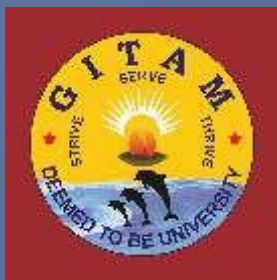# GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University)

VISAKHAPATNAM * HYDERABAD * BENGALURU

Accredited by NAAC with A$^{++}$ Grade

## GITAM School of Science

## CURRICULUM AND SYLLABUS

## 4 Year Undergraduate Programme
## UPHYS08: B.Sc. Electronics

w.e.f. 2023-24 admitted batch

(Updated on 31$^{st}$ July 2023)

# Academic Regulations

## Applicable for the Undergraduate Programmes offered:

**School of Humanities and Social Sciences**
**School of Business**
**and**
**School of Science**

# Vision

To become a global leader in higher education.

# Mission

To impart futuristic and comprehensive education of global standards with a high sense of discipline and social relevance in a serene and invigorating environment.

# 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

1. To provide a flexible, responsive, and adaptive curriculum that emphasizes experiential learning and allows students to realize their full potential.

2. To develop high-impact research knowledge and solutions to improve the communities in which we live.

3. To promote a culture of high curiosity, enterprising mindset and keen desire to contribute to society.

4. To inculcate empathy, integrity, and trust in the GITAM fraternity with a strong commitment towards society and environment.

# UPHYS08: B.Sc. Electronics
## (w.e.f.2023-24 Admitted Batch)

## Programme Educational Objectives (PEOs)

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

**PEO 2:**    To make the students competent in the field of Electronics and related areas by providing hands on experience.

**PEO 3:**    To foster techno-commercial skills for innovative solutions in Electronics.

**PEO 4:**    To instill the ability for research among the students.

**PEO 5:**    To enhance the ability of students in integrating different aspects of electronics related fields

**PEO Articulation**

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

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

# UPHYS08: B.Sc. Electronics

## 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 of Basic and Advanced topics and apply logical thinking to solve problems in the field of Electronics.

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

**PSO3:**  Capability to conduct electronic experiments and analyze and interpret data obtained from them.

**PSO4:**  Capacity to create and construct electronic devices/systems in adherence to specified requirements while considering ethical and economic limitations.

# Curriculum Structure
*(Flexible Credit System)*

**Minimum Credit Requirements to Award Degree Under Each Category**

| S.No. | Course Category and Category Code | | 3 Year Undergraduate | | 4 Year Undergraduate (Hons.) | | 4 Year Undergraduate (Hons.) with Research | |
|---|---|---|---|---|---|---|---|---|
| | | | Credits | (%) | Credits | (%) | Credits | (%) |
| 1 | Multidisciplinary Core Courses | MDC | 12 | 10 | 12 | 7.5 | 12 | 7.5 |
| 2 | Major Core | MC | 42 | 35.00 | 74 | 46.25 | 62 | 0.3875 |
| 3 | Major Electives | ME | 18 | 15.00 | 18 | 11.25 | 18 | 11.25 |
| 4 | Minor | MI | 24 | 20 | 32 | 20 | 32 | 20 |
| 5 | Internship | INT | 04 | 3.40 | 04 | 2.50 | 04 | 2.50 |
| 6 | Ability Enhancement Courses – University Core | UC | 08 | 6.60 | 08 | 05 | 08 | 05 |
| 7 | Skill Enhancement Courses – University Core | UC | 08 | 6.60 | 08 | 05 | 08 | 05 |
| 8 | Value Added Courses – University Core | UC | 04 | 3.40 | 04 | 2.50 | 04 | 2.50 |
| 9 | Research Project / Dissertation | PROJ | -- | 00 | -- | 00 | 12 | 7.50 |
| | **Total** | | **120** | **100** | **160** | **100** | **160** | **100** |

