



**Darrang College
(Autonomous),
Tezpur-784001**

**Syllabus for
FYUGP
Physics (SEC)**

**Approved by :
Board of Studies meeting held on 30-07-2025
&
Academic Council vide Resolution no. 04, dated- 12-08-2025**

FYUGP (Physics Major) SEC Syllabus

Subject: PHYSICS

(The syllabus is approved in the Board of Studies meeting held on 30th July, 2025)



Department of Physics
DARRANG COLLEGE AUTONOMOUS
TEZPUR

W.e.f. August 2025

**The syllabus is approved by Academic Council, Darrang College (Autonomous)
vide Resolution no. 04, dated- 12-08-2025**

AIMS OF FYUGP in PHYSICS

The FYUGP in Physics aims to cultivate not just knowledgeable physicists, but also well-rounded individuals who can contribute to society through their understanding of the physical world and their ability to solve problems creatively. The program mainly focuses on:

1. Solid Foundation in Physics:

To develop a strong base on the subject, the course includes mathematical Physics, mechanics, electricity & magnetism, thermodynamics, electronics, Electromagnetic Theory, classical mechanics, modern physics, statistical mechanics and quantum mechanics.

2. Experimental Skills:

Students learn, design, and conduct experiments in laboratories to demonstrate the concepts, principles, and theories learned in the classroom.

3. Problem-Solving Abilities:

The curriculum encourages students to develop strong and critical analytical and problem-solving skills, enabling them to tackle complex physics problems.

4. Interdisciplinary Learning:

Emphasize Physics as the most critical branch of science to pursue interdisciplinary and multidisciplinary higher education and research in interdisciplinary and multidisciplinary areas.

5. Practical Applications:

Students are encouraged to relate physics concepts to real-world applications and understand the relevance of physics in various fields, including advanced computing, sustainable energy, environmental management, and healthcare.

6. Preparation for Diverse Careers:

The program prepares students for careers in research, academia, industry, and other related fields.

PROGRAM OUTCOME

PO1: Knowledge Acquisition: Students will develop an adequate foundation of theoretical concepts and experimental techniques in physics.

PO2: Analytical and Problem-Solving Skills: Students graduating in Physics will be adept at critically analyzing physics problems, formulating solutions using mathematical and computational tools, and interpreting results.

PO3: Experimental Skills: Students will develop proficiency in conducting experiments, collecting and analyzing data, and drawing meaningful conclusions from observations.

PO4: Communication and presentation skills: Students will be able to communicate effectively about their understanding, ideas and findings to explain natural phenomena.

PO5: Digital and ICT efficiency: Students will be able to use modern ICT tools in a variety of learning environments for knowledge gain, and work places to broaden the capability and improve efficiency.

PO6: Teamwork and leadership: Students will be able to develop teamwork and leadership abilities to work effectively in a co-operative and coordinated manner within diverse teams and peer groups.

PO7: Interdisciplinary Awareness: Students will understand how physics principles relate to other scientific disciplines and how interdisciplinary knowledge can contribute to problem-solving.

PO8: Ethics and Values: Students will comply with ethical conduct and adhere to professional standards in learning.

PO9: Employability and entrepreneurial skills: Students will acquire adequate skills and knowledge to become employable.

TEACHING LEARNING PROCESS

The method and practice of teaching for FYUGP in Physics is based on the L+T+P model, where L, T, and P stand for Lecture, Tutorial, and Practical respectively. Lecture classes are aided with prescribed textbooks, e-learning resources, and self-study materials. This approach recognizes the importance of a well-rounded education that includes theoretical knowledge, practical experience, and personal development. Tutorials are interactive sessions where students can ask questions, clarify their doubts, and engage in discussions with their peers and teachers. Tutorials are designed to encourage active learning and to promote critical thinking. The practical courses are designed to provide hands-on experience to students and to help them develop the necessary skills for conducting experiments and record results.

Teaching and Learning Tools:

Traditional Learning Tools like blackboard, textbook, hand notes, visual aids, model etc.

Digital Learning Tools:

Virtual Labs, Educational Videos and Animations E-books and E-readers etc.

