

GANDHI 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

4 Year Undergraduate Programme

UMFST06: B.Sc. Microbiology

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.Optomtry, 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

Fostering a seamless and innovative interdisciplinary research-driven academic ecosystem to address complex biological challenges, by reinforcing critical thinking, creativity, and collaboration

MISSION

- Holistic development of the students through interdisciplinary research and teaching programs with focus on contemporary problems in health, food, disease and environment
- Encourage students to embrace their curiosity to understand the natural processes and boost entrepreneurship for sustainable development
- To emerge as centre of excellence by addressing global challenges in personalized food and medicine, sustainable agriculture and environment through cutting-edge and collaborative research
- Nurture a culture of honesty, kindness, empathy and trust among the Life Sciences fraternity with a strong commitment towards all life on earth and its environment

Programme Educational Objectives (PEOs)

- PEO 1:** To expose students to the theory and laboratory skills in microbiology.
- PEO 2:** To make students competent in Microbiology and allied areas by providing them with hands-on experience.
- PEO 3:** To instill the ability for research and entrepreneurship in the students.
- PEO 4:** To increase the student's ability in integrating various aspects of Microbiology.

PEO Articulation

	PEO1	PEO2	PEO3	PEO4
M1	3	3	2	3
M2	3	3	3	3
M3	2	2	3	3
M4	1	2	3	3

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

UMFST06: B.Sc. Microbiology

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:** Will implement basic principles of bacteriology, cell biology, molecular biology, virology, mycology, and immunology in real-world situations and problems.
- PSO2:** Understand the importance of recombinant DNA techniques correlating the knowledge gained in microbial genetics.
- PSO3:** Learn the detailed principles, procedures, and applications of chromatographic and electrophoretic techniques to purify proteins and nucleic acids to homogeneity.
- PSO4:** Understand the importance of techniques in quantitating biomolecular concentrations successfully.

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	40	32.79	72	44.44	60	37.03
3	Major Electives	ME	20	16.39	20	12.35	20	12.35
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
	Total		122	100	162	100	162	100

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	Principles of Management*	2	0	0	0	0	2
IENT1061	100	Introduction to Business Environment	2	0	0	0	0	2
INFS1011	100	Technology and Business	2	0	0	0	0	2
STGM1011	100	Introduction to Business Organization	2	0	0	0	0	2
Basket - Humanities and Social Sciences (Minimum 4 Credits)								
SOCY1071	100	Introduction to the Humanities	2	0	0	0	0	2
SOCY1081	100	Foundations of Social Sciences	2	0	0	0	0	2
MSTU1081	100	Media and Communication (Offered in Hyderabad Campus alone)	2	0	0	0	0	2
FPEA1221	100	Performing Arts in Indian Cinema	2	0	0	0	0	2
LANG1261	100	The Art of Storytelling	2	0	0	0	0	2
Basket - Science (Minimum 4 Credits)								
PHYS1371	100	Introduction to Astronomy and Astrophysics	2	0	0	0	0	2
LFSC1001	100	Essentials of Life Processes	2	0	0	0	0	2
LFSC1011	100	Fundamentals of Natural and Chemical Sciences	2	0	0	0	0	2
MATH1371	100	Conceptual Mathematics	2	0	0	0	0	2
CSCI1341	100	Fundamentals of Computer Science	2	0	0	0	0	2
Total Credits								12

*Mandatory Course in Basket

Major Core (MC): 40 credits

Course Code	Level	Course Title	L	T	P	S	J	C
MFST2581	200	General Microbiology	3	0	2	0	0	4
MFST2591	200	Biofertilizers and Biopesticides	3	0	2	0	0	4
MFST2601	200	Microbial Physiology	3	0	2	0	0	4
MFST2611	200	Biochemical and Biophysical Techniques	3	0	2	0	0	4
MFST3521	300	Medical Microbiology	3	0	2	0	0	4
MFST3441	300	Microbial Genetics	3	0	0	0	0	3
MFST3531	300	Recombinant DNA Technology	3	0	2	0	0	4
BCBI1101	100	Cell Biology	3	0	0	0	0	3
BCBI1111	100	Chemistry of Biomolecules	3	0	0	0	0	3
BTSC2251	200	Molecular Biology	3	0	2	0	0	4
BTSC3111	300	Genetics and Evolution	3	0	0	0	0	3
Total Credits			40					

Major Electives (ME): 20 credits

Minimum number of credits to be earned: 20.

Course Code	Level	Course Title	L	T	P	S	J	C
MFST2621	200	Biofilms	3	0	2	0	0	4
MFST2631	200	Ecology	3	0	2	0	0	4
MFST2641	200	Marine Microbiology	3	0	2	0	0	4
MFST2651	200	Virology	3	0	2	0	0	4
MFST3222	300	Bioremediation	3	0	0	0	0	3
MFST3541	300	Microbial Biotechnology	3	0	2	0	0	4
MFST3551	300	Bioenergy and Biofuels	3	0	2	0	0	4
MFST3561	300	Environmental Microbiology	3	0	2	0	0	4
MFST3301	300	Food and Agriculture Microbiology	3	0	0	0	0	3
MFST3571	300	Inheritance Biology	3	0	2	0	0	4
MFST3431	300	Management of Human Microbial Diseases	3	0	0	0	0	3
MFST3461	300	Probiotics and Prebiotics	3	0	0	0	0	3

Internship (INT): 4 credits

Course code	Level	Course Title	L	T	P	S	J	C
MFST3444	300	Internship	0	0	0	0	8	4

University Core (UC): 22 credits

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

* Massive Open Online Course (MOOC)

Students pursuing 4th 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
MFST4571	400	Epidemiology	3	0	2	0	0	4
MFST4581	400	Functional Omics and Bioinformatics	3	0	2	0	0	4
MFST4591	400	Fundamentals of Immunology	3	0	2	0	0	4
MFST4601	400	Industrial Microbiology	3	0	2	0	0	4
MFST4611	400	Microbial Diagnosis in Health Clinics	3	0	2	0	0	4
MFST4621	400	Microbial Metabolites	3	0	2	0	0	4
MFST4631	400	Pharmaceutical Microbiology	3	0	2	0	0	4
MFST4641	400	Vaccinology	3	0	2	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
MFST4571	400	Epidemiology	3	0	2	0	0	4
MFST4581	400	Functional Omics and Bioinformatics	3	0	2	0	0	4
MFST4601	400	Industrial Microbiology	3	0	2	0	0	4
MFST4611	400	Microbial Diagnosis in Health Clinics	3	0	2	0	0	4
MFST4631	400	Pharmaceutical Microbiology	3	0	2	0	0	4
Research Project / Dissertation (PROJ)								
MFST4888	400	Dissertation - I (Review of Literature & Research Proposal)	0	0	0	0	8	4
MFST4999	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 year programme is 32.

Minors List: [Click here](#)



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