

**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 Technology**



**CURRICULUM AND SYLLABUS**

**4 Year Undergraduate Programme**

**UBTEN02: B.Tech. Biomedical Engineering**

w.e.f. 2024-25 admitted batch  
(Updated on July 2025)

# **Academic Regulations**

**Applicable for the Undergraduate Programmes in the  
School of Technology (except B.Tech.CSBS)**

**<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.

## **VISION AND MISSION OF THE SCHOOL**

### **VISION**

To become a global leader in holistic engineering education and research

### **MISSION**

- To impart a strong academic foundation and practical education through a flexible curriculum, state-of-the-art infrastructure, and best learning resources
- To actively pursue academic and collaborative research with industries and research institutions, both in India and abroad
- To build a congenial and innovative eco system by enabling the latest technologies, thus helping the students, to solve the challenges of societal importance
- To provide our students with the appropriate leadership, management, communication skills and professional ethics for career success and to continuously impact the global lives

## **VISION AND MISSION OF THE DEPARTMENT**

### **VISION**

To become a global leader in holistic engineering education and research

### **MISSION**

- To enhance the efficiency of education for the empowerment of human resources that can stimulate innovations related to food security, environment and health.
- To foster a collaborative ecosystem that integrates engineering and biological sciences, that enables and motivates our youth to address societal challenges for the benefit of humanity.
- To support and advance food processing, biotech and biomedical industries through cutting-edge research capabilities that catalyze groundbreaking discoveries
- To develop innovative technological solutions for bioprocesses, biomaterials and biomedical devices, based on translational research, and deploy them to facilitate commercialization for economic advancement.

**UBTEN02: Biomedical Engineering**  
**(w.e.f. academic year 2024-25 admitted batch)**

**Programme Educational Objectives (PEOs)**

<b>PEO 1</b>	To provide a strong foundation in biomedical engineering that enables graduates to develop innovative solutions to healthcare challenges by integrating engineering and life sciences.
<b>PEO 2</b>	To foster research and interdisciplinary problem-solving for addressing complex healthcare issues, ensuring graduates can translate innovations into practical medical technologies
<b>PEO 3</b>	To prepare graduates for leadership and professional excellence in biomedical industries, academia, and healthcare by promoting ethical decision-making, adaptability, and teamwork.
<b>PEO 4</b>	To encourage lifelong learning and professional growth so that graduates remain at the cutting edge of biomedical technology and contribute to advancing healthcare systems and patient outcomes.

**Establish consistency of PEOs with Mission of the Department**

<b>PEOs</b>	<b>Aligned with Mission</b>	<b>Justification</b>
<b>PEO 1</b>	<b>Mission 1:</b> Strengthen education in biomedical engineering.	This PEO aligns with the mission to provide a solid educational foundation in biomedical engineering, enabling students to innovate and address healthcare challenges.
<b>PEO 2</b>	<b>Mission 4:</b> Promote cutting-edge research and interdisciplinary learning.	This PEO supports the mission by focusing on building research skills and encouraging interdisciplinary approaches to solve complex healthcare problems.
<b>PEO 3</b>	<b>Mission 2:</b> Foster leadership and collaborative ecosystem.	This PEO promotes leadership, adaptability, and teamwork, which directly supports the mission to prepare students for leading roles and foster collaboration in multidisciplinary settings.
<b>PEO 4</b>	<b>Mission 3:</b> Encourage continuous learning and contribute to healthcare advancement.	This PEO emphasizes lifelong learning, aligning with the mission to keep graduates at the forefront of technological advancements and improve healthcare systems.

**PEO Articulation**

	<b>PEO1</b>	<b>PEO2</b>	<b>PEO3</b>	<b>PEO4</b>
<b>M1</b>	H	M	L	M
<b>M2</b>	L	M	H	L
<b>M3</b>	M	M	L	H
<b>M4</b>	M	H	L	M

