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
UENVS04: B.Sc. Environmental Science

w.e.f. 2024-25 admitted batch

(Updated on June 2024)

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.Optometry, 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

To nurture outstanding Science Education and build a vibrant world-class research and innovation ecosystem.

Mission

- To provide a flexible, responsive, and adaptive curriculum that emphasizes experiential learning and allows students to realize their full potential.
- To develop high-impact research knowledge and solutions to improve the communities in which we live.
- To promote a culture of high curiosity, enterprising mindset and keen desire to contribute to society.
- To inculcate 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: Exhibit their proficiency for solving contemporary environmental issues through measurement, modeling, monitoring and management.

PEO 2: Engross in the environmental science profession at local and global levels through ethical contribution in terms of professional and skilled practice of science and allied professions.

PEO 3: Acclimatize to the dynamically changing world through sustained learning and professional development.

PEO 4: Present skills of entrepreneurship and leadership through incorporating the goals of the organization and through providing facilities for peer associates with defined objectives.

PEO 5: Acquire communication skills and exhibit commitment towards teamwork, which are necessary for functioning productively and professionally on multidisciplinary teams.

PEO Articulation

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

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

UENVS04: B.Sc. Environmental Science

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: Recognize, devise, and resolve concerns related to the environment towards providing competent solutions.

PSO2: Evaluate and devise techniques and methods of varying intricacies in the emergent pollution abatement areas.

PSO3: Employ skills in specific areas of Environmental Science to ensure commitment to health and well-being for developing sustainable societies.

PSO4: Provide a platform for involvement in research with proficient and ethical responsibilities toward meeting societal needs.

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)								
HRMG1012	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**

Major Core (MC): 40 credits

Course Code	Level	Course Title	L	T	P	S	J	C
ENVS1051	100	Understanding Environment	3	0	0	0	0	3
ENVS1061	100	Ecology	3	0	0	0	0	3
ENVS2141	200	Environmental Chemistry and Toxicology	3	0	0	0	0	3
ENVS2151	200	Environmental Chemistry and Toxicology Laboratory	0	0	2	0	0	1
ENVS2161	200	Introduction to Earth System Sciences	3	0	0	0	0	3
ENVS2171	200	Introduction to Earth system Science Laboratory	0	0	2	0	0	1
ENVS2181	200	Biodiversity Characterization and conservation	3	0	0	0	0	3
ENVS2191	200	Biodiversity characterization and conservation Laboratory	0	0	2	0	0	1
ENVS2201	200	Biogeochemical cycles	3	0	0	0	0	3
ENVS2211	200	Biogeochemical cycles Laboratory	0	0	2	0	0	1
ENVS2221	200	Environmental Impact Assessment	3	0	0	0	0	3
ENVS2231	200	Environmental Impact Assessment Laboratory	0	0	2	0	0	1
ENVS3042	300	Industrial Safety	3	0	0	0	0	3
ENVS3101	300	Earth Surface Processes and its Resources	3	0	0	0	0	3
ENVS3111	300	Earth Surface Processes and its Resources Laboratory	0	0	2	0	0	1
ENVS3121	300	Eco-Tourism and wildlife management	3	0	0	0	0	3
ENVS3211	300	Ocean and Climate	3	0	0	0	0	3
ENVS3221	300	Ocean and Climate Laboratory	0	0	2	0	0	1
		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
ENVS2241	200	Environmental Instrumentation	3	0	0	0	0	3
ENVS2251	200	Environmental Instrumentation Laboratory	0	0	2	0	0	1
ENVS2261	200	Environmental pollution, monitoring and control	3	0	0	0	0	3
ENVS2271	200	Environmental pollution, monitoring and control Laboratory	0	0	2	0	0	1
ENVS3131	300	Environmental Problems in Indian Context	3	0	0	0	0	3
ENVS3141	300	Environmental Problems in Indian Context Laboratory	0	0	2	0	0	1
ENVS3082	300	Environmental Sanitation	3	0	0	0	0	3
ENVS3151	300	Environmental Sanitation Laboratory	0	0	2	0	0	1
ENVS3161	300	Environmental Toxicology	3	0	0	0	0	3
ENVS3171	300	Environmental Toxicology Laboratory	0	0	2	0	0	1
ENVS3062	300	Global warming and Climate Change	3	0	0	0	0	3
ENVS3181	300	Global warming and Climate Change Laboratory	0	0	2	0	0	1
ENVS3191	300	Green Technologies	3	0	0	0	0	3
ENVS3201	300	Green Technologies Laboratory	0	0	2	0	0	1
ENVS3072	300	Remote sensing and GIS	3	0	0	0	0	3
ENVS3231	300	Remote sensing and GIS Laboratory	0	0	2	0	0	1
ENVS3241	300	Waste Management Technologies	3	0	0	0	0	3
ENVS3251	300	Waste Management Technologies Laboratory	0	0	2	0	0	1
ENVS3261	300	Water Quality and wastewater management	3	0	0	0	0	3
ENVS3271	300	Water Quality and wastewater management Laboratory	0	0	2	0	0	1

