GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University)

VISAKHAPATNAM * HYDERABAD * BENGALURU

Accredited by NAAC with A^{++} 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 May 2024)

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

UBTEN02: Biomedical Engineering

(w.e.f. academic year 2024-25 admitted batch)

Programme Educational Objectives (PEOs)

PEO 1	
PEO 2	
PEO 3	
PEO 4	
PEO 5	

PEO Articulation

	PEO1	PEO2	PEO3	PEO4	PEO5
M1					
M2					
M3					
M4					
M5					

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:

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	
PSO2	
PSO3	

Curriculum Structure

(Flexible Credit System)

Minimum Credit Requirements for the Award of Degree

S.No.	Course Category and Category Code	Minimum Credits	% of credits in the Programme
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
	Total	**160**	**100**

University Core (UC) : 19 Credits								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
Ability Enhancement Courses								
LANG1201	100	Critical Thinking	2	0	0	0	0	2
LANG1241	100	Communicative English - I	0	0	4	0	0	2
LANG1251	100	Communicative English - II	0	0	4	0	0	2
IENT1051	100	Fundamentals of Entrepreneurship	2	0	0	0	0	2
Skill Enhancement Courses								
CLAD1041	100	Art of Persuasive Communication	0	0	2	0	0	1
CLAD1051	100	Competence in Communication	0	0	2	0	0	1
CLAD1061	100	Life Skills	0	0	2	0	0	1
CLADXXXX	100	Soft Skills - 4	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 *	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)

FACULTY CORE (FC) : 53 credits								
Course code	**Level**	**Course title**	**L**	**T**	**P**	**S**	**J**	**C**
MATH1351/ 24BTEN1001	100	Trigonometry and Geometry / Biology for Engineers	4 3	0 1	0 0	0 0	0 0	4 4
MATH1361	100	Linear Algebra and calculus	4	0	0	0	0	4
MATH2611	200	Vector calculus and Differential equations	4	0	0	0	0	4
MATH2621	200	Complex Analysis, Series and Transform Techniques	4	0	0	0	0	4
PHYS1311	100	Essential Physics for Bioengineering	3	0	2	0	0	4
CHEM1111	100	Engineering Chemistry	2	1	2	0	0	4
24CSEN1031	100	Programming for Problem Solving - 1 (Programming with Python)	0	0	6	0	0	3
24CSEN1041	100	Programming for Problem Solving - 2 (Programming with C)	0	0	6	0	0	3
24xxxxxxxx	xxx	Engineering Basket - Choice 1	2	0	2	0	0	3
24xxxxxxxx	xxx	Engineering Basket - Choice 2	2	0	2	0	0	3
MECH1011	100	Engineering Visualization and Product Realization	0	0	4	0	0	2
MECH1041	100	Technology Exploration and Product Engineering	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 & 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	Fundamentals of Sensors and Internet of Things	2	0	2	0	0	3
24EECE 2211	200	Fundamentals of Electrical and Electronics Engineering	2	0	2	0	0	3
24EECE2231	200	Foundations of Electrical and Electronics Engineering	3	0	2	0	0	4
24MECH1001	100	Introduction to Mechanical Engineering	2	0	2	0	0	3
24CIVL1001	100	Introduction to Civil Engineering	2	0	2	0	0	3
24BTEN1021	100	Biotechnology and Bioengineering	2	0	2	0	0	3
24BTEN1031	100	Introduction to Biomedical Engineering	2	0	2	0	0	3
24CSEN2261	200	Data Structures and Algorithms	2	0	2	0	0	3

Programme Core (PC) : 49 credits								
49 credits to be earned through programme core courses.								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
24BTEN2081	200	Biochemistry and Biophysics	2	1	0	0	0	3
24BTEN2091	200	Human Anatomy and Physiology	3	0	2	0	0	4
24BTEN2101	200	Molecular Biology and Genetic Engineering	3	0	2	0	0	4
24BTEN2111	200	Cell and Tissue Engineering	3	0	0	0	0	3
24MECH2091	200	Biomaterials	3	0	0	0	0	3
24MECH3321	300	Biomechanics	2	1	2	0	0	4
24EECE3651	300	Biomedical optics and lasers	3	0	0	0	0	3
24EECE2251	200	Fundamentals of Analog and Digital Electronics	3	0	2	0	0	4
24EECE2271	200	Biomedical Signals and Systems	3	0	2	0	0	4
24EECE3661	300	Image Processing	3	0	0	0	0	3
24EECE3671	300	Biomedical instrumentation	3	0	2	0	0	4
24MECH4091	400	Rehabilitation engineering	3	0	0	0	0	3
24BTEN3421	300	Biomedical Informatics	3	0	2	0	0	4
24BTEN4061	400	Biomedical regulatory affairs and IPR	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	Biomedical MRI	3	0	0	0	0	3
24EECE3681	300	Biomedical Image Analysis	3	0	0	0	0	3
24EECE3041	300	Control systems	2	1	0	0	0	3
24MECH3331	300	Introduction to Robotics	3	0	0	0	0	3
24EECE4261	400	Surgical and endoscopic robots	3	0	0	0	0	3
24EECE4271	400	Radiative surgery and therapeutics	3	0	0	0	0	3
24EECE2031	200	Introduction to IoT and its applications	3	0	0	0	0	3
24EECE2281	200	Biosensors	3	0	0	0	0	3
24EECE3691	300	Portable and Wearable biomedical device engineering	3	0	0	0	0	3
24EECE4281	400	Nanobioelectronics	3	0	0	0	0	3
24MECH4111	400	Bioprinting	3	0	0	0	0	3
24EECE4291	400	Medical Imaging Systems	3	0	0	0	0	3
Track # : **Rehabilitation Engineering**								
24MECH4101	400	Finite element analysis for BME	3	0	0	0	0	3
24BTEN3431	300	Physiological modeling	3	0	0	0	0	3
24MECH3331	300	Introduction to Robotics	3	0	0	0	0	3
24MECH3341	300	Robot kinematics and dynamics	3	0	0	0	0	3
24EECE3701	300	Sensors and Actuators for prosthetics	3	0	0	0	0	3
24EECE3041	300	Control systems	3	0	0	0	0	3
24EECE3711	300	Electronic Sensing for perception of vision and sound	3	0	0	0	0	3
24EECE3721	300	Neuroengineering	3	0	0	0	0	3
24EECE4281	400	Nanobioelectronics	3	0	0	0	0	3
24MECH4111	400	Bioprinting	3	0	0	0	0	3
General Electives								
Course code	**Level**	**Course Title**	L	T	P	S	J	C
24BTEN3441	300	Mechanisms of Aging	3	0	0	0	0	3
24EECE4301	400	Biomedical Lab-On-A-Chip systems	3	0	0	0	0	3
24MECH3351	300	Modeling and simulation of Prosthetic Devices	3	0	0	0	0	3

24EECE4311	400	Haptics for biomedical engineering	3	0	0	0	0	3
24EECE3731	300	Human-Machine Interface Engineering	3	0	0	0	0	3
24CSEN2361	200	Fundamentals of Neural Networks and Deep Learning	3	0	0	0	0	3
24MECH4121	400	Neuromechanics	3	0	0	0	0	3
24MECH4131	400	Biomicrofluidics	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.

The current list of courses offered under OE will be available through the registration portal. Refer here for the tentative list of courses offered under OE category

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