H – High, M – Medium, L – Low

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

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

<b>PO1</b>	<b>Engineering Knowledge:</b> Apply knowledge of mathematics, science, and biomedical engineering fundamentals to solve complex engineering problems related to healthcare.
<b>PO2</b>	<b>Problem Analysis:</b> Identify, formulate, and analyze complex biomedical engineering problems using principles of engineering, biology, and physiology.
<b>PO3</b>	<b>Design and Development:</b> Design and develop biomedical systems, devices, and processes that meet specified needs, considering public health, safety, cultural, societal, and environmental aspects.
<b>PO4</b>	<b>Investigations of Complex Problems:</b> Conduct experiments, analyze data, and synthesize information to draw valid conclusions related to biomedical engineering challenges.
<b>PO5</b>	<b>Modern Tool Usage:</b> Use appropriate techniques, resources, and modern engineering and IT tools for biomedical engineering applications, with an understanding of their limitations.
<b>PO6</b>	<b>The Engineer and Society:</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to professional biomedical engineering practice.
<b>PO7</b>	<b>Environment and Sustainability:</b> Understand the impact of biomedical engineering solutions on society and the environment and demonstrate knowledge of sustainable practices.
<b>PO8</b>	<b>Ethics:</b> Adhere to ethical principles and commit to professional ethics and responsibilities in biomedical engineering practices.
<b>PO9</b>	<b>Individual and Teamwork:</b> Function effectively as an individual and as a member or leader in diverse teams, especially in multidisciplinary environments.
<b>PO10</b>	<b>Communication:</b> Communicate effectively on complex biomedical engineering activities with the engineering community and society at large, including writing reports, preparing documentation, and giving presentations.
<b>PO11</b>	<b>Project Management and Finance:</b> Apply engineering and management principles to one's work, as a member or leader of a team, to manage projects in multidisciplinary settings
<b>PO12</b>	<b>Life-long Learning:</b> Recognize the need for, and have the ability to engage in, independent and lifelong learning in the context of technological change, particularly in biomedical engineering.

<b>PSO1</b>	Apply engineering principles to design, develop, and maintain medical devices and systems that improve diagnosis, monitoring, and treatment of medical conditions
<b>PSO2</b>	Design, develop and utilize biomedical signal processing, imaging techniques, and computational tools to analyze biological data, aiding in the development of diagnostic, prognostic and therapeutic solutions
<b>PSO3</b>	Implement biomedical engineering solutions in clinical settings, integrating biological knowledge and technology to innovate and improve healthcare practices, rehabilitation systems, and assistive devices

**Mapping of Program Outcomes and Program Specific Outcomes  
with Department Mission**

Mission				
	M1	M2	M3	M4
Program Objectives				
PO1	H	H	H	H
PO2	H	H	H	H
PO3	H	H	H	H
PO4	M	H	H	H
PO5	M	H	H	H
PO6	M	M	H	L
PO7	M	H	H	L
PO8	L	M	L	L
PO9	L	L	L	H
PO10	M	L	L	H
PO11	L	H	L	H
PO12	H	L	M	H
Program Specific Objectives				
PSO1	H	H	H	H
PSO2	H	H	M	H
PSO3	H	H	H	H



# **Curriculum Structure**

## *(Flexible Credit System)*

**Minimum Credit Requirements for the Award of Degree**

<b>S.No.</b>	<b>Course Category and Category Code</b>	<b>Minimum Credits</b>	<b>% of credits in the Programme</b>
1.	University Core (UC)	19	11.87
2.	Faculty Core (FC)	53	33.13
3.	Programme Core (PC)	49	30.62
4.	Programme Electives (PE)	15	9.38
5.	Open Electives (OE)	24	15.00
	<b>Total</b>	<b>160</b>	<b>100</b>

University Core (UC) : 19 Credits								
Course code	Level	Course Title	L	T	P	S	J	C
<b>Ability Enhancement Courses</b>								
LANG1201	100	<a href="#">Critical Thinking</a>	2	0	0	0	0	2
LANG1241	100	<a href="#">Communicative English - I</a>	0	0	4	0	0	2
LANG1251	100	<a href="#">Communicative English - II</a>	0	0	4	0	0	2
IENT1051	100	<a href="#">Fundamentals of Entrepreneurship</a>	2	0	0	0	0	2
<b>Skill Enhancement Courses</b>								
GCGC1001	100	<a href="#">Aptitude and Self-Management Skills</a>	0	0	2	0	0	1
GCGC1011	100	<a href="#">Integrated Aptitude and Ethical Communications</a>	0	0	2	0	0	1
GCGC1021	100	<a href="#">Applied Communication and Quantitative Skills</a>	0	0	2	0	0	1
GCGC1031	100	<a href="#">Placement Preparation and Professional Readiness</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 *</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)

