Govt. College for Women,
Parade Ground, Jammu
Autonomous College under University of Jammu

Learning outcome based curriculum

B. Sc. Programme (CBCS)

With Physics as a subject

(Session 2021-22, 2022-23 and 2023-24)

CONTENTS

Preamble

The objective of any university/college programme is to prepare students to be upright and productive citizens. Need of hour is to develop students by inculcating in them creative and reasoning abilities so that they will give their positive contribution for the development of the society in particular and country as a whole.

The LOCF approach is envisioned to provide a focused, outcome-based syllabus at the undergraduate level with an agenda to structure the teaching-learning experiences in a more student-centric manner. The LOCF approach has been adopted to strengthen students' experiences as they engage themselves in the programme of their choice. Each programme vividly elaborates its nature and promises the outcomes that are to be accomplished by studying the courses. Each programme fully prepares students for sustainability and lifelong learning.

In this direction, the college offers an learning outcome-based curriculum framework (LOCF) for its entire undergraduate programme. LOCF is intended to provide focused outcome-based syllabi at the undergraduate level to make the whole teaching- learning experiences as much student-centric as possible. These programmes will enhance student's intellectual competences, skills and readiness to face the world to make them socially aware and responsible citizens. The new curriculum of B.Sc. Semester III&IV with Physics as a subject has the aim to enable students not only to seek but also to create scientific skill among them. The LOCF curriculum takes into consideration the requirements of the present as well as the future time. It offers training that is comparable to that of an undergraduate student at the national level. College hopes that the LOCF approach of the programme will be of great help to the students in deciding their goal and field of further education.

1. Course structure

1.1 Alignment with CBCS

The undergraduate course in Physics is aligned with Choice Based Credit System (CBCS) adopted by Government College for women, Parade, Jammu.

1.2 Types of Courses

1. Core Courses
2. Disciplines Specific Electives
3. Skill enhancement Course
4. Generic courses

Semester	Core course	DSE course	Skill course	Generic course
First	(UPHTC-101) (UPHPC- 101)			
second	(UPHTC-201) (UPHPC- 201)			
Third	(UPHTC-301) (UPHPC-301)		(UPHTS-301) (UPHPS-301)	
Fourth	(UPHTC-401) (UPHPC-401)		(UPHTS-401) (UPHPS-401)	
Fifth		(UPHTDSE-501) (UPHPC 501) (UPHTDSE 502)	UPHTS-501	(UPHTGEC 501) (UPHPGEC 501)
Six		(UPHTDSE 601) (UPHTDSE 602) (UPHPC-601)	(UPHSEC -601)	(UPHTGEC 601) (UPHPGEC 601)

COURSES OFFERED BY PHYSICS DEPARTMENT

Core courses

1. B.Sc. Sem.I-Mechanics, Oscillations and Theory of Relativity (UPHTC-101)
2. B.Sc. Sem. I – Practicals (UPHPC-101)
3. B.Sc. Sem. II -Vectors, Electricity & Magnetism and Electromagnetic Waves (UPHTC-201)
4. B.Sc. Sem. II – Practicals (UPHPC-201)
5. B.Sc. Sem. III -Electronics, Thermodynamics and Statistical mechanics (UPHTC-301)
6. B.Sc. Sem. III –Practicals UPHPC-301
7. B.Sc. Sem. IV- Fourier series, Waves and Optics (UPHTC-401)
8. B.Sc. Sem. IV – Practicals UPHPC-401

Disciplines Specific Electives

1. B.Sc. Sem.V-DSE: 1-QUANTUM MECHANICS & NUCLEAR PHYSICS (UPHTDSE-501)
2. B.Sc. Sem.V-DSE: 2-ELEMENTS OF MODERN PHYSICS (UPHTC-502)
3. B.Sc. Sem.V-Practicals (UPHPC-501)
4. B.Sc. Semester VI DSE: 1-SOLID STATE PHYSICS AND QUANTUM OPTICS (UPHTC-601)
5. B.Sc. Semester VI PHYSICS-DSE: 2-NUCLEAR AND PARTICLE PHYSICS (UPHTC-602)
6. B.Sc. Sem-VI Practicals (UPHPC-601)