**Multi-disciplinary Core Courses (MDC)**

| Course Code | Level | Course Title | L | T | P | S | J | C |
|---|---|---|---|---|---|---|---|---|
| HRMG1012 | 100 | Principles of Management | 2 | 0 | 0 | 0 | 0 | 2 |
| VEDC1001 | 100 | Venture Development | 2 | 0 | 0 | 0 | 0 | 2 |
| SOCY1031 | 100 | Humans, Humanity and Humanities | 2 | 0 | 0 | 0 | 0 | 2 |
| SOCY1041 | 100 | Humans and their World | 2 | 0 | 0 | 0 | 0 | 2 |
| PHYS1251 | 100 | Introduction to Physical Sciences | 2 | 0 | 0 | 0 | 0 | 2 |
| BCBI1041 | 100 | Introduction to Chemical and Life Sciences | 2 | 0 | 0 | 0 | 0 | 2 |
| | | **Total Credits** | | | | | | **12** |

**Major Core (MC)**

| Course Code | Level | Course Title | L | T | P | S | J | C |
|---|---|---|---|---|---|---|---|---|
| PHYS1271 | 100 | Mathematical Physics I | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS1281 | 100 | Basic circuit theory | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS2002 | 200 | Electricity and Magnetism | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS2291 | 200 | Electrical Devices and Circuits | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS2411 | 200 | Computational Physics | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS2541 | 200 | Electronic Communications | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS2271 | 200 | Digital electronics | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS2351 | 200 | Operational amplifiers and applications | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS2311 | 200 | Electronic instrumentation | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3301 | 300 | Microcontrollers | 2 | 0 | 2 | 0 | 0 | 3 |
| PHYS3441 | 300 | Signals and systems | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3251 | 300 | Control systems | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3411 | 300 | VLSI Design | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3291 | 300 | Embedded systems | 2 | 0 | 2 | 0 | 0 | 3 |
| **Total Credits** | | | | | | | | **42** |

**Major Electives (ME)**

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)** | | | | | | | | |
| PHYS2381 | 200 | Renewable energy and energy harvesting | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS2361 | 200 | PCB Design and fabrication | 3 | 0 | 0 | 0 | 0 | 3 |
| **(Any Two courses to be chosen)** | | | | | | | | |
| PHYS3231 | 300 | Basics of Power Electronics & E-vehicles | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3331 | 300 | Non-Destructive Testing and Evaluation of Materials | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3261 | 300 | Data communication | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3271 | 300 | Digital image processing | 3 | 0 | 0 | 0 | 0 | 3 |
| **(Any Three courses to be chosen)** | | | | | | | | |
| PHYS3311 | 300 | Mobile App Development | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3201 | 300 | AI and ML using python | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3371 | 300 | Semiconductor Device Technology | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3361 | 300 | Robotics | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3211 | 300 | Applied quantum mechanics | 3 | 0 | 0 | 0 | 0 | 3 |
| PHYS3321 | 300 | Mobile communication | 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)

| 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 |
| LANG1012 | 100 | Communication Skills in English – Intermediate | 0 | 0 | 4 | 0 | 0 | 2 |
| LANG1022 | 100 | Communication Skills in English – Advanced | 0 | 0 | 4 | 0 | 0 | 2 |
| **Skill Enhancement Courses** | | | | | | | | |
| CSCI1301 | 100 | Introduction to Programming | 0 | 0 | 4 | 0 | 0 | 2 |
| CSCI1311 | 100 | Introduction to Data Science | 0 | 0 | 4 | 0 | 0 | 2 |
| CLAD1002 | 100 | Emotional Intelligence & Reasoning Skills | 0 | 0 | 2 | 0 | 0 | 1 |
| CLAD1012 | 100 | Leadership Skills & Quantitative Aptitude | 0 | 0 | 2 | 0 | 0 | 1 |
| CLAD1022 | 100 | Verbal Ability & Quantitative Ability | 0 | 0 | 2 | 0 | 0 | 1 |
| CLAD1032 | 100 | Practicing Verbal Ability & Quantitative Aptitude | 0 | 0 | 2 | 0 | 0 | 1 |
| **Value Added Courses** | | | | | | | | |
| ENVS1002 | 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 | 0 |
| PHPY1011 | 100 | Gandhi and the Contemporary World * / UHV | 1 | 0 | 0 | 0 | 0 | 0 |
| **Pass / Fail Courses (Any one course to be chosen)** | | | | | | | | |
| DOSP1122 | 100 | Yoga | 0 | 0 | 2 | 0 | 0 | 0 |
| MFST1002 | 100 | Health and Wellbeing * | 0 | 0 | 2 | 0 | 0 | 0 |
| **Club Activities** | | | | | | | | |
| DOSL1002 | 100 | Club Activity (Participant) | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSL1012 | 100 | Club Activity (Member of the Club) | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSL1022 | 100 | Club Activity (Leader of the Club) | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSL1032 | 100 | Club Activity (Competitor) | 0 | 0 | 2 | 0 | 0 | 0 |
| **Community Service** | | | | | | | | |
| DOSL1042 | 100 | Community Services – Volunteer | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSL1052 | 100 | Community Services – Mobilizer | 0 | 0 | 2 | 0 | 0 | 0 |
| **Sports** | | | | | | | | |
| DOSP1002 | 100 | Badminton | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1012 | 100 | Chess | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1022 | 100 | Carrom | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1032 | 100 | Football | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1042 | 100 | Volleyball | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1052 | 100 | Kabaddi | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1062 | 100 | Kho- Kho | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1072 | 100 | Table Tennis | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1082 | 100 | Handball | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1092 | 100 | Basketball | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1102 | 100 | Tennis | 0 | 0 | 2 | 0 | 0 | 0 |
| DOSP1112 | 100 | Throw ball | 0 | 0 | 2 | 0 | 0 | 0 |

