

Department	Department of Electrical Engineering	Dept. Code	EE
Course Title	Physics Lab for Engineers	Course Code	NL1002
Pre-requisite(s)	-	Credit Hours	1

Course Objective	To implement the concepts of Physics through different experiments.
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No.	Assigned Program Learning Outcome (PLO)	Level	Tool
4	An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.	I	F

Q = Quiz, M = Midterm, F = Final, L = Lab, W = Written Report.

No.	Course Learning Outcome (CLO) Statements	Assessment Tools	Taxonomy Levels	PLO
1	Construct the relationship between centripetal force with mass, velocity and radial distance for an object in uniform circular motion theoretically from the centripetal force formulae and experimentally from respective slopes in Data Studio generated graphs.	Q1,W1, L1	P4	4.3H, 4.5 M
2	Calculate coefficient of static friction/kinetic friction of different 500g loaded carts theoretically from the ratio between static frictional force/kinetic frictional force and the normal force and experimentally from respective graph's (force vs. time) in the Data Studio software file.	Q1,W2, L2	C3, P4	4.3H, 4.5 L
3	Measure the rotational inertia of a ring and disk from the setup of, mass-set, rotary motion sensor (CI6538), 500-interface (CI6760) and mini-rotational accessory (CI-6691).	Q1,W3, L3	P5	4.3H
4	Apply Hooke's law to measure the spring constant of different springs (shiny, dull or longest) of varying lengths (cm).	Q1, W4, L4	P4	4.3H, 4.4 M
5	Calculate the time period of oscillation for a torsional pendulum and a 'g' (acceleration due to gravity) dependent simple pendulum .	Q2,W5, L5	C3, P5, P4	4.3H, 4.4M, 4.5M
6	Calculate ratio of specific heat of air by using period of oscillation from Richardt's method and using piston to produce oscillations of air molecules by compression in a cylinder.	Q2, W6, L6	C3, P5	4.3H, 4.4 H
7	To verify the inverse-square relationship of Coulomb's law to measure Coulomb's constant of for charging spheres with torsional balance (ES9070A), charge producers (ES9057B) and basic electrometer (ES9078) and to measure the charge of the droplet by experimental set up of Millikan's oil drop apparatus (AP8210), DMM (SE9789) and high voltage power supply (SF9585A).	Q2,W7, L7	P5, P4	4.4H, 4.6M, 4.3H, 4.4M
8	Demonstrate the role of resistors and capacitors in electronic circuits on PCB (EM8678) by charging and discharging capacitor and calculate equivalent capacitance in case of parallel or series combination of capacitors (e.g., 0.1-0.3 μ F) in circuits on the breadboard of digital logic trainer (EES IT-300) and power supply (MPS-3005LS-3) and measure the voltage and charges across the capacitors by DMM (GDM-360) to verify the behavior in case of parallel or series combination of capacitors in circuits. Verify Ohm's law by setting up a circuit on PCB (EM8678) and calculate the slope and vertical intercept through each graph to measure resistance value with the help of DataStudio software. Study time constant of RC circuit on PCB (EM8678) and sketch I/V plot to examine the time constant by applying natural exponent fit in DataStudio software.	Q2, W8, L8	P4	4.3H, 4.3M, 4.6M, 4.4M, 4.5M
9	Show linear relationship between magnetic force with: current carrying wire, length of conductor and magnetic field by using basic current balance (SF8607) with graphs generated in DataStudio software.	Q3, W9, L9	P2	4.3H, 4.6M
10	Apply Faraday's law to find the induced emf from the oscillations of induction wand (EM8099) in magnetic field from the conducted experiment and compare theoretical and experimental values. Plot the magnetic fields of different coils (single, double, solenoid) versus position by using Helmholtz coil base (EM6715), field coils (EM6711) and	Q3,W10, L10	P4	4.3H, 4.4M, 4.5M

LAB MANUAL- PHYSICS LABORATORY FOR ENGINEER

Week	Course Contents/Topics of Experiments	CLO
1	To discover the relationship of centripetal force with mass, velocity and radial distance to study simple harmonic motion as circular motion.	1
2	To find the coefficient of static friction and the coefficient of kinetic friction for different surfaces.	2
3	To find the rotational inertia of a ring and a disk.	3
4	To find the spring constant for several springs (Hooke's Law).	4
5	To calculate the period of oscillation is measured from a plot of the angular displacement versus time from a torsional pendulum AND To explore the dependence of period of a simple pendulum on the acceleration due to gravity.	5
6	To calculate the ratio of specific heat by using the period of oscillation.	6
7	To verify the inverse-square relationship of Coulomb's law and find the value of Coulomb's constant from Coulomb torsional balance.	7
8	To calculate the charge on an electron with Millikan's oil drop experiment.	7
9	Determine the role of resistors and capacitors in electronic circuits. To verify Ohm's law. To evaluate a time constant of a capacitor.	8
10	To calculate the equivalent capacitance in series and in parallel combination of capacitors.	8
11	To investigate the magnetic force of a current carrying wire by the effect of current , length of conductor and magnetic field on the magnetic force.	9
12	To calculate induced emf in a circuit by Faraday's law of induction.	10
13	To plot the magnetic fields of different coils (single, double, solenoid) versus position.	10
	primary & secondary coils (SE8653) and analyze each graph that magnetic field strength is inversely proportional to the distance from the coil(s).	

Assessment Tools	Weightage
Quizzes (3)	20.0%
Laboratory Performance	30.0%
Project	10.0%
Written Reports	10.0%
Final Exam	30.0%

Grading Criteria: An Absolute Grading Scheme may be used for the course evaluation.

Total Marks (%)	Grade
≥ 90	A+
86-89	A
82-85	A-
78-81	B+
74-77	B
70-73	B-
66-69	C+
62-65	C
58-61	C-
54-57	D+
50-53	D
≤ 49	F

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