Skill Courses

1. Sem-III PHYSICS WORKSHOP SKILL (UPHTS-301)
2. B.Sc. Sem.III – Practicals UPHPC-301
3. Sem. IV RENEWABLE ENERGY AND ENERGY HARVESTING Course code: (UPHTC-401)
4. B.Sc. Sem. IV – Practicals UPHPC-401
5. Sem -V SEC: BASIC INSTRUMENTATION SKILLS(UPHSEC-501)
6. B.Sc. Sem-VI SEC: WEATHER FORECASTING (UPHSEC-601)

Generic courses

1. PAPERS GENERIC ELECTIVE (GE) SEMESTER V - MECHANICS & SPACE COMMUNICATION (UPHTGEC-501)
2. PHYSICS LAB: GE-LAB: MECHANICS (UPHPGEC-501)
3. GENERIC ELECTIVE PAPER FOR B.Sc. SEMESTER VI-ELECTRICITY AND MAGNETISM (UPHTGEC-601)
4. PHYSICS LAB: GE-LAB: ELECTRICITY AND MAGNETISM(UPHPGEC-601)

2. Learning outcome based approach

Learning outcomes specify what graduates completing the programme of study are expected to know, understand and be able to do at the end of their programme of study. The B.Sc. programme in Physics provides a firm basis for much of the advanced thinking in the Physics discipline. It provides the student with a logical and scientific temperament to interpret the physics laws and Physics related problems which they find in their day to day life. The programme is consistent with global standards in the Physics discipline. It offers training that is comparable to that of an undergraduate student at the world's best universities. The curriculum allows students to choose elective courses from a set of courses with contemporary relevance, thereby offering students the flexibility to prepare for careers in academia, government, research and many other fields.

3. Graduate attributes

Upon completion of this programme, a student will have the necessary knowledge to understand and analyze in a logical manner all major Physics laws and physics related problems. A student will have the ability to analyse, interpret and draw conclusions from quantitative/qualitative data, critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. The programme provides the basic ingredients of Physics laws and theories and opportunity to learn how to process and analyse scientific data based on mathematical tools, in order to arrive at scientific meaningful conclusions.

4. Qualification description

Upon successfully completing the programme, a student will be entitled to be awarded the degree of B.Sc. (Physics)

5. Programme objectives

The overall objectives of the learning outcomes-based curriculum framework are to help formulate graduate attributes, qualification descriptors and course learning outcomes that are expected to be demonstrated by the holder of a qualification.
The programme aims to:

1. Train students in basic laws and theories in Physics;
2. Equip students with the mathematical and scientific techniques necessary for a proper understanding of the discipline;
3. Discuss real problems facing the country and the world;
4. Train students to collect primary data and perform experiments to arrive at some scientific conclusions;
5. Train students to learn the art of making models, assignments and projects.

6. Programme learning outcomes

An undergraduate student of a programme of study in Physics should be able:

1. To use Physics skills such as formulating and solving Physics related problems
2. To identify and apply appropriate physical principles and methodologies to solve a wide range of problems associated with Physics.
3. To plan and execute physics –related experiments or investigations
4. To analyse and interpret data using appropriate methods and relate his findings to relevant theories of Physics.
   In addition, he should also be able to demonstrate professional behavior such as being objective, unbiased and truthful in all aspects of work. He will avoid unethical behavior such as fabricating or misrepresenting data and will promote safe learning and working environment.

7. Teaching learning process

Teaching learning process in this programme involves classroom lectures as well as tutorials. The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention. In tutorials, the teacher can keep track of each student's progress and address her/his individual difficulties. Written assignments and projects submitted by students as part of the course are also discussed in tutorials.

Students are encouraged to undertake independent research projects and submit a written report at the end of the project. Research projects will encourage independent thinking among students and prepare them to carry out research on their own after completion of the degree. Students will be assigned regular home assignments and will be tested periodically through quizzes and class tests to ensure that they have properly learnt the course material.

8. Assessment/Evaluation method

There will be an internal assessment test of 15 marks and 5 marks will be awarded to students as per their attendance in the class. Students have to attempt five questions each carrying 3 marks. The theory question paper shall be of 80 marks. There will be **3** sections in the question paper. Section **A,** contains 5 short answer type questions each of 3 marks, with one from each unit. Section **B** contains 5 medium type answer questions each of 7 marks with one from each unit. Section **C** contains 5 long answer type questions, each of 15 marks with one from each unit.
Note: - A Candidate has to attempt all the questions from sections **A**&**B** and 2 questions from section C.

