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
UPHYS07: B.Sc. Physics

w.e.f. 2025-26 admitted batch

(Updated on July 2025)

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

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

To provide high-quality education and research in the physics by nurturing an immersive and enjoyable blended learning environment and evolving into a centre of product-based research with an industrial partnership.

MISSION

- An interdisciplinary curriculum to teach students to solve complicated challenges and innovate to meet social demands, from technology to sustainability.

- Foster a dynamic academic environment that promotes curiosity, critical thinking, and application-oriented learning in physics so students can excel in their careers.

- Translate material science, quantum technologies, and IoT research findings into commercialized novel products.

- Inculcate a culture of honesty, compassion, and kindness, motivating students to make meaningful contributions to society.

Programme Educational Objectives (PEOs)

PEO 1: To introduce the foundations of various concepts in the Physics.

PEO 2: To develop a deep understanding of the Physics and allied areas from empirically grounded work in local and global contexts.

PEO 3: To foster a scientific temper in students.

PEO 4: To instill research capabilities among the students.

PEO 5: To enhance the ability of students towards the use of Physics knowledge in developing applications

PEO Articulation

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

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

UPHYS07: B.Sc. Physics

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:   Acquire knowledge the core concept of Physics subjects and excel in Experimental and Theoretical Physics.

PSO2:   The aptitude to employ modern tools and techniques for problem-solving across diverse domains within the field of Physics.

PSO3:   Acquire research oriented learning that develops analytical and integrative problem-solving approaches.

PSO4:   Acquire analytical and logical skills required for higher Education/Academics/ Industry.

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	42	34.43	74	45.68	62	38.27
3	Major Electives	ME	18	14.75	18	11.11	18	11.11
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)								
ODHR1011	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**

*Mandatory Course in Basket

Major Core (MC): 42 credits

Course Code	Level	Course Title	L	T	P	S	J	C
PHYS1261	100	Mechanics	2	0	2	0	0	3
PHYS1271	100	Mathematical Physics I	3	0	0	0	0	3
PHYS2002	200	Electricity and Magnetism	2	0	2	0	0	3
PHYS2241	200	Classical Mechanics	3	0	0	0	0	3
PHYS2321	200	Mathematical Physics II	3	0	0	0	0	3
PHYS2331	200	Mathematical Physics III	3	0	0	0	0	3
PHYS2341	200	Modern Physics	2	0	2	0	0	3
PHYS2371	200	Quantum Mechanics I	3	0	0	0	0	3
PHYS2391	200	Thermal Physics	2	0	2	0	0	3
PHYS2401	200	Waves and Optics	2	0	2	0	0	3
PHYS2411	200	Computational Physics	2	0	2	0	0	3
PHYS3281	300	Electrodynamics	3	0	0	0	0	3
PHYS3381	300	Solid State Physics	2	0	2	0	0	3
PHYS3391	300	Statistical Mechanics	3	0	0	0	0	3
Total Credits								**42**

Major Electives (ME): 18 credits

Minimum number of credits to be earned: 18.

Course Code	Level	Course Title	L	T	P	S	J	C
(Any One course to be chosen)								
PHYS2271	200	Digital Electronics	2	0	2	0	0	3
PHYS2311	200	Electronic instrumentation	3	0	0	0	0	3
PHYS2521	200	Electronic Product Design and Development	2	1	0	0	0	3
PHYS2531	200	Hand-on Scientific Visualization	3	0	0	0	0	3
PHYS3132	300	Essentials of Biophysics	3	0	0	0	0	3
PHYS3191	300	Physics of Nanomaterials	3	0	0	0	0	3
PHYS3221	300	Atomic and Molecular Physics	3	0	0	0	0	3
PHYS3341	300	Nuclear and Particle Physics	2	0	2	0	0	3
PHYS3351	300	Quantum Mechanics II	3	0	0	0	0	3
PHYS3451	300	Basics of Quantum Computing	3	0	0	0	0	3
PHYS4201	400	Essential Physics for Characterization	3	0	0	0	0	3
PHYS4211	400	Introduction to Material Modelling and Simulation	3	0	0	0	0	3

Internship (INT)

Course code	Level	Course Title	L	T	P	S	J	C
PHYS3444	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
LANG1242	100	Communicative English - I	0	0	4	0	0	2
LANG1252	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
GCGC1041	100	Introduction to Core Competencies	0	0	2	0	0	1
GCGC1051	100	Professional Communication and Analytical Skills Development	0	0	2	0	0	1
GCGC1061	100	Applied Communication and Aptitude Skills	0	0	2	0	0	1
GCGC1071	100	Preparation for Campus Placements	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
PHYS4001	400	Condensed Matter Physics	4	0	0	0	0	4
PHYS4011	400	Great Experiments in Physics	3	0	2	0	0	4
PHYS4021	400	Soft Condensed Matter Physics	4	0	0	0	0	4
PHYS4031	400	Relativistic Physics	4	0	0	0	0	4
PHYS4041	400	Quantum Information and Computation	4	0	0	0	0	4
PHYS4051	400	Photonics and Laser Physics	3	0	2	0	0	4
PHYS4061	400	Plasma Physics	4	0	0	0	0	4
PHYS4071	400	Thin Film Technology	4	0	0	0	0	4

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
(Any Three courses to be chosen)								
PHYS4001	400	Condensed Matter Physics	4	0	0	0	0	4
PHYS4011	400	Great Experiments in Physics	3	0	2	0	0	4
PHYS4021	400	Soft Condensed Matter Physics	4	0	0	0	0	4
PHYS4031	400	Relativistic Physics	4	0	0	0	0	4
PHYS4041	400	Quantum Information and Computation	4	0	0	0	0	4
(Any two courses to be chosen)								
PHYS4051	400	Photonics and Laser Physics	3	0	2	0	0	4
PHYS4061	400	Plasma Physics	4	0	0	0	0	4
PHYS4071	400	Thin Film Technology	4	0	0	0	0	4
PHYS4081	400	Medical Physics	4	0	0	0	0	4
Research Project / Dissertation (PROJ)								
PHYS4888	400	Dissertation - I (Review of Literature & Research Proposal)	0	0	0	0	8	4
PHYS4999	400	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: Click here

GITAM School of Science

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