



Gyanmanjari
Innovative University

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

Subject: Experimental Physics – DET2XX10102

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.



Course Content:

Sr. No	Course Content	Hrs.	% Weightage												
1	Units and Measurement <u>Theory Topics:</u> 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. <u>Practical:</u> 1. Use Vernier calipers to measure the dimensions of a given object. 2. Use a micrometer screw gauge to measure diameter of a given wire and determine volume of a given metallic piece. Evolution Methods: <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> The Skill Simulation By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator. </td><td>20</td><td>00</td></tr> <tr> <td>2</td><td> Active Learning Assignment: Draw and Label This activity demonstrates spatial cognitive mapping, showing how accurately a participant translates abstract concepts into clear, visual layouts. </td><td>00</td><td>10</td></tr> </tbody> </table> <u>Examination Style:</u> • The Skill Simulation (20 Marks) • 05 Marks: find the error in instrument • 05 Marks: prepare a table • 05 Marks: take correct reading • 05 Marks: calculation and answer • Draw and Label (10 Marks) In this task student have to prepare a labeled diagram of any one instrument assign by faculty from module 1 on A3 size Project Sheet.	Sr. No.	Evolution Methods	SEE	CCE	1	The Skill Simulation By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.	20	00	2	Active Learning Assignment: Draw and Label This activity demonstrates spatial cognitive mapping, showing how accurately a participant translates abstract concepts into clear, visual layouts.	00	10	18	20%
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2	Heat and Temperature <u>Theory Topics:</u> 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 <u>Practical:</u> - To study the relationship between the temperature of a hot body and its time of cooling by plotting a cooling curve. - Use Lee's method to measure the coefficient of thermal conductivity of a given bad conductor. Evolution Methods: <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>Applied Performance Assessment By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.</td><td>20</td><td>00</td></tr> <tr> <td>2</td><td>Active Learning Assignment: Prepare a Chart This activity demonstrates data visualization mastery showing how effectively a participant distills complex, chaotic information into clear, scan able graphics.</td><td>00</td><td>10</td></tr> </tbody> </table> <u>Examination Style:</u> Applied Performance Assessment (20 Marks). 05 Marks: find the error in instrument 05 Marks: prepare a table 05 Marks: take correct reading 05 Marks: calculation and answer Prepare a Chart (10 Marks) In this task student have to prepare a chart having Drawing principal construction and working of any one Thermometer given by faculty from module 2 on A2 size Drawing sheet.	Sr. No.	Evolution Methods	SEE	CCE	1	Applied Performance Assessment By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.	20	00	2	Active Learning Assignment: Prepare a Chart This activity demonstrates data visualization mastery showing how effectively a participant distills complex, chaotic information into clear, scan able graphics.	00	10	18	20%
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3	Wave motion and its Application <u>Theory Topics:</u> 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. <u>Practical:</u> 5. Use the resonator to determine unknown frequency of tuning fork. 6. To determine Melde's tuning fork frequency and to verify laws of vibrating strings. Evolution Methods: <table border="1" data-bbox="381 1055 1132 1487"> <thead> <tr> <th>Sr. No.</th><th>Evolution Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td>The Technical Showcase By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.</td><td>20</td><td>00</td></tr> <tr> <td>2</td><td>Cerebral Calculus This activity demonstrates how the brain processes mathematical problem-solving</td><td>00</td><td>10</td></tr> </tbody> </table> <u>Examination Style:</u> • The Technical Showcase (20 Marks) • 05 Marks: find the error in instrument • 05 Marks: prepare a table • 05 Marks: take correct reading • 05 Marks: calculation and answer • Cerebral Calculus (10 Marks) Faculty will give the complex Numerical Problem Students process data, mentally and solve the problem.	Sr. No.	Evolution Methods	SEE	CCE	1	The Technical Showcase By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.	20	00	2	Cerebral Calculus This activity demonstrates how the brain processes mathematical problem-solving	00	10	18	20%
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4	Optics and Modern Physics <u>Theory Topics:</u> 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. <u>Practical:</u> 7. Determine the refractive index of a given semi-circular glass block using TIR. 8. Determine refractive index of liquid by convex lens by liquid lens method. Evolution Methods: <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>Field Protocol Evaluation By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.</td><td>20</td><td>00</td></tr> <tr> <td>2</td><td>Active Learning Assignment: Write Detailed Report This activity demonstrates cognitive load capacity showing how efficiently an individual processes heavy, abstract data without mental fatigue. It also highlights predictive modeling and adaptive execution</td><td>00</td><td>10</td></tr> </tbody> </table> <u>Examination Style:</u> Field Protocol Evaluation (20 Marks) 05 Marks: find the error in instrument 05 Marks: prepare a table 05 Marks: take correct reading 05 Marks: calculation and answer Write Detailed Report (10 Marks) In this task student have to prepare a Detailed Report on LASER or Optical Fiber given by faculty with current research work on it as per the module-4 theory.	Sr. No.	Evolution Methods	SEE	CCE	1	Field Protocol Evaluation By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.	20	00	2	Active Learning Assignment: Write Detailed Report This activity demonstrates cognitive load capacity showing how efficiently an individual processes heavy, abstract data without mental fatigue. It also highlights predictive modeling and adaptive execution	00	10	18	20%
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5	Elasticity and Surface tension <u>Theory Topics:</u> 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. <u>Practical:</u> 9. To determine Young's modulus of a given wire by using virtual lab tool. 10. Use capillary rise method and traveling microscope to determine the surface tension of a given liquid by using virtual lab tool. Evolution Methods: <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>The Proficiency Lab By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.</td><td>20</td><td>00</td></tr> <tr> <td>2</td><td>Numeric Nexus This activity demonstrates advanced data synthesis, showcasing how efficiently a person connects unrelated, complex data streams into a cohesive solution.</td><td>00</td><td>10</td></tr> </tbody> </table> <u>Examination Style:</u> The Proficiency Lab (20 Marks) 05 Marks: find the error in instrument 05 Marks: prepare a table 05 Marks: take correct reading 05 Marks: calculation and answer Numeric Nexus (10 Marks) Faculty will give the Numerical Problem Students process data mentally and solve the problem.	Sr. No.	Evolution Methods	SEE	CCE	1	The Proficiency Lab By random draw System Student will get the problem statement from the above list of the experiment and achieve results as asked in problem statement by using virtual lab simulator.	20	00	2	Numeric Nexus This activity demonstrates advanced data synthesis, showcasing how efficiently a person connects unrelated, complex data streams into a cohesive solution.	00	10	18	20%
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Suggested Specification table with Marks (Theory):100