Proposed syllabi for revision of Core and Skill courses

Govt. College for Women Parade Ground, Jammu

(Autonomous College)

B.Sc. Programme curriculum (CBCS)

Title: Electronics, Thermodynamics and Statistical Mechanics

(Session 2021-22, 2022-23, 2023-24)

Semester-III

Code: UPHTC-301

(Credits: Theory-04, Practicals-02) Theory: 60 Lectures, Practicals: 60 Hours

Internal Examination: 20 Marks
External Examination: 80 Marks

Course Objective

This course will introduce Electronics, Thermodynamics and Statistical Mechanics to the students. The foremost objective of this course is to understand the basic and fundamental laws in electronics and thermodynamics and its applications to various electronic appliances and thermodynamics systems and processes.

The primary goal of this course work is to enable the students to understand the connection between Macroscopic observations of physical systems and Microscopic behaviour of atoms and molecules through statistical mechanics.

Course Learning Outcomes

On the completion of this course the students are expected to learn

- ➢ Band theory of semiconductors, The various fundamental laws, important characteristics and applications of electronic devices such as PN-Junction diodes, special diodes and Transistors.
- ➢ Review of Zeroth law, First law of thermodynamics and its limitation, Second law of thermodynamics and its applications, concept of entropy in different forms and the associated theorems.
- ➢ Thermodynamics potential, Maxwell's thermodynamics relations their physical interpretations and applications.
- ➢ Low temperature in physics and its Measurement.
- ➢ The concept of Statistical Mechanics and its types, various fundamental laws in three types of statistics and their applications.

Unit-I

ELECTRONICS

Band theory of semiconductors, Fermi energy and Fermi-level, PN junction and its V-I characteristics, PN junction diode as a Half-Wave Rectifier (HWR) and Full-Wave Rectifier (FWR), Ripple factor and efficiency of HWR and FWR, Zener diode and its V-I characteristics, Avalanche and Zener breakdown, Zener diode as a voltage regulator. Construction, Working and V-I characteristics of Tunnel diode and Light Emitting Diode.

BJT: Definition, types, modes of operation and VI characteristics for Common-Base and Common-Emitter configurations. Construction, Working and V-I characteristics of UJT. **(12 Hours)**

Unit-II

THERMODYNAMICS -I

Thermodynamic Equilibrium and Zeroth-law of thermodynamics, Concept of Indicator diagram, Review of 1^{st} law of thermodynamics and its limitations. 2^{nd} Law of thermodynamics, heat-engine and its efficiency. Refrigerator and its coefficient of performance.

Carnot theorem, thermodynamic scale of temperature and its identity with gas scale. Entropy, Entropy changes in reversible and irreversible processes, law of increase of entropy with examples, T-S diagram, Entropy & disorder. Heat death of the universe, 3^{rd} law of thermodynamics. **(12 Hours)**

Unit-III

THERMODYNAMICS -II

Thermodynamic variables (extensive & intensive), thermodynamic potentials, Maxwell's thermodynamic relations and their applications to: Joule's Thomson effect, Clausius-Clapeyron's heat-equation, TdS equations, variation of Internal energy with volume and relations between C_p and C_v.

Low temperature Physics: Cooling due to adiabatic demagnetization, production and measurement of very low temperature. **(12 Hours)**

Unit-IV

STATISTICAL MECHANICS –I

Introductory idea about statistical mechanics its need and types.

Probability, permutations and combination, macrostates and microstates, thermodynamic probability, effects of constraints on a system, most probable state, deviation from the state of maximum probability, distribution of n-distinguishable particles in k-compartments of unequal sizes.

Phase space, types of statistics, basic approach in three types of statistics, Maxwell-Boltzman distribution law, Maxwell's distributions of speeds and velocities. Average, r.m.s. and most probable speed of gas molecules. **(12 Hours)**

Unit-V

STATISTICAL MECHANICS -II

Bose-Einstein (BE) statistics and distribution law, Blackbody radiations, photon gas , derivation of Plank's radiation law, Rayleigh-Jeans law, Wein's displacement law and Stefan's Boltzman law from Plank's law. Bose Einstein's gas, degeneracy and BE condensation.

Fermi-Dirac statistics and its distribution law, Applications of FD statistics to electron gas in metals, zero point energy, comparison between ordinary gas and electron gas, comparison among three types of statistics.

