1st Semester

SEC-PHY-111:**Physical gadgets and their applications**

Course Code	**Course Title**	**Credit**	**Course Type**	**Duration of Course**	**No. of hours per Semester**
SEC-PHYP-111	Physical gadgets and their applications	03	SEC	One Semester	45

No. of hours per week		**Total Marks**		**Pass Marks**		**End Semester Examination**		**Continuous Comprehensive Assessment (CCA)**
06 (Theory + Practical)		75		27		*Theory & practical of 2 hours duration		25 Based on internal exam/test conducted by the teacher and attendance
T	P	**End Semester Exam**	**Internal Assessment**	**End Semester Exam**	**Internal Assessment**	**Experimental work and Theory**	**Viva**	
02	04	50	25	18	09	30	20	

Course Description	Physical gadgets and their applications
Code	SEC-PHY-111
***End Semester Theory &Practical Examination**	**50 Marks (3 Hours duration)** Experiment and Theory (40+10) **50 Marks** a.) External examiner will conduct a written test (on the spot) consisting of five questions **10 Marks** b.) Student will be asked to perform one experiment and make observations **20 Marks** c.) Viva-voce **20 Marks**
Continuous Comprehensive Assessment (CCA)	**25 marks** a.) Based on internal exam/test conducted by the Teacher **10 Marks** **b)** Assignment / **Presentation** **10 Marks** b.) Attendance **05 Marks**

Note: Pass Marks of each subject: 40% Aggregate and minimum 35% in each individual component (term end exams, practical, IA, etc.) of a subject.

Instructions:

1. ***It will be a laboratory based course. Students will learn and practice in the Laboratory hours***.
2. ***Teacher will introduce the basic physical gadgets to the students in the laboratory.***
3. ***Teacher will also explain the basic physic/concepts involved in each gadget.***
4. ***Each student has to perform minimum twelve (12) experiments.***
5. ***External examiner for the end semester practical exam should be deputed by the H. P. University and should not be from the same college. University has to depute from any other college affiliated to the University.***

UNIT-I

Knowledge of Basic measurement instruments to measure Mass, Length, Time and Temperature.

1. Vernier calliper, its least count, and positive and negative errors and its applications.
2. Screw Gauge, least count and positive and negative errors and its applications.
3. Spherometer to measure the curvature.
4. Value of g using simple pendulum. Using it find pressure at place.
5. To measure volume of irregular object using measuring cylindrical and water.

UNIT-II

6. Microscope to measure small distances.
7. Stop watch and its applications to measure time, distance, speed, etc.
8. Different type of thermometers to measure the temperature. Relation between Kelvin, Celsius and Fahrenheit their conversion from one scale to other.
9. Electric wiring in household circuits. Concept of Live, Neutral and Earth wire and their coding.
10. Conversion of Galvanometer to ammeter and voltmeter and make observations.
11. To understand the concept of Rheostat and use this to control the intensity of incandescent bulb. Also verify Ohm's law.

UNIT-III

Knowledge of Screwdriver, Tester, Plier, Galvanometer, Voltmeter, Ammeter, Multi-meter, and other measuring devices.

12. Use of multi-meter and its applications.
13. To understand the concept of Resistance, capacitor and inductor.LCR circuits in different combination, i.e., series and parallel, to make observations.
14. Fuse and its type used in household circuits.
15. Earthing and its importance in home appliances.
16. To understand the concept of Insulator, Conductor and Semiconductor through experiments.
    I-V characteristic of a conductor and a semiconductor.

SEC-PHY-111
(Course Outcomes)

By the end students will be able to:

- **Identify and use basic measurement instruments:**
  - Recognize and operate instruments for measuring mass, length, time, and temperature.
  - Understand the least count of these instruments and their significance in measurements.
  - Locate and identify common measuring instruments in your surroundings.
  - Concept of Microscope its use and applications.
  - Differentiate between a galvanometer, voltmeter, and ammeter based on their functions and least count.
  - Differentiate between AC/DC ammeter and voltmeter.

    - Understand Multi-meter and its use in household circuits and examining household equipments.
    - Design a basic electric wiring model, identifying various components like wires, switches, sockets, holders and bulbs.
    - Measure the diameter of wires using a screw gauge and convert the measurement to wire gauge size.
    - Understand the concept of wire gauge and its application in electrical circuits.
- **Construct and utilize electrical measuring instruments:**
    - Convert a galvanometer into an ammeter and voltmeter, and make electrical observations using these instruments.
- **Grasp and apply the concept of voltage control:**
    - Understand the concept of a rheostat and its function as a voltage regulator for a fan.
    - Utilize a rheostat (fan regulator) to control the intensity of an incandescent bulb.
    - Verify Ohm's Law through experimentation with voltage control and bulb brightness.
- **Operate and interpret electrical measurements:**
    - Utilize a digital multimeter for various electrical measurements (voltage, current, resistance).
    - Design a voltage divider circuit on a breadboard using a 9V battery and resistors, and understand its operation.
- **Identify and report on electrical components:**
    - Create a collection of different electrical components (switches, LEDs, diodes, transistors, capacitors, inductors, resistance, etc).
    - Prepare a brief report describing the function and basic applications of each component.