FACULTY CORE (FC) : 53 credits								
Course code	Level	Course title	L	T	P	S	J	C
MATH1351/ 24BTEN1001	100	<a href="#">Trigonometry and Geometry /</a> <a href="#">Biology for Engineers</a>	4 3	0 1	0 0	0 0	0 0	4 4
MATH1361	100	<a href="#">Linear Algebra and calculus</a>	4	0	0	0	0	4
MATH2611	200	<a href="#">Vector calculus and Differential equations</a>	4	0	0	0	0	4
MATH2621	200	<a href="#">Complex Analysis, Series and Transform Techniques</a>	4	0	0	0	0	4
PHYS1311	100	<a href="#">Essential Physics for Bioengineering</a>	3	0	2	0	0	4
CHEM1111	100	<a href="#">Engineering Chemistry</a>	2	1	2	0	0	4
24CSEN1031	100	<a href="#">Programming for Problem Solving - 1</a> (Programming with Python)	0	0	6	0	0	3
24CSEN1041	100	<a href="#">Programming for Problem Solving - 2</a> (Programming with C)	0	0	6	0	0	3
24xxxxxxx	xxx	Engineering Basket - Choice 1	2	0	2	0	0	3
24xxxxxxx	xxx	Engineering Basket - Choice 2	2	0	2	0	0	3
MECH1011	100	<a href="#">Engineering Visualization and Product Realization</a>	0	0	4	0	0	2
MECH1041	100	<a href="#">Technology Exploration and Product Engineering</a>	0	0	4	0	0	2
24PROJ4777	400	Capstone Project - Introduction	0	0	0	0	2	1
24IENT3777	300	Internship-1	0	0	0	0	2	1
24PROJ4888 / 24IENT4888 / 24RESH4888	400	Capstone Project - Final / Internship-2 / Research	0	0	0	0	16	8
HSMCH102	100	Universal Human Values 2: Understanding Harmony	2	1	0	0	0	3

## Engineering Basket 1 &amp; 2

Six credits have to be chosen from the basket other than Parent Department course.

Course code	Level	Course title	L	T	P	S	J	C
24EECE2221	200	<a href="#">Fundamentals of Sensors and Internet of Things</a>	2	0	2	0	0	3
24EECE 2211	200	<a href="#">Fundamentals of Electrical and Electronics Engineering</a>	2	0	2	0	0	3
24EECE2231	200	<a href="#">Foundations of Electrical and Electronics Engineering</a>	3	0	2	0	0	4
24MECH1001	100	<a href="#">Introduction to Mechanical Engineering</a>	2	0	2	0	0	3
24CIVL1001	100	<a href="#">Introduction to Civil Engineering</a>	2	0	2	0	0	3
24BTEN1021	100	<a href="#">Biotechnology and Bioengineering</a>	2	0	2	0	0	3
24BTEN1031	100	<a href="#">Introduction to Biomedical Engineering</a>	2	0	2	0	0	3
24CSEN2261	200	<a href="#">Data Structures and Algorithms</a>	2	0	2	0	0	3

<b>Programme Core (PC) : 49 credits</b>								
<b>49 credits to be earned through programme core courses.</b>								
<b>Course code</b>	<b>Level</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>J</b>	<b>C</b>
24BTEN2081	200	<a href="#">Biochemistry and Biophysics</a>	2	1	0	0	0	3
24BTEN2091	200	<a href="#">Human Anatomy and Physiology</a>	3	0	2	0	0	4
24BTEN2101	200	<a href="#">Molecular Biology and Genetic Engineering</a>	3	0	2	0	0	4
24BTEN2111	200	<a href="#">Cell and Tissue Engineering</a>	3	0	0	0	0	3
24MECH2091	200	<a href="#">Biomaterials</a>	3	0	0	0	0	3
24MECH3321	300	<a href="#">Biomechanics</a>	2	1	2	0	0	4
24EECE3651	300	<a href="#">Biomedical optics and lasers</a>	3	0	0	0	0	3
24EECE2251	200	<a href="#">Fundamentals of Analog and Digital Electronics</a>	3	0	2	0	0	4
24EECE2271	200	<a href="#">Biomedical Signals and Systems</a>	3	0	2	0	0	4
24EECE3661	300	<a href="#">Image Processing</a>	3	0	0	0	0	3
24EECE3671	300	<a href="#">Biomedical instrumentation</a>	3	0	2	0	0	4
24MECH4091	400	<a href="#">Rehabilitation engineering</a>	3	0	0	0	0	3
24BTEN3421	300	<a href="#">Biomedical Informatics</a>	3	0	2	0	0	4
24BTEN4061	400	<a href="#">Biomedical regulatory affairs and IPR</a>	3	0	0	0	0	3