(12 Hours)

Reference Books of Sem 3rd (Electronics, Thermodynamics and Statistical Mechanics)

1. Thermal Physics, S. Garg, R. Bansal and C. Gosh 1993, Tata McGraw-Hill Publications.

2. Thermodynamics, Enrico Fermi, 1956 Courier Dover Publications.

3. Heat and Thermodynamics, M.W. Zemansky and R. Dittman, 1981, Mc Graw Hill Publications.

4. Thermodynamics, Kinetic theory and Statistical Thermodynamics, F.W. Sears & G.L. Salinger 1988, Narosa.

5.Thermal Physics, A. Kumar and S. P. Taneja, 2014, R.Chand Publications.

6. Introduction to Statistical Mechanics , B. B. Laud

7. Statistical and Thermal Physics by S. Lokanathan and R. S. Gambir.

8. Thermodynamics and Statistical Physics by J. K. Sharma.

9. Principles of Electronics by V. K. Mehta. (S. Chand and Co)

10. Basic Electronics by B. L. Theraja (S. Chand and Co)

Teaching learning process

Lectures, tutorials, powerpoint presentations, group discussion, seminars, projects etc.

Evaluation

There will be an internal assessment test of 15 marks and 5 marks will be awarded to students as per their attendance in the class. Students have to attempt five questions each carrying 3.0marks. The theory question paper shall be of 80 marks. There will be **3** sections in the question paper. Section **A,** contains 5 short answer type questions each of 3 marks, with one from each unit. Section **B** contains 5 medium type answer questions each of 7 marks with one from each unit. Section **C** contains 5 long answer type questions, each of 15 marks with one from each unit.
Note: - A Candidate has to attempt all the questions from sections **A**&**B** and 2 questions from section C.

Govt. College for Women Parade Ground, Jammu
(Autonomous College)

B.Sc. Programme curriculum (CBCS)

Physics (Session 2021-22, 2022-23 and 2023-24)

PRACTICAL

(60 Hours)

UPHPC- 301 **External Examination: 25 marks**
Internal Examination: 25 marks

1. To study the V-I characteristics of a PN Junction Diode.
2. To study the V-I characteristics of a Zener Diode.
3. To study the input and output characteristics of common base PNP/NPN transistors.
4. To study the input and output characteristics of common emitter PNP/NPN transistors.
5. To study the V-I characteristics of a Tunnel diode.
6. To find the angle of a prism by using a spectrometer.
7. To find the Refractive index of water by using a hollow prism and spectrometer.
8. To plot a graph between the angle of incidence and the corresponding angle of deviation and to find the refractive index of the material of a prism.
9. To find the value of Cauchy's constants A and B for the material of the prism using a mercury vapour lamp.
10. To verify certain laws of probability by throwing one coin, two coins and 10 coins.
11. To study statistical distribution of 4 distinguishable particles in 2 compartments of equal size and find macrostates, microstates and thermodynamic probability.

Reference Books

1. B. Sc Practical Physics by C. L. Arora.
2. Practical Physics by O. L. Squires Cambridge University Press
3. Advanced Practical Physics for Students by Worsnop and Flint
4. Practical Physics by R. K. Shulda
5. B. Sc. Practical Physics by Harnam Singh.

Note: The candidates are required to complete at least 5 practicals. The Practicals can be added or deleted as per requirement.

Govt. College for Women Parade Ground, Jammu
(Autonomous College)

B.Sc. Programme curriculum (CBCS)

Physics (Session 2021-22, 2022-23 and 2023-24)

Title: Fourier Series, Waves and Optics

Semester-IV

Code: UPHTC-401

(Credits: Theory-04, Practicals-02) **Theory: 60 Lectures, Practicals:60 Hours**

Internal Examination: 20 Marks
External Examination: 80 Marks

Course Objective

The basic aim of teaching this syllabus is to empower the students to acquire engineering skills and practical knowledge which will be of great help to students in their day today life. This course is designed with a special objective to study Fourier series and its applications; and to review the concepts of waves and optics learnt at the school level from a more advanced perspective and move on to develop new concepts.This course begins with explaining basic idea of types of waves,characteristics and superposition of harmonic oscillations leading to physics of plane progressive and standing waves.

This course also provides an in-depth understanding of important wave phenomena of light, namely; interference, diffraction and polarisation with more emphasis laid on the practical applications.This Course will provide a sound foundation in Fourier series, waves and optics.