B.Sc. Multidisciplinary with Physics

SEC-PHYP-122 Instrumentation and Scientific data visualization

<table>
<tr><th colspan="2">Course Code</th><th colspan="2">Course Title</th><th>Credit</th><th>Course Type</th><th colspan="2">Duration of Course</th><th>No. of hours per Semester</th></tr>
<tr><td colspan="2">SEC-PHYP-122</td><td colspan="2">Instrumentation and Scientific data visualization</td><td>03</td><td>SEC</td><td colspan="2">One Semester</td><td>36</td></tr>
<tr><th colspan="2">No. of hours per week</th><th colspan="2">Total Marks</th><th colspan="2">Pass Marks</th><th colspan="2">End Semester Examination</th><th>Continuous Comprehensive Assessment (CCA)</th></tr>
<tr><td colspan="2">06 (Theory +Practical)</td><td colspan="2">75</td><td colspan="2">27</td><td colspan="2">*Theory &practical of 2 hours duration</td><td rowspan="3">25

Based on internal exam/test conducted by the teacher/assignment/presentation and attendance</td></tr>
<tr><td rowspan="2">T
02</td><td rowspan="2">P
04</td><td>End Semester Exam</td><td>Internal Assessment</td><td>End Semester Exam</td><td>Internal Assessment</td><td>Experimental work and Theory</td><td>Viva</td></tr>
<tr><td>50</td><td>25</td><td>18</td><td>09</td><td>30</td><td>20</td></tr>
</table>

Course Description	Physical gadgets and their applications
Code	SEC-PHY-122
***End Semester Theory &Practical Examination**	**50 Marks (3 Hours duration)** Experiment and Theory (40+10) **50 Marks** c.) External examiner will conduct a written test (on the spot) consisting of five questions **10 Marks** d.) Student will be asked to perform two experiment from any two unit and make observations **20 Marks** c.) Viva-voce **20 Marks**
Continuous Comprehensive Assessment (CCA)	**25 marks** c.) Based on internal exam/test conducted by the Teacher/ **10 Marks** **d.)** Assignment/Presentation **10 Marks** e.) Attendance **05 Marks**

Note: Pass Marks of each subject: 40% Aggregate and minimum 35% in each individual component (term end exams, practical, IA, etc.) of a subject.

Instructions:

1. ***It will be a laboratory based course. Students will learn and practice in the Laboratory hours***.
2. ***Teacher will introduce the basic physical gadgets to the students in the laboratory.***
3. ***Teacher will also explain the basic physical concepts involved in each gadget.***

4. ***Each student has to perform minimum twelve (15) experiments.***
5. ***External examiner for the end semester practical exam should be deputed by the H. P. University and should not be from the same college. University has to depute from any other college affiliated to the University.***

UNIT-I

Calibration of instruments: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements.

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration, brief discussion on screen material, visual persistence & chemical composition. Time base operation, synchronization. Use of front panel controls and their significance. Idea of CRO probes. Digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Use of CRO for different measurements dc and ac frequency, time-period, component tester, Amplitude and time period of sinusoidal signals, tracing of sine, square, triangular wave. Phase difference between sinusoidal signals.

UNIT-II

Signal Generators and Analysis Instruments: Oscillator, working principal, types of oscillator (Hartley and Colpitt), application of oscillators. Function Generator and pulse generator, and their significance and their applications.

Electronic devices and circuits : PN Junction diode and Zener diode working, I-V characteristics. And applications. Full wave and half wave, working and significance. Amplifier, input and output characteristics.

UNIT-III

Scientific data visualization: Introduction to graphical analysis and its limitations. Introduction to Gnuplot importance of visualization of computational data. Basic Gnuplot commands. Scatter plots, line graphs, bar charts and histograms. Simple plots (plotting functions using formula, linear, quadratic, exponential, trigonometric, logarithmic etc.), plotting using equation of line, parabola, ellipse and hyperbola. Plotting data from a file, saving, and exporting, multiple data sets per file. Customizing plots: titles, labels, legends, and colours. Linear and quadratic fitting, (Linear regression: Finding the "best-fit" line for given experimental data). The importance of effective data visualization

Laboratory Exercises:

1. To measure the amplitude and frequency/time period of any signal (sine, cos, square, triangular wave) using CRO.
2. To test the electronic passive and active components, capacitor, resistance, inductor, diodes, transistors.
3. To study the phase difference of two sinusoidal signals.
4. To find the pulse width of any signal.
5. To compare the frequency of two different signals.
6. To find the charging and discharging of a capacitor using CRO.
7. To find the frequency of Colpitt oscillator using CRO.
8. To find the frequency of Hartley oscillator using CRO.
9. To compare the frequency of Colpitt and Hartley oscillators,
10. I-V characteristics of PN junction and Zener diode.
11. To trace the wave forms of half and full wave rectifier.
12. Input and output characteristic of amplifier.
13. Plotting of simple function using Gnuplot.
14. Plotting of multi functions using Gnuplot.
15. To make bar chart for a given data.
16. To make histogram for a given data.
17. To plot parabola. hyperbola and using their equations.
18. Linear fitting of an experimental data say ohm’s law.

19. To plot a data from a file.
20. Plotting a combination of exponential function, trigonometric function and simple function.

Reference Books:

1. A Textbook in Electrical Technology - B L Theraja - S Chand and Co.
2. Electronic Devices and circuits, S. Salivahanan& N. S.Kumar, Ed., 2012, Tata Mc Graw Hill.
3. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India.
4. Electronic Instruments and measurements, by M L Anand, IInd Ed. 2012, S K Kataria and sons,
5. Practical Physics, by C L Arora, S. Chand and Company.