EVALUATION/ASSESSMENT**FIRST SEMESTER**

Paper	In-semester			End-Semester			Grand Total Marks
	Activity	Marks	Total	Activity	Marks	Total	
SEC	Sessional Examination	15	30	Theory Examination	45	45	75
	Seminar/presentation, assignment, regularity, classroom activity etc.	15					

SECOND SEMESTER

Paper	In-semester			End-Semester			Grand Total Marks
	Activity	Marks	Total	Activity	Marks	Total	
SEC	Sessional Examination	5	10	Theory Examination	15	65	75
	Seminar/presentation, assignment, regularity, classroom activity etc.	5		Practical Examination	50		

1 Credit= 1 hour of Lecture/Tutorial

1 Credit= 2 hours of Practical class

COURSE STRUCTURE**MAJOR**

Semester	Paper	Theory		Practical		Total	
		Credit	Marks	Credit	Marks	Credit	Marks
I	PHY-SEC-01013	3	75	0	0	3	75
II	PHY-SEC-02023	1	25	2	50	3	75

FIRST SEMESTER
Physics Major

Course Type: Skill Enhancement Course (SEC)

Course Name: Renewable Energy and Energy Harvesting

Paper Code: PHY-SEC-01013

COURSE OBJECTIVE

The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning on the necessity of renewable energy resources for sustainable future.

COURSE OUTCOME

At the end of the course, the students shall be able to understand the need of renewable energy, different forms of renewable energy.

COURSE STRUCTURE

SEM	Type	Course	Code	Course Type	Credit	Marks Distribution				Total
						Th	Th IA	PR	PR IA	
I	Major	Renewable Energy and Energy Harvesting	PHY-SEC-01013	Theory	3	45	30	-	-	75

FIRST SEMESTER**SYLLABUS**

Course Course Title Course code	Skill Enhancement Course (SEC) Renewable Energy and Energy Harvesting PHY-SEC-01013
Total Credit (Theory + Practical)	3 (3+0)
Contact hours: Lecture+Tutorial+Practical	30+15+0
Distribution of Marks	Internal Examination: 30 Final Examination: Theory=45; Practical=0

Topic	Unit	Content	Lecture (Hours)	Tutorial (Hours)	Practical (Hours)	Total (Hours)
Renewable Energy and Energy Harvesting PHY-SEC-01013	1	Fossil fuels and Alternate Sources of energy	9	15	0	45
	2	Solar energy	6			
	3	Wind Energy Harvesting	3			
	4	Ocean Energy	3			
	5	Tidal Energy	2			
	6	Geothermal Energy	2			
	7	Hydro Energy	2			
	8	Carbon Capture	3			

FIRST SEMESTER

Physics Major

DETAIL SYLLABUS

Course Name: Renewable Energy and Energy Harvesting

Course Code: PHY-SEC-01013

Theory

(Credit: 3; Lectures: 30; Tutorial: 15)

Unit 1: Fossil fuels and Alternate Sources of energy (Lectures 13; Tutorial 4)

Fossil fuels and Nuclear Energy, their limitation, non-conventional energy sources and their potential, need of renewable energy. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy, tidal energy, Hydroelectricity, Piezoelectric Energy.

Unit 2: Solar energy (Lectures 8; Tutorial: 2)

Solar energy, it's potential and importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems.

Unit 3: Wind Energy Harvesting (Lectures 3; Tutorial 3)

Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

Unit 4: Ocean Energy (Lectures 3; Tutorial 2)

Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices.

Unit 5: Tidal Energy (Lectures 2; Tutorial 1)

Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass.

Unit 6: Geothermal Energy (Lectures 2; Tutorial 1)

Geothermal Resources, Geothermal Technologies.

Unit 7: Hydro Energy (Lectures 3; Tutorial 1)

Hydropower resources, hydropower technologies, environmental impact of hydro power sources.

Unit 8: Carbon Capture

(Lectures 3; Tutorial 1)

Introduction to Carbon capture technologies

Reference Books:

- Non-conventional energy sources – G.D Rai – Khanna Publishers, New Delhi
- Solar energy – M P Agarwal – S Chand and Co. Ltd.
- Solar energy – Suhas P Sukhative Tata McGraw – Hill Publishing Company Ltd.
- Godfrey Boyle, “Renewable Energy, Power for a sustainable future”, 2004, Oxford University Press, in association with The Open University.
- Dr. P jayakumar, Solar Energy: Resource Assessment Handbook, 2009, J. Balfour, M. Shawand S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).
- http://en.wikipedia.org/wiki/Renewable_energy

SECOND SEMESTER

Physics Major

Skill Enhancement Course (SEC)

Course Name: Basic Skills on Electronic Equipment

Course Code: PHY-SEC-02023

OBJECTIVE OF THE COURSE

This course aims at making the students introduced to the working of electronic equipment used in daily life and to repair and maintenance of these equipment's.