Course Learning Outcome

On the completion of this course the students will have acquired the knowledge to:

- ➢ Understand the Fourier series and its important applications.
- ➢ Review and understand the related concepts about waves, Superposition principle, Reflection and Transmission of waves at the boundary of two media, importance of classical wave equations in different forms in terms of transverse and longitudinal waves, formation of standing waves on a string of fixed length, Normal modes,frequencies, Eigen-functions and energy of the vibrating string in nth normal mode.
- ➢ Understand coherent sources of light, Interference phenomenon,theory of interference fringes, demonstration of Young's Double Slit Experiment, Fresnel's biprism and Newton's ring experiment.
- ➢ Understand the concept and experimental demonstration of diffraction phenomenon, superposition of wavelets diffracted from apertures. Fraunhofer diffraction from a single slit, double slit etc.
- ➢ Understand the concept of Polarisation and experiments to demonstrate this phenomenon. Huygens double refraction, Brewster's law, optical activity, Laurent's Half shade Polarimeter and its applications.

Unit I :

FOURIER SERIES

Periodic functions, even and odd functions, continuous and discontinuous functions, Dirichlet's conditions, Fourier series and its coefficients. Sine and cosine series, complex form of Fourier Series, extension of interval from $(-\pi , \pi)$ to $(-l , l)$. Fourier solutions of simple functions. Application of Fourier theorem to square wave, rectangular wave, HWR and FWR. **(12 Hours)**

Unit II:

WAVES

Brief idea about plane and spherical waves, transverse and longitudinal waves, Plane progressive wave in one direction, wave equation in simple and differential form, general solution of wave equation.

Energy, energy density and intensity of progressive wave, velocity of transverse wave in a string and velocity of longitudinal wave in a fluid. Phase and group velocity, characteristic impedance of a string, reflection and transmission coefficients, impedance matching, concept of superposition principle. Formation of standing/stationary waves, standing wave on a string of fixed length, Eigen functions, eigen frequencies, energy of a vibrating string. **(12 Hours)**

Unit III:

INTERFERENCE

Conditions for interference, constructive and destructive interference, Young's Double Slit Experiment, Theory of interference fringes (fringe width). Fresnel's Biprism and its application for determination of wavelength of the sodium light and distance between the two virtual sources. Concept of phase change on reflection, thin films (reflected and transmitted cases).

Newton's rings and its application for determination of refractive index of a liquid and wavelength of the sodium light. Michelson's Interferometer and its applications to the determination of wavelength of monochromatic light and thickness of a thin transparent sheet/plate. **(12 Hours)**

Unit IV:

DIFFRACTION

Experimental concept of diffraction, distinction between interference and diffraction.

Review of Fresnel and Fraunhaufer's diffraction.

Fresnel's diffraction: Fresnel's half-period zones, zone plate, action of zone plate, difference between zone plate and converging lens, diffraction at a straight edge, rectangular slit and thin wire.

Fraunhofer's diffraction: single slit diffraction, double slit diffraction, plane transmission grating, determination of wavelength of sodium light using grating, dispersive power of grating, Rayleigh's criterion and resolving power of grating.

(12 Hours)

Unit V:

POLARIZATION

Experimental demonstration of a polarization of light, methods of producing plane polarized light, polarization by reflection. Malus law, Brewster's law, phenomenon of double refraction, Huygen's theory of double refraction. Nicol prism. Theory, production and detection of plane, circular and elliptical polarized light. Optical activity, specific rotation, Laurent's half shade polarimeter. **(12 Hours)**

Text & Reference Books

1. Mathematical Physics by Satya Parkash S. Chand Publication.
2. Fourier Analysis, M. R. Spiegel (Tata McGraw Hill).
3. Mathematical Physics by H. K. Das, S. Chand Publication.
4. Waves and Oscillations, N. Subrahmanyam and B. Lal (Vikas Publishers)
5. Physics of Vibrations and Waves, H. J. Pain (John Wiley, London)
6. Text Book of Vibrations and Waves, S. P. Puri (MacMillan India)
7. Fundamentals of Optics, F.A. Jenkins and H. E. White, 1976 McGraw Hill.
8. Principles of Optics, B. K. Mathur, 1995 Gopal Printing.
9. Fundamentals of Optics, H. R. Gulati and D. R. Khanna, 1991 R. Chand Publication.
10. University Physics F.W. Sears, M.W. Zemansky and H. D. Young, 1986 Addison-Wesley 1.
11. Fundamentals of Optics, F. A. Jenkins and H. E. White, 1976, McGraw Hill.

Teaching learning process

Lectures, tutorials, powerpoint presentations, group discussion, seminars, projects etc.

