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

2 Year Postgraduate Programme
PBTSC01: M.Sc. Biotechnology

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

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: Equip students with a comprehensive understanding of biotechnological principles, techniques, and methodologies, including molecular biology, genetics, bioinformatics, and microbiology, enabling them to apply this knowledge to real- world challenges in research and industry.

PEO 2: Develop hands-on laboratory skills in various biotechnological applications, such as genetic engineering, fermentation technology, protein purification, and plant & animal cell culture, preparing students for both academic research and industrial environment.

PEO 3: Foster analytical thinking and problem-solving skills, encouraging students to critically evaluate experimental data, design innovative biotechnological solutions, and conduct independent research to address complex biological and environmental issues.

PEO 4: Promote an interdisciplinary perspective by integrating biotechnological principles with fields such as bioinformatics, environmental science, pharmacology, and agriculture, preparing students for diverse career opportunities in academic, government, and private sectors

PEO 5: Cultivate an understanding of the ethical, legal, and regulatory aspects of biotechnology, along with a focus on sustainable practices in biotechnological development, ensuring that students are prepared to make responsible decisions in the development and application of biotechnologies for societal benefit.

PEO Articulation

	PEO1	PEO2	PEO3	PEO4	PEO5
M1	3	3	3	2	2
M2	2	2	3	2	3
M3	3	2	3	3	2
M4	1	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

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.

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.

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

PO5: The graduates should be able to demonstrate the willingness and ability to: 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 the transition towards more technology-assisted work involving the creation of new forms of work and rapidly changing work and production processes.

PSO1: The student should be able to understand, evaluate and apply comprehensive knowledge of the fundamental concepts of biological sciences.

PSO2: The student should be able to understand and gain practical, professional, and procedural knowledge in various spheres of Biotechnology, interdisciplinary and multidisciplinary areas of Biotechnology.

PSO3: The student should be able to get potential understanding on different industrial processes in Biotechnology and allied fields that promote innovative ability, equipped with entrepreneurship skills, contributing to self and national development.

PSO4: The student can gain sufficient subject knowledge and apply these concepts to real-life situations by acquiring competencies and being helpful for societal needs.

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

Program structure of 2 Year M.Sc. Biotechnology

Course Category	Credit distribution			
	Semester I	Semester II	Semester III	Semester IV
	Credits	Credits	Credits	Credits
Programme Core Courses	3 X 4 = 12	2 X 4 = 08	2 X 4 = 08	2 X 4 = 08
Programme Elective Courses	1 X 4 = 04	1 X 4 = 04	2 X 4 = 08	2 X 4 = 08
Labs	2 X 2 = 04	2 X 2 = 04	2 X 2 = 04	2 X 2 = 04
Research Methodology	0	1 X 4 = 04	0	0
Seminar	0	1 X 1 = 01	0	0
Term Paper	0	1 X 1 = 01	0	0
Internship	0	1 X 4 = 04	0	0
Research Project	0	0	0	20**
Research Dissertation	--	--	40*	
Total at the end semester	20	26	20	20
Total credits at the end	6		40	
Total credits at the end of 2 years	86			

** Number of credits for the student pursuing 2nd year with Course Work and Research
* Number of credits for the student pursuing in 2nd year with Research alone

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									
25BTSC6001	PC	600	Enzymology and Metabolic Regulation	4	0	0	0	0	4
25BTSC6011	PC	600	Cell and Molecular Biology	4	0	0	0	0	4
25BTSC6021	PC	600	Bioanalytical techniques and Biostatistics	4	0	0	0	0	4
25BTSC6031	PC	600	Cell and Molecular Biology Laboratory	0	0	4	0	0	2
25BTSC6041	PC	600	Enzymology and Bioanalytical techniques Laboratory	0	0	4	0	0	2
Choose any one of the following electives:									
25BTSC6051	PE	600	Microbiology	4	0	0	0	0	4
25BTSC6061	PE	600	Genetics- Principles and Applications	4	0	0	0	0	4
25BTSC6071	PE	600	Environmental Microbiology and Biotechnology	4	0	0	0	0	4
			Total Credits						**20**
Semester - II									
25BTSC6081	PC	600	Genetic Engineering: Methods and Applications	4	0	0	0	0	4
25BTSC6091	PC	600	Plant and Animal Biotechnology	4	0	0	0	0	4
25BTSC6101	PC	600	Genetic Engineering Methods Laboratory	0	0	4	0	0	2
25BTSC6111	PC	600	Plant and Animal Biotechnology Laboratory	0	0	4	0	0	2
25BTSC6444	FC	600	Research Methodology	4	0	0	0	0	4
25BTSC6777	FC	600	Term Paper	0	0	0	0	2	1
25BTSC6666	FC	600	Seminar	0	0	0	0	2	1
25BTSC6333	FC	600	Internship	0	0	0	0	8	4
Choose any one of the following electives:									
25BTSC6121	PE	600	Molecular Oncology and Regenerative Medicine	4	0	0	0	0	4
25BTSC6131	PE	600	Cellular and Molecular Neurobiology	4	0	0	0	0	4
25BTSC6141	PE	600	Bioinformatics and Computational Biology	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									
25BTSC7888	FC	700	Research Dissertation - I	0	0	0	0	40	20
			Total Credits						**20**
Semester – IV									
25BTSC7999	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**
25BTSC7001	PC	700	Immunology and Immunotechnology	4	0	0	0	0	4
25BTSC7011	PC	700	Bioprocess Technology and Bioentrepreneurship	4	0	0	0	0	4
25BTSC7021	PC	700	Immunology and Immunotechnology Laboratory	0	0	4	0	0	2
25BTSC7031	PC	700	Bioprocess Technology Laboratory	0	0	4	0	0	2
Choose any one of the following electives:									
25BTSC7041	PE	700	Medical and Pharmaceutical Biotechnology	4	0	0	0	0	4
25BTSC7051	PE	700	Molecular Diagnostics	4	0	0	0	0	4
25BTSC7061	PE	700	Forensic Biotechnology	4	0	0	0	0	4
Choose any one of the following electives:									
25BTSC7071	PE	700	Marine Biotechnology	4	0	0	0	0	4
25BTSC7081	PE	700	IPR and Ethical Issues	4	0	0	0	0	4
25BTSC7091	PE	700	Molecular Virology	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**
25BTSC7101	PC	700	Nanobiotechnology	4	0	0	0	0	4
25BTSC7111	PC	700	Food Biotechnology	4	0	0	0	0	4
25BTSC7121	PC	700	Nanobiotechnology Laboratory	0	0	4	0	0	2
25BTSC7131	PC	700	Food Biotechnology Laboratory	0	0	4	0	0	2
Choose any one of the following electives:									
25BTSC7141	PE	700	Protein Engineering	4	0	0	0	0	4
25BTSC7151	PE	700	Systems and Synthetic Biology	4	0	0	0	0	4
25BTSC7161	PE	700	Developmental Biology	4	0	0	0	0	4
Choose any one of the following electives:									
25BTSC7171	PE	700	Applied Data Science and Biostatistics	4	0	0	0	0	4
25BTSC7181	PE	700	Clinical Research in Biotechnology	4	0	0	0	0	4
25BTSC7191	PE	700	Genomics, Proteomics and Metabolomics	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**
25BTSC7555	FC	700	Research Project	0	0	0	0	40	20
			Total Credits						**20**

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