Internship (INT): 4 credits

Course code	Level	Course Title	L	T	P	S	J	C
ENVS3444	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
LANG1241	100	Communicative English - I	0	0	4	0	0	2
LANG1251	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
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
CLAD1071	100	Business Communication	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
ENVS4001	400	Environmental Biotechnology and Nanotechnology	3	0	0	0	0	3
ENVS4011	400	Environmental Biotechnology and Nanotechnology Laboratory	0	0	2	0	0	1
ENVS4021	400	Urban Ecosystems	3	0	0	0	0	3
ENVS4031	400	Urban Ecosystems Laboratory	0	0	2	0	0	1
ENVS4041	400	Marine Pollution and Coastal Zone Management	3	0	0	0	0	3
ENVS4051	400	Marine Pollution and Coastal Zone Management Laboratory	0	0	2	0	0	1
ENVS4061	400	Energy and Environment	3	0	0	0	0	3
ENVS4071	400	Energy and Environment Laboratory	0	0	2	0	0	1
ENVS4081	400	Industrial Waste Management	3	0	0	0	0	3
ENVS4091	400	Industrial Waste Management Laboratory	0	0	2	0	0	1
ENVS4101	400	Environmental Remediation	3	0	0	0	0	3
ENVS4111	400	Environmental Remediation Laboratory	0	0	2	0	0	1
ENVS4121	400	Natural Hazards and Disaster Management	3	0	0	0	0	3
ENVS4131	400	Natural Hazards and Disaster Management Laboratory	0	0	2	0	0	1
ENVS4141	400	Environmental Planning and Sustainable Development	3	0	0	0	0	3
ENVS4151	400	Environmental Planning and Sustainable Development Laboratory	0	0	2	0	0	1

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
ENVS4001	400	Environmental Biotechnology and Nanotechnology	3	0	0	0	0	3
ENVS4011	400	Environmental Biotechnology and Nanotechnology Laboratory	0	0	2	0	0	1
ENVS4021	400	Urban Ecosystems	3	0	0	0	0	3
ENVS4031	400	Urban Ecosystems Laboratory	0	0	2	0	0	1
ENVS4041	400	Marine Pollution and Coastal Zone Management	3	0	0	0	0	3
ENVS4051	400	Marine Pollution and Coastal Zone Management Laboratory	0	0	2	0	0	1
ENVS4081	400	Industrial Waste Management	3	0	0	0	0	3
ENVS4091	400	Industrial Waste Management Laboratory	0	0	2	0	0	1
ENVS4141	400	Environmental Planning and Sustainable Development	3	0	0	0	0	3
ENVS4151	400	Environmental Planning and Sustainable Development Laboratory	0	0	2	0	0	1
Research Project / Dissertation (PROJ)								
ENVS4888		Dissertation - I (Review of Literature & Research Proposal)	0	0	0	0	8	4
ENVS4999		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

S.No.	Minor	Offered by School	Credits Required	
			3-Year UG	4-Year UG
1	Business Analytics (Except for GSB)	Business	24	32
2	Business Management (Except for GSB)	Business	24	32
3	Financial Markets (Except for GSB)	Business	24	32
4	Psychology	Humanities	24	32
5	Economics	Humanities	24	32
6	English	Humanities	24	32
7	Bharatanatyam	Humanities	24	32
8	Carnatic Vocal	Humanities	24	32
9	Choreography and Screen Dance	Humanities	24	32
10	Kuchipudi	Humanities	24	32
11	Mohiniyattam	Humanities	24	32
12	Mridangam	Humanities	24	32
13	Theatre Arts	Humanities	24	32
14	Visual Arts	Humanities	24	32
15	History	Humanities	24	32
16	Mass communication (Hyd)	Humanities	24	32
17	Visual Communication (Hyd)	Humanities	24	32
18	Sociology	Humanities	24	32
19	Political Science	Humanities	24	32
20	Public Policy (Hyd)	Public Policy	24	32
21	Chemistry	Science	24	32
22	Data Science	Science	24	32
23	Biochemistry	Science	24	32
24	Bioinformatics	Science	24	32
25	Biotechnology	Science	24	32
26	Environmental Management	Science	24	32
27	Environmental Science	Science	24	32
28	Microbiology	Science	24	32
29	Food Science and Technology	Science	24	32
30	Mathematics	Science	24	32
31	Statistics	Science	24	32
32	Atmospheric Physics	Science	24	32
33	Climate Science	Science	24	32
34	Electronics	Science	24	32
35	Physics	Science	24	32
36	Quantum Computing	Science	24	32
37	Computer Science	Technology	24	32
38	Data Analytics	Technology	24	32
39	Machine Learning	Technology	24	32

GITAM School of Science

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