Evaluation

There will be an internal assessment test of 15 marks and 5 marks will be awarded to students as per their attendance in the class. Students have to attempt five questions each carrying 3.0marks. The theory question paper shall be of 80 marks. There will be **3** sections in the question paper. Section **A,** contains 5 short answer type questions each of 3 marks, with one from each unit. Section **B** contains 5 medium type answer questions each of 7 marks with one from each unit. Section **C** contains 5 long answer type questions each of 15 marks with one from each unit.
Note: - A Candidate has to attempt all the questions from sections **A**&**B** and 2 questions from section **C**.

Govt. College for Women Parade Ground, Jammu
(Autonomous College)

B.Sc. Programme curriculum (CBCS)

Physics (Session 2021-22, 2022-23 and 2023-24)

PRACTICALS

UPHPC- 401

(60 Hours)

External Examination: 25 marks
Internal Examination: 25 marks

1. To find the Refractive index of O-ray and E-ray.
2. To find the Wavelength of sodium light by using Diffraction Grating.
3. To find the wavelength of Sodium light using Newton's Rings.
4. To find specific rotation of sugar by Polarimeter.
5. To find the dispersive power of a given glass prism by using a mercury vapour lamp and spectrometer.
6. To find the wavelength of monochromatic light by using Michelson Interferometer
7. To determine the resolving power of a plane transmission diffraction grating.
8. To find the number of lines per centimeter of the given grating. Given mean wavelength of sodium light to be 5893Å
9. To find the wavelength of sodium light using Fresnel's biprism.
10. To find the coefficient of self inductance by Anderson's method.
11. To find the ionization potential of mercury.
12. To study the V-I characteristics of UJT.

Reference Books:

1. B.Sc. Practical Physics by C. L. Arora.
2. Advanced Practical Physics for students, B. L. Flint and H. Worsnop, 1971, Asia Publishing House.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A text book of Practical Physics, Indu Prakash and Rama Krishna, 11th Edition 2011, Kitab Mahal New Delhi.

Note: The candidates are required to complete at least 5 practicals.
The Practicals can be added or deleted as per requirement.

Scheme of Examination for B. Sc. Physics(Core Courses)

The students shall be evaluated during the conduct of the course in the semester as follows:-

Examination(Theory)	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Internal Assessment Test	Upto 50% (after 45 days)	1hour	15 % (15marks)
External End Semester Examination	Upto 100% (after 90 days)	3hour	80% (80marks)
			Attendance = 5 marks(5%)
Total			100

Scheme for Internal Assessment Test: The question paper would comprise of five short answer type questions of 3 marks each. Total marks for the assignment test is 15.

Scheme for End Semester Examination: The question paper comprises three sections section A, B and C.

Section A contains 05 short answer type questions (one from each unit) carrying 3 marks each. All the questions in this section are compulsory. 15 Marks

Section B contains 05 medium answer type questions (one from each unit) and each question carries 7 marks. 35 Marks

Section C contains 05 long answer type questions each carrying 15 marks one from each unit and the candidate is required to attempt any two questions. 30 Marks

Govt. College for Women Parade Ground, Jammu
(Autonomous College)

B.Sc. Programme curriculum (CBCS

Skill- Enhancement Elective Course- (SEC)

Title: Physics Workshop Skills

(Session 2021-22, 2022-23, 2023-24)

Semester-III

Code: UPHTS-301

(Credits: Theory-02, Practicals-02) Theory: 30 Lectures, Practicals: 60 Hours

Internal Examination: 10 Marks
External Examination: 40 Marks

Course Objective

This skill enhancement elective course is designed with an objective to enable the students to be familiar and acquire experience of various mechanical and electrical tools through hands- on mode.

This course helps the students in learning and working of various devices and the different sorts of errors encountered in the measurement process. This course empowers the students to get exposure to working with different machines and tools through demonstration and experimental techniques. It also improves the mechanical and technical skills of the students.

Course learning outcomes

At the end of this course, students will be able to achieve the following learning outcomes:

- ➢ Knowledge of making measurements with devices like Vernier caliper, Screw gauge, Travelling microscope and Sextant for measuring height of buildings, mountains ,etc.
- ➢ Students acquire skills for using various electrical devices such as multimeter, oscilloscopes, power supplies, soldering iron , relays, function generator, d.c and a.c bridges like wheatstone bridge, Anderson's bridge etc.
- ➢ Develop mechanical skills in drilling, machining, casting, introduction to common machine tools like shaper, milling, surface machines and cutting tools.
- ➢ Students become familiar with wheels, lifting of weight using levers, use of pulleys and power generation systems.

