Department	Department of Electrical Engineering	**Dept. Code**	EE
Course Title	Physics Lab for Engineers	**Course Code**	NL110
Pre-requisite(s)	-	**Credit Hrs.**	1
Course Objectives	To introduce the concepts of Waves & Oscillations and Electricity & Magnetism BS electrical engineer students to further enhance the understanding of other subsequent engineering courses.		

No.	Assigned Program Learning Outcome (PLO)	Level	Tool
04	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	P

I = Introduction, R = Reinforcement, E = Evaluation, A = Assignment, Q = Quiz, M = Midterm, F=Final, L = Lab Performance, P = Project, W= Written Report.

No.	Course Learning Outcome (CLO) Statements	Tool
01	Investigate 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 DataStudio generated graphs.	Q1,W1, L1
02	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 DataStudio software file.	Q1,W2, L2
03	Find 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
04	Apply Hooke's law to find the spring constant of different springs (shiny, dull or longest) of varying lengths (cm).	Q1, W4, L4
05	Calculate the period of oscillation from a plot of the angular displacement versus time from a torsional pendulum.	Q1,W5, L5
06	Identify the dependence of the period of a simple pendulum on the acceleration due to gravity.	Q2,W6, L6
07	Calculate ratio of specific heat of air by using period of oscillation from Ruchardt's method and using piston to produce oscillations of air molecules by compression in a cylinder.	W7, P L7
08	To verify the inverse-square relationship of Coulomb's law by using charging spheres, Coulomb's torsional balance (ES9070A), charge producers (ES9057B) and basic electrometer (ES9078) and calculate Coulomb's constant from the experimental set up.	Q2,W8, L8
09	Determine 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, W9
10	Determine the role of resistors and capacitors in electronic circuits on PCB (EM8678) by charging and discharging capacitor.	Q2, W10, L10
11	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.	Q3, W11, L11
12	Examine time constant of RC circuit on PCB (EM8678) and generate I/V plot to examine the time constant by applying