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	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



Suggested Assessment Guidelines:**Module-1: Units and Measurement**

The Skill Simulation (20)		
Criteria	Description	Marks
Virtual Setup & Calibration	Correct selection of apparatus, proper circuit connections, and "zeroing" instruments.	5
Procedural Accuracy	Systematic data collection. Did the student use appropriate increments in data collection.	5
Analytical Reporting	Correct use of formulas, unit conversions, and graph plotting. Does the final calculated value align with the simulation data ?	5
Conceptual Defense (Viva)	Oral or written explanation of the physics laws involved and the ability to troubleshoot virtual errors.	5
Total		20

Module-2 Heat and Temperature

Applied Performance Assessment (20)		
Criteria	Description	Marks
Virtual Setup & Calibration	Correct selection of apparatus, proper circuit connections, and "zeroing" instruments.	5
Procedural Accuracy	Systematic data collection. Did the student use appropriate increments in data collection.	5
Analytical Reporting	Correct use of formulas, unit conversions, and graph plotting. Does the final calculated value align with the simulation data ?	5
Conceptual Defense (Viva)	Oral or written explanation of the physics laws involved and the ability to troubleshoot virtual errors.	5
Total		20

Module-3 Waves motion and its application

The Technical Showcase (20)		
Criteria	Description	Marks
Virtual Setup & Calibration	Correct selection of apparatus, proper circuit connections, and "zeroing" instruments.	5
Procedural Accuracy	Systematic data collection. Did the student use appropriate increments in data collection.	5
Analytical Reporting	Correct use of formulas, unit conversions, and graph plotting. Does the final calculated value align with the simulation data ?	5
Conceptual Defense (Viva)	Oral or written explanation of the physics laws involved and the ability to troubleshoot virtual errors.	5
Total		20



Module-4 Optics and Modern Physics

Field Protocol Evaluation (20)		
Criteria	Description	Marks
Virtual Setup & Calibration	Correct selection of apparatus, proper circuit connections, and "zeroing" instruments.	5
Procedural Accuracy	Systematic data collection. Did the student use appropriate increments in data collection.	5
Analytical Reporting	Correct use of formulas, unit conversions, and graph plotting. Does the final calculated value align with the simulation data ?	5
Conceptual Defense (Viva)	Oral or written explanation of the physics laws involved and the ability to troubleshoot virtual errors.	5
Total		20

Module-5 Elasticity and Surface tension

The Proficiency Lab (20)		
Criteria	Description	Marks
Virtual Setup & Calibration	Correct selection of apparatus, proper circuit connections, and "zeroing" instruments.	5
Procedural Accuracy	Systematic data collection. Did the student use appropriate increments in data collection.	5
Analytical Reporting	Correct use of formulas, unit conversions, and graph plotting. Does the final calculated value align with the simulation data ?	5
Conceptual Defense (Viva)	Oral or written explanation of the physics laws involved and the ability to troubleshoot virtual errors.	5
Total		20