UNIT–I :
Measurement and mechanical skills

Review of different measuring systems and their interconversion, familiarization with meter scale, Vernier Calliper, Screw gauge, Spherometer and travelling microscope. Measuring the dimensions of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, bob of a pendulum, thickness of a metal sheet, etc. Use of sextant to measure height of buildings, mountains, etc.
Introduction to manufacturing methods: casting, foundry, machining and forming. Materials used for manufacturing, introduction and use of common machine tools like lathe, shaper, drilling and surface machines. cutting of a metal sheet using a blade, drilling holes of different diameter in metal sheets and wooden blocks. Use of bench vice and tools for fitting and lubricating oils. **(15 Hours)**

UNIT II:
Basic laws of electricity, Measuring instruments and devices

Introduction to fundamental terms like Resistance, capacitance, inductance, cell, voltage, current, a.c, d.c, power etc. and their units. Ohm's law, Kirchoff's laws, simple series and parallel combinations of electrical circuits, power supply, electric wiring used at homes and commercial units of electricity.

Measuring instruments such as voltmeter, ammeter, tester pin, multimeter (digital and analog) and function generator. Introduction to instruments like C.R.O (Cathode Ray Oscilloscope), d.c and a.c bridges like Wheatestone bridge, De-Sauty's bridge and Anderson's bridge with important applications.

(15 Hours)

PRACTICALS

Code: UPHPS- 301

External Examination: 25 marks
Internal Examination: 25 marks

In the Skill practical course, emphasis is laid on taking observations, calculations, graphs and results. Students are asked to perform at least five practicals from the following.

However, in case of non-availability of equipment, the teacher may give a long duration project/Module based on this paper.

Experiments:

1. To find the diameter of a cylindrical / spherical body and hence its volume by using a Vernier calliper.
2. To find the thickness of two or more wires / sheets by using a Screw gauge.
3. To find the radius of curvature of concave and convex mirrors/lenses by using a Spherometer.
4. To find the refractive index of a transparent liquid (water) with the help of a travelling microscope.
5. To perform the practical drilling of holes in wood, plastic and metal.
6. Experiment for cutting of a glass and a metal sheet.
7. Experiment to verify Ohm's law.
8. Experiment to verify Kirchhof's laws.
9. To find the value of an unknown resistance by using a Wheatestone bridge.
10. To compare the capacitances of two capacitors by de-Sauty's null method.
11. To find the self inductance of a coil by Anderson's bridge method using a headphone.
12. Experiment to measure resistance, current, voltage(d.c and a.c) in an electrical circuit by using a multimeter
13. To obtain the waveform of A.C. mains supply using a cathode ray oscilloscope.

Text & Reference Books:

1. Principles of Electronics by V. K. Mehta (S.Chand and Co)
2. Basic Electronics by B. L. Theraja (S. Chand and Co)
3. Performance and design of A. C. Machines-M.G. Say, ELBS Edn.
4. Mechanical workshop practice, K. C. John 2010, PHI Learning Pvt. Ltd.
5. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn.
6. B. Sc Practical Physics by C. L. Arora
7. Advanced Practical Physics for students, B. L. Flint and H. Worsnop 1971, Asia Publishing House.
8. Electronic Devices and Circuits, S. Salivahanan & N. S. Kumar, 3rd Edn. 2012, Tata Mc-Graw Hill.

Govt. College for Women Parade Ground, Jammu
(Autonomous College)

B.Sc. Programme curriculum (CBCS

Skill- Enhancement Elective Course- (SEC)

Title: Renewable Energy and Energy Harvesting

(Session 2021-22, 2022-23, 2023-24)

Semester-IV

Code: UPHTS-401

(Credits: Theory-02, Practicals-02) Theory: 30 Lectures, Practicals: 60 Hours

Internal Examination: 10 Marks
External Examination: 40 Marks

Course Objective

The main objective of this course is to impart knowledge and hands-on learning to students about various alternative energy sources. While framing this course, more emphasis is laid on to teach the ways of harvesting energy by means of wind, solar, mechanical, ocean, geothermal energy etc. and to review the working of various energy harvesting systems installed in India and worldwide.

