATH4301	400	<a href="#">Statistical Learning Using R</a>	4	0	0	0	0	4
MATH4351	400	<a href="#">Advanced Partial Differential Equations</a>	4	0	0	0	0	4
MATH4361	400	<a href="#">Differential Geometry of Curves and Surfaces</a>	4	0	0	0	0	4
MATH4371	400	<a href="#">Financial Engineering</a>	3	0	2	0	0	4
MATH4381	400	<a href="#">Riemannian Geometry</a>	4	0	0	0	0	4

<b>Research Project / Dissertation (PROJ)</b>								
MATH4888	400	Dissertation - I (Review of Literature & Research Proposal)	0	0	0	0	8	4
MATH4999	400	Dissertation – II	0	0	0	0	16	8

**Minor Courses**

One Minor is to be chosen from the following list of Minors.

The minimum number of credits to be earned up to 3 years of the programme is 24.

The minimum number of credits to be earned for the 4 years programme is 32.

**Minors List:** [Click here](#)





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**GITAM School of Science**  
**GITAM (Deemed to be University)**  
**Visakhapatnam | Hyderabad | Bengaluru**