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
UMECH02: B.Tech. Robotics and Artificial Intelligence

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

VISION AND MISSION OF THE DEPARTMENT

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

- Nurture the learning environment by imparting activity-based learning enabling the student fraternity to come up with innovative solutions.
- Create significant impact through dissemination of research through public and private partnerships and solving real-world complex problems.
- Provide professional development opportunities through skill development activities, workshops, corporate and community outreach activities.
- Develop entrepreneurial mindset through industry collaborations, incubation centers and by promoting a competitive environment.

UMECH02: B.Tech. Robotics and Artificial Intelligence
(w.e.f. academic year 2024-25 admitted batch)

Programme Educational Objectives (PEOs)

PEO 1	Apply their engineering expertise, critical thinking skills, managerial acumen, and communication proficiency to position themselves as professionals in domains related to Robotics and Artificial Intelligence
PEO 2	Sustain their educational journey through a blend of advanced studies, upskilling initiatives, professional development, and research in cutting-edge areas of Robotics and Artificial Intelligence.
PEO 3	Foster leadership abilities through practical experience, entrepreneurship, and/or public service engagements.
PEO 4	Exhibit, practice and maintain high standards of professional integrity, ethics and inclusion in their professional and daily lives.

PEO Articulation

	PEO1	**PEO2**	**PEO3**	**PEO4**
M1	H	H	L	H
M2	M	H	M	H
M3	M	M	H	H
M4	M	M	H	H

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	Integrate the principles of Robotics and Artificial Intelligence towards creating intelligent automated systems for novel application domains in line with Industry 5.0.
PSO2	Offer industry solutions and consulting services for the integration of innovative technologies, facilitating the adoption of efficient and intelligent automation systems.
PSO3	Work in teams to solve multidisciplinary problems related to societal and environmental problems.

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**
MATH1341	100	Calculus and Differential Equations	3	1	0	0	0	4
MATH1272	100	Linear Algebra	3	1	0	0	0	4
MATH2561	200	Probability and Statistics for Engineering	3	1	0	0	0	4
MATH2601	200	Numerical Methods	3	1	0	0	0	4
PHYS1301	100	Basics of Engineering Physics	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
24INTN3777	300	Internship-1	0	0	0	0	2	1
24PROJ4888/ 24INTN4888/ 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
24EECE2211	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								
B.Tech: Robotics and Artificial Intelligence								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
24CSEN2351	200	Fundamentals of Artificial Intelligence and Machine Learning	3	0	0	0	0	3
24EECE2251	200	Fundamentals of Analog and Digital Electronics	3	0	2	0	0	4
24MECH2061	200	Mechanics of Materials	3	0	2	0	0	4
24EECE2261	200	Electronics for Robotics	3	0	2	0	0	4
24EECE2011	200	Signals and Systems	2	1	0	0	0	3
24MECH4051	400	Theory of Machines and Machine Design	3	0	0	0	0	3
24MECH4061	400	Hydraulic and Pneumatic drives for Robots	3	0	2	0	0	4
24MECH3231	300	Robot Control Systems	2	0	2	0	0	3
24CSEN3301	300	Advances in Robotics and Artificial Intelligence	3	0	2	0	0	4
24MECH3241	300	Kinematics of Robotics	3	0	0	0	0	3
24CSEN3311	300	Robot Vision	3	0	0	0	0	3
24MECH4071	400	Dynamics, Trajectory planning and Robot Operating System	3	0	2	0	0	4
24EECE3631	300	Embedded System and Robot Internet of Things (RIoT)	3	0	2	0	0	4
24MECH3151	300	Model Based System Engineering Design	2	1	0	0	0	3

Programme Elective (PE) : 15 credits								
A minimum of 15 credits from any one of the tracks								
Track # : PROGRAM ELECTIVES								
Course code	**Level**	**Course Title**	**L**	**T**	**P**	**S**	**J**	**C**
24MECH3261	300	Mobile and Micro-robotics	3	0	0	0	0	3
24MECH3271	300	Intelligent Manufacturing Systems	3	0	0	0	0	3
24MECH4081	400	Advanced Robotics Programming	3	0	0	0	0	3
24EECE3641	300	Micro Electro Mechanical Systems	3	0	0	0	0	3
24EECE4241	400	Autonomous Robotics and Telecherics	3	0	0	0	0	3
24MECH3281	300	Mechatronics System Design	3	0	0	0	0	3
24MECH3291	300	Fundamentals of Materials Science and Smart Materials	3	0	0	0	0	3
24MECH2071	200	Robot Ethics and Safety	3	0	0	0	0	3

24MECH4031	400	AI in Preventive Maintenance and Diagnosis	3	0	0	0	0	3
24EECE3161	300	Fundamentals Wireless Communications	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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