



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Diploma Engineering College  
Semester-1 (Diploma)

**Subject:** Experimental Physics – DET1XX10101

**Type of course:** Multidisciplinary

**Prerequisite:** Basic mathematics, understanding of shapes, different states of matter.

**Rationale:**

Physics is a branch of science mainly dealing with interaction of energy and matter and considered as the mother of all engineering disciplines. Diploma engineers (technologists) have to deal with various materials while using/ maintaining machines. Moreover, the basic knowledge of principles of physics helps diploma students to lay foundations of core engineering courses. The laws and principles of physics, formulae and knowledge of physical phenomena and physical properties provide a means of estimating the behavior of things before we design and observe them. This course of physics has been designed as per program requirements to help students to study the relevant core engineering courses. The complicated derivations have been avoided and micro projects are introduced. This course will help the diploma engineers to use/apply the basic concepts and principles of physics solve well designed engineering problems and comprehend different technology-based applications.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |   | Credits | Examination Marks |     | Total Marks |
|-----------------|---|---|---------|-------------------|-----|-------------|
| CI              | T | P | C       | SEE               | CCE |             |
| 4               | 0 | 2 | 5       | 100               | 50  | 150         |

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.*

**Teaching and Examination Scheme: 150**

| Examination Component                      | Weightage (%) |
|--|---------------|
| Practical Exams (Module 1,2,3,4,5)         | 40%           |
| Viva (Module 1,2,3,4,5)                    | 20%           |
| Problem solving (Module 1,2,3,4,5)         | 20%           |
| Project Work (Mini project) (Module 1,2,4) | 20%           |





**Course Content:**

| Sr. No  | Course Content  | Hrs.    | % Weightage       |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
|---------|---|---------|-------------------|-----|-----|---|-----------------|----|----|---|------|----|----|---|-----------------|----|----|---|--------------|----|----|--------------|-----|
| 1       | <p><b>Theory Topics</b> -Units and Measurements Measurement and units in engineering and science, Physical quantities; fundamental and derived quantities, Systems of units: CGS, MKS and SI, definition of units (only for information and not to be asked in examination), Interco version of units MKS to CGS and vice versa, requirements of standard unit, Vernier caliper, Micrometer screw gauge, Accuracy, precision and error, estimation of errors absolute error, relative error and percentage error, error propagation, significant figures.</p> <p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>• Use Vernier calipers to measure the dimensions of a given object.</li> <li>• Use a micrometer screw gauge to measure diameter of a given wire and determine volume of a given metallic piece.</li> </ul> <p><b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Evolution Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td>Practical Exams</td><td>12</td><td>00</td></tr> <tr> <td>2</td><td>Viva</td><td>04</td><td>00</td></tr> <tr> <td>3</td><td>Problem solving</td><td>04</td><td>00</td></tr> <tr> <td>4</td><td>Project Work</td><td>00</td><td>10</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>• <b>Practical Exams (12 Marks)</b><br/>In this task student have to perform any one practical from module 1 only. <ul style="list-style-type: none"> <li>• <b>03 Marks:</b> find the error in instrument</li> <li>• <b>03 Marks:</b> prepare a table</li> <li>• <b>03 Marks:</b> take correct reading</li> <li>• <b>03 Marks:</b> calculation and answer</li> </ul> </li> <li>• <b>Viva (04 Marks)</b><br/>In this task there will be 2 question each having 2 Marks from module 1</li> <li>• <b>Problem solving (04 Marks)</b><br/>In this task there will be 1 numerical having 04 Marks from module 1</li> <li>• <b>Project Work (10 Marks)</b><br/>In this task student have to prepare a labeled diagram of any one instrument from module 1 on A3 size Project Sheet.</li> </ul> | Sr. No. | Evolution Methods | SEE | CCE | 1 | Practical Exams | 12 | 00 | 2 | Viva | 04 | 00 | 3 | Problem solving | 04 | 00 | 4 | Project Work | 00 | 10 | T:12<br>P:08 | 20% |
| Sr. No. | Evolution Methods   | SEE     | CCE               |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 1       | Practical Exams   | 12      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 2       | Viva  | 04      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 3       | Problem solving   | 04      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 4       | Project Work  | 00      | 10                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |



| 2       | <p><b>Theory Topics:</b> Heat and Temperature, Modes of Heat transfer: Conduction, Convection and Radiation, Temperature measurement scales: Kelvin, Celsius and Fahrenheit and inter conversion between them, Heat Capacity and Specific Heat, Types of thermometers (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses, Coefficient of thermal conductivity and its engineering applications, Expansion of solids, coefficient of linear expansion</p> <p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>• Use different types of thermometers to measure temperature of a hot bath and convert it into different scales.</li> <li>• Use Lee's method to measure the coefficient of thermal conductivity of a given bad conductor.</li> </ul> <p><b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Evolution Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td>Practical Exams</td><td>12</td><td>00</td></tr> <tr> <td>2</td><td>Viva</td><td>04</td><td>00</td></tr> <tr> <td>3</td><td>Problem solving</td><td>04</td><td>00</td></tr> <tr> <td>4</td><td>Project Work</td><td>00</td><td>10</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>• <b>Practical Exams (12 Marks)</b><br/>In this task student have to perform any one practical from module 2 only. <ul style="list-style-type: none"> <li>• <b>03 Marks:</b> find the error in instrument</li> <li>• <b>03 Marks:</b> prepare a table</li> <li>• <b>03 Marks:</b> take correct reading</li> <li>• <b>03 Marks:</b> calculation and answer</li> </ul> </li> <li>• <b>Viva (04 Marks)</b><br/>In this task there will be 2 question each having 2 Marks from module 2</li> <li>• <b>Problem solving (04 Marks)</b><br/>In this task there will be 1 numerical having 04 Marks from module 2</li> <li>• <b>Project Work (10 Marks)</b><br/>In this task student have to prepare a chart having principal construction and working of any one Thermometer from module 2 on A3 size Project sheet.</li> </ul> | Sr. No. | Evolution Methods | SEE | CCE | 1 | Practical Exams | 12 | 00 | 2 | Viva | 04 | 00 | 3 | Problem solving | 04 | 00 | 4 | Project Work | 00 | 10 | T:12<br>P:06 | 20% |
|---------|---|---------|-------------------|-----|-----|---|-----------------|----|----|---|------|----|----|---|-----------------|----|----|---|--------------|----|----|--------------|-----|
| Sr. No. | Evolution Methods   | SEE     | CCE               |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 1       | Practical Exams   | 12      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 2       | Viva  | 04      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 3       | Problem solving   | 04      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 4       | Project Work  | 00      | 10                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |





3

**Theory Topics:** Waves, wave motion, and types of waves: longitudinal and transverse waves, Frequency, periodic time, amplitude, wavelength and wave velocity and their relationship, Properties of sound and light waves, phase, phase difference and various terms of wave equation ( $y = A\sin(\omega t + \phi)$ ) [NO equations of velocity and acceleration], Superposition of waves, Interference: constructive and destructive interference, condition for stationary interference pattern, beat formation, Ultrasonic waves, production of ultrasonic waves magnetostriction and piezoelectric method, their properties, applications of ultrasonic waves in the field of engineering and medical.

**Practical:**

- Use the resonator to determine unknown frequency of tuning fork.
- To determine Melde's tuning fork frequency and to verify laws of vibrating strings.

**Examination Style:**

| Sr. No. | Evolution Methods | SEE | CCE |
|---------|-------------------|-----|-----|
| 1       | Practical Exams   | 12  | 00  |
| 2       | Viva              | 08  | 00  |
| 3       | Problem solving   | 00  | 10  |

• **Practical Exams (12 Marks)**

In this task student have to perform any one practical from module 3 only.

- **03 Marks:** find the error in instrument
- **03 Marks:** prepare a table
- **03 Marks:** take correct reading
- **03 Marks:** calculation and answer

• **Viva (08 Marks)**

In this task there will be 4 question each having 2 Marks from module 3

• **Problem solving (10 Marks)**

In this task there will be 2 numerical having 05 Marks from module 3

T:12  
P:08

20%



| 4       | <p><b>Theory Topics</b> Refraction, refractive index and Snell's law, Total internal reflection, critical angle and necessary conditions for total internal reflection, Application of total internal reflection in optical fire, LASER, characteristics of LASER, differences between LASER and ordinary light, Applications of LASER in engineering and medical field, Optical fiber and light propagation through optical fiber, acceptance angle and numerical aperture, Step index and graded index, Applications of optical fiber in engineering and medical, Advantages of optical fiber over coaxial cable.</p> <p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>Determine the refractive index of a given semi-circular glass block using TIR.</li> <li>Determine refractive index of liquid by convex lens by liquid lens method.</li> </ul> <p><b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Evolution Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td>Practical Exams</td><td>12</td><td>00</td></tr> <tr> <td>2</td><td>Viva</td><td>04</td><td>00</td></tr> <tr> <td>3</td><td>Problem solving</td><td>04</td><td>00</td></tr> <tr> <td>4</td><td>Project Work</td><td>00</td><td>10</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li><b>Practical Exams (12 Marks)</b><br/>In this task student have to perform any one practical from module 3 only. <ul style="list-style-type: none"> <li><b>03 Marks:</b> find the error in instrument</li> <li><b>03 Marks:</b> prepare a table</li> <li><b>03 Marks:</b> take correct reading</li> <li><b>03 Marks:</b> calculation and answer</li> </ul> </li> <li><b>Viva (04 Marks)</b><br/>In this task there will be 2 question each having 2 Marks from module 4</li> <li><b>Problem solving (04 Marks)</b><br/>In this task there will be 1 numerical having 04 Marks from module 4</li> <li><b>Project Work (10 Marks)</b><br/>In this task student have to prepare a Detailed Report on LASER or Optical Fiber with current research work on it.</li> </ul> | Sr. No. | Evolution Methods | SEE | CCE | 1 | Practical Exams | 12 | 00 | 2 | Viva | 04 | 00 | 3 | Problem solving | 04 | 00 | 4 | Project Work | 00 | 10 | T:12<br>P:04 | 20% |
|---------|--|---------|-------------------|-----|-----|---|-----------------|----|----|---|------|----|----|---|-----------------|----|----|---|--------------|----|----|--------------|-----|
| Sr. No. | Evolution Methods  | SEE     | CCE               |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 1       | Practical Exams  | 12      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 2       | Viva   | 04      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 3       | Problem solving  | 04      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |
| 4       | Project Work   | 00      | 10                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |   |              |    |    |              |     |



| 5       | <p><b>Theory Topics:</b> Deforming and restoring Force, Stress-Strain with their types, Hooke's law, Modules of elasticity, Young's modulus, Bulk modulus, Shear modulus, Stress-Strain curve, Surface tension; concept and units, Cohesive and adhesive forces, Molecular range and sphere of Influence, Laplace's molecular theory, Angle of contact, Ascent Formula (No derivation), Surface energy, Applications of surface tension, Effect of temperature and impurity on surface tension, Applications of viscosity in hydraulic systems</p> <p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>To determine Young's modulus of a given wire.</li> <li>Use capillary rise method and traveling microscope to determine the surface tension of a given liquid.</li> </ul> <p><b>Examination Style:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Evolution Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td>Practical Exams</td><td>12</td><td>00</td></tr> <tr> <td>2</td><td>Viva</td><td>08</td><td>00</td></tr> <tr> <td>3</td><td>Problem solving</td><td>00</td><td>10</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li><b>Practical Exams (12 Marks)</b><br/>In this task student have to perform any one practical from module 3 only. <ul style="list-style-type: none"> <li><b>03 Marks:</b> find the error in instrument</li> <li><b>03 Marks:</b> prepare a table</li> <li><b>03 Marks:</b> take correct reading</li> <li><b>03 Marks:</b> calculation and answer</li> </ul> </li> <li><b>Viva (08 Marks)</b><br/>In this task there will be 4 question each having 2 Marks from module 5</li> <li><b>Problem solving (10 Marks)</b><br/>In this task there will be 2 numerical having 05 Marks from module 5</li> </ul> | Sr. No. | Evolution Methods | SEE | CCE | 1 | Practical Exams | 12 | 00 | 2 | Viva | 08 | 00 | 3 | Problem solving | 00 | 10 | T:12<br>P:04 | 20% |
|---------|---|---------|-------------------|-----|-----|---|-----------------|----|----|---|------|----|----|---|-----------------|----|----|--------------|-----|
| Sr. No. | Evolution Methods   | SEE     | CCE               |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |              |     |
| 1       | Practical Exams   | 12      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |              |     |
| 2       | Viva  | 08      | 00                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |              |     |
| 3       | Problem solving   | 00      | 10                |     |     |   |                 |    |    |   |      |    |    |   |                 |    |    |              |     |



**Suggested Specification table with Marks (Theory):100**

| Distribution of Theory Marks<br>(Revised Bloom's Taxonomy) |                    |                      |                    |                |                 |               |
|--|--------------------|----------------------|--------------------|----------------|-----------------|---------------|
| Level  | Remembrance<br>(R) | Understanding<br>(U) | Application<br>(A) | Analyze<br>(N) | Evaluate<br>(E) | Create<br>(C) |
| Weightage<br>%   | 20%                | 20%                  | 30%                | 10%            | 10%             | 10%           |

**Course Outcome:**

| After learning the course the students should be able to: |  |
|---|--|
| CO1   | Use relevant instruments with precision to measure the dimension of given physical quantities in various engineering situations. |
| CO2   | Apply the basic concepts of heat transfer and thermometric properties to provide solutions for various engineering problems.     |
| CO3   | Use the concept of waves and sound waves for various engineering applications involving wave dynamics.                           |
| CO4   | Use the concepts of LASER and Fiber optics for various engineering applications  |
| CO5   | Use the concepts of Elasticity, Surface and Tension for various engineering applications   |

**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.





**Reference Books:**

- [1] Modern Physics by P. K. Chattopadhyay
- [2] Principles of Physics by Jearl Walker, David Halliday, Robert Resnick
- [3] Concept of Physics (volume I & II) by H.C. Verma
- [4] A textbook of optics by Dr. N. Subramanyam
- [5] Introduction to Fiber optics by Ajoy Ghatak & K. Thyagarajan
- [6] Applied Physics for diploma by Dineshkumar Mehta
- [7] Physics for Scientists and Engineers with Modern Physics by John W. Jewett & Raymond