\*  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 |
|---|---|---|---|---|---|---|---|---|
| PHYS4091 | 400 | Biomedical Instrumentation | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4101 | 400 | Sensors and transducers | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4041 | 400 | Quantum Information and Computation | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4121 | 400 | Nanoelectronics | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4131 | 400 | Energy Storage Devices | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4141 | 400 | IoT and Applications | 3 | 0 | 2 | 0 | 0 | 4 |
| PHYS4051 | 400 | Photonics and Laser Physics | 3 | 0 | 2 | 0 | 0 | 4 |
| PHYS4161 | 400 | Advanced embedded systems | 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)** | | | | | | | | |
| PHYS4091 | 400 | Biomedical Instrumentation | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4101 | 400 | Sensors and Transducers | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4041 | 400 | Quantum Information and Computation | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4121 | 400 | Nanoelectronics | 4 | 0 | 0 | 0 | 0 | 4 |
| **(Any two courses to be chosen)** | | | | | | | | |
| PHYS4131 | 400 | Energy Storage Devices | 4 | 0 | 0 | 0 | 0 | 4 |
| PHYS4141 | 400 | IoT and Applications | 3 | 0 | 2 | 0 | 0 | 4 |
| PHYS4051 | 400 | Photonics and Laser Physics | 3 | 0 | 2 | 0 | 0 | 4 |
| PHYS4161 | 400 | Advanced embedded systems | 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**

| S.No. | Minor | Credits Required | |
| --- | --- | --- | --- |
| | | 3-Year UG | 4-Year UG |
| 1 | Biochemistry | 24 | 32 |
| 2 | Bioinformatics | 24 | 32 |
| 3 | Biotechnology | 24 | 32 |
| 4 | Chemistry | 24 | 32 |
| 5 | Environmental Science | 24 | 32 |
| 6 | Mathematics | 24 | 32 |
| 7 | Statistics | 24 | 32 |
| 8 | Microbiology | 24 | 32 |
| 9 | Food Science and Technology | 24 | 32 |
| 10 | Physics | 24 | 32 |
| 11 | Electronics | 24 | 32 |
| 12 | Data Science | 24 | 32 |
| 13 | English | 24 | 32 |
| 14 | History | 24 | 32 |
| 15 | Political Science | 24 | 32 |
| 16 | Psychology | 24 | 32 |
| 17 | Sociology | 24 | 32 |
| 18 | Economics | 24 | 32 |
| 19 | Mass communication | 24 | 32 |
| 20 | Visual Communication | 24 | 32 |
| 21 | Bharatanatyam | 24 | 32 |
| 22 | Carnatic Vocal | 24 | 32 |
| 23 | Kuchipudi | 24 | 32 |
| 24 | Mohiniyattam | 24 | 32 |
| 25 | Mridangam | 24 | 32 |
| 26 | Theatre Arts | 24 | 32 |
| 27 | Business Administration | 24 | 32 |

**GITAM School of Science**

**GITAM (Deemed to be University)**

**Visakhapatnam | Hyderabad | Bengaluru**