COURSE OUTCOME

At the end of the course, the students shall be able to identify the fault, repair & do maintenance of daily use electronic equipment's.

COURSE STRUCTURE

SEM	Type	Course	Code	Course Type	Credit	Marks Distribution				Total
						Th	Th IA	PR	PR IA	
II	Major	Basic Skills on Electronic Equipment	PHY-SEC-02013	Theory +Practical	1+2	15	10	40	10	75

SECOND SEMESTER**Physics Major****SYLLABUS**

Title of the course Course code	Basic Skills on Electronic Equipment PHY-SEC-02023
Total Credit (Theory+ Practical)	3 (1+2)
Contact hours: Lecture+Tutorial+ Practical	15+0+60
Distribution of Marks	Internal Examination:10 Final Examination: Theory=15; Practical=50

Topic	Unit	Content	Lecture (Hours)	Tutorial (Hours)	Practical (Hours)	Total (Hours)
Basic Skills on Electronic Equipment	1	Basic Electronic Components	3	0	60	75
	2	Basic Electronic Circuits	3			
	3	Use of laboratory instrument	3			
	4	Soldering Technique	3			
	5	Electrical switch Board, Power Supply and PCB	3			

SECOND SEMESTER

Physics Major

DETAIL SYLLABUS

Title of the course: Basic Skills on Electronic Equipment

Course code: PHY-SEC-02023

Theory (Credit-1; Lecture-15; Tutorial: 0)

Unit-1: Basic Electronic Components (Lecture: 02)

Introduction to Resistor, Capacitor, Inductor, Diode, Transistor, Transformer, battery / cell (Brief idea, use and application only)

Unit-2: Basic Electronic Circuits (Lecture: 02)

Ohm's Law, Kirchhoff's current & voltage law, series and parallel circuit's connection, rectifier circuit using diode.

Unit-3: Use of laboratory instrument (Lecture: 02)

Use of Vernier slide calliper, screw gauge, spherometer, Digital Multi-Meter (DMM), Testers, different type of fuse, electronic balance, breadboard.

Unit-4: Soldering Technique (Lecture: 02)

Introduction to Soldering and Desoldering Techniques: Soldering tools, Soldering iron, Solder joint, Dry solder joint, Cold solder joint, Good and bad solder joints.

Unit -5: Electrical switch Board, Power Supply and PCB (Lecture: 03)

Circuit design for electrical switch board. Circuit design and principle of regulated power supply (AC to DC). Fabrication of PCB (Printed Circuit Board): Types of PCBs-Steps involved in development of PCB using FeCl₃ solution.

Practical (Credit-2)

At least five experiments should be performed from the following

1. Identification of electronic components (Active or Passive)
(a) Resistor (b) Capacitor (c) Inductor (d) Diode (e) LED (f) Transistor (g) IC
2. Use Multimeter to measure the followings:
(a) AC/DC current (b) AC/DC voltage (c) Resistance (d) capacitance
3. Use Multimeter to check the continuity of the following:
(a) Diode (b) Transistor (c) LED (d) Cable wire

4. Use of Vernier slide calliper, screw gauge, spherometer to measure the following physical quantity of given specimen:
(a) Length (b) radius (inner /outer) (c) volume (d) thickness (e) depth
5. Soldering and de-soldering of given circuit board.
6. Circuit connection of house hold switch board containing both socket, plug and switch.
7. To convert AC to DC using (a) Half-wave rectifier (b) full-wave rectifier (c) bridge rectifier.
8. Fabrication of printed circuit board (PCB) using FeCl₃ solution.

Suggested Readings

- A text of Applied Electronics, R.S. Sedha – S. Chand (2005) Basic Electronics, B. L. Theraja (S. Chand)
- EASY Laser Printer Maintenance & Repair By Stephen J. Bioelow