Programme Elective (PE) : 15 credits								
A minimum of 15 credits from any one of the tracks								
Track # : Biomedical Instrumentation								
Course code	Level	Course Title	L	T	P	S	J	C
24EECE4251	400	<a href="#">Biomedical MRI</a>	3	0	0	0	0	3
24EECE3681	300	<a href="#">Biomedical Image Analysis</a>	3	0	0	0	0	3
24EECE3041	300	<a href="#">Control systems</a>	2	1	0	0	0	3
24MECH3331	300	<a href="#">Introduction to Robotics</a>	3	0	0	0	0	3
24EECE4261	400	<a href="#">Surgical and endoscopic robots</a>	3	0	0	0	0	3
24EECE4271	400	<a href="#">Radiative surgery and therapeutics</a>	3	0	0	0	0	3
24EECE2031	200	<a href="#">Introduction to IoT and its applications</a>	3	0	0	0	0	3
24EECE2281	200	<a href="#">Biosensors</a>	3	0	0	0	0	3
24EECE3691	300	<a href="#">Portable and Wearable biomedical device engineering</a>	3	0	0	0	0	3
24EECE4281	400	<a href="#">Nanobioelectronics</a>	3	0	0	0	0	3
24MECH4111	400	<a href="#">Bioprinting</a>	3	0	0	0	0	3
24EECE4291	400	<a href="#">Medical Imaging Systems</a>	3	0	0	0	0	3
Track # : Rehabilitation Engineering								
24MECH4101	400	<a href="#">Finite element analysis for BME</a>	3	0	0	0	0	3
24BTEN3431	300	<a href="#">Physiological modeling</a>	3	0	0	0	0	3
24MECH3331	300	<a href="#">Introduction to Robotics</a>	3	0	0	0	0	3
24MECH3341	300	<a href="#">Robot kinematics and dynamics</a>	3	0	0	0	0	3
24EECE3701	300	<a href="#">Sensors and Actuators for prosthetics</a>	3	0	0	0	0	3
24EECE3041	300	<a href="#">Control systems</a>	3	0	0	0	0	3
24EECE3711	300	<a href="#">Electronic Sensing for perception of vision and sound</a>	3	0	0	0	0	3
24EECE3721	300	<a href="#">Neuroengineering</a>	3	0	0	0	0	3
24EECE4281	400	<a href="#">Nanobioelectronics</a>	3	0	0	0	0	3
24MECH4111	400	<a href="#">Bioprinting</a>	3	0	0	0	0	3
General Electives								
Course code	Level	Course Title	L	T	P	S	J	C
24BTEN3441	300	<a href="#">Mechanisms of Aging</a>	3	0	0	0	0	3
24EECE4301	400	<a href="#">Biomedical Lab-On-A-Chip systems</a>	3	0	0	0	0	3
24MECH3351	300	<a href="#">Modeling and simulation of Prosthetic Devices</a>	3	0	0	0	0	3

24EECE4311	400	<a href="#">Haptics for biomedical engineering</a>	3	0	0	0	0	3
24EECE3731	300	<a href="#">Human-Machine Interface Engineering</a>	3	0	0	0	0	3
24CSEN2361	200	<a href="#">Fundamentals of Neural Networks and Deep Learning</a>	3	0	0	0	0	3
24MECH4121	400	<a href="#">Neuromechanics</a>	3	0	0	0	0	3
24MECH4131	400	<a href="#">Biomicrofluidics</a>	3	0	0	0	0	3

## Open Electives (OE)

A minimum of 24 credits are to be earned under this category of courses, out of which 9 credits are from other departments from the School of Technology and the remaining 15 credits are from schools other than the School of Technology.

## Minor

Students may opt to enroll in a Minor programme for 20 Credits extra beyond the academic requirement of 160 Credits to obtain the B.Tech. degree.

The list of available Minor Programmes are listed [here](#)



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