Course learning outcomes

On the completion of this course, students will be able to:

- ➢ Acquire the knowledge of various sources of energy for harvesting.
- ➢ A good understanding of various renewable energy systems and its components.
- ➢ Acquire skills for using some of the renewable energy systems.
- ➢ Develop mechanical skills about renewable energy technologies, different storage technologies, regulation and their control.
- ➢ Design the model for the wind energy or solar energy plant and will also gain hands -on experience for different kinds of alternative energy sources, conversion of thermal energy into voltage using thermoelectric modules and conversion of vibration into voltage using piezoelectric materials.

UNIT-I:

Sources of Renewable Energy:

Solar Energy:

Need of Renewable energy, An overview of non-conventional sources of energy.

Solar Radiation, Measurement of Solar Radiation, Radiation measuring instruments (Qualitative Idea), Solar Energy, Benefits of harnessing solar energy, Storage of Solar Energy, Solar Water Heater, Solar Cooker, Photo-Voltaic Systems and uses, Principle of photovoltaic conversion, Characteristics of Photovoltaic (PV) systems, PV Models and equivalent circuits, Solar Cells and characteristics, Solar Green Houses.

Hydro-Energy:

Hydropower Resources, Hydropower Resources in Jammu and Kashmir, Hydropower scenario in J&K, Essential elements of a hydro-electric power plant, Hydropower technologies, Advantages and Disadvantages of Hydropower.

(15 Hours)

Unit-II:

Energy Storage Systems and Energy Harvesting:

Electrochemical Energy Storage Systems: Cells and Batteries, Types, Working principles and applications, Carbon capture and storage technology, present scenario in India. Fuel Cells, Principle of working, Basic thermodynamic and Electrochemical principles, Classifications, Applications for power generations.

Basic Physics of Piezoelectric effect, mathematics, materials and methods of piezo-electricity, piezoelectric generators and piezo-electric energy and applications.

Electrical Utilities:

Electric Motors, Motor Types, Characteristics, Efficiency. Energy Efficient Motors, Factors affecting Energy efficiency of a motor.

(15 Hours)

PRACTICALS

Code: UPHPS- 401

External Examination: 25 marks
Internal Examination: 25 marks

In this Skill practical course, more emphasis is laid on the project work. Students are required to perform a maximum number of practicals from the following.
However, in case of non- availability of equipment, the teacher may give a long duration project/Module based on this paper.

Practicals:

1. To study/verify the inverse square law of radiation using photovoltaic cells.

2. Study the (V-I), Power load (VI-R), Area and Azimuthal Characteristics of Solar Cell (Photovoltaic Cell)

3. To study the spectral characteristics of Photovoltaic Cell.

4. To compare the luminous intensities (Illuminating powers) of two light sources using photovoltaic cells.

Projects:

1. Assessment of Hydropower stations of J&K, Power Generation Capacity of these stations, Power Distribution etc.

2. To set up a Charging station/Energy station in the laboratory using solar energy.

3. Field visit to a Hydropower Station/Solar power plant followed by the submission of a project report.

Reference for Theory:

Essential Readings

1. Solar Energy, Suhas P Sukahative, Tata McGraw-Hill Publication company Ltd.
2. Renewable Energy, Power for a sustainable future, Godfrey Boyle, 3rd Edition, 2012, Oxford University Press.

Additional Readings

1. Solar Energy: Resource Assessment Handbook, P Jayakumar, 2009
2. https://en.wikipedia.org/wiki/Renewable_energy

Reference for Laboratory

1. Non-conventional energy sources, B.H. Khan, McGraw Hill 60

Scheme of Examination for B. Sc. Physics(Skill-Courses)

The students shall be evaluated during the conduct of the course in the semester as follows:-

Examination(Theory)	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Internal Assessment Test	Upto 50% (after 45 days)	1/2hour	15 % (7.5marks)
External End Semester Examination	Upto 100% (after 90 days)	1.5 hour	80% (40marks)
			Attendance = 2.5 marks (5%)
Total			50 marks

Scheme for Internal Assessment Test: The question paper would comprise of three short answer type questions of 2.5 marks each. Total marks for the assignment test is 7.5.

Scheme for End Semester Examination: The question paper comprises three sections, section A, B and C.

Section A contains 04 short answer type questions (two from each unit) carrying 2 marks each. All the questions in this section are compulsory. 8 Marks

Section B contains 04 medium answer type questions (two from each unit) and each question carries 5 marks. 20 Marks

Section C contains 03 long answer type questions (1.5 questions from each unit) each carrying 12 marks and the candidate is required to attempt any one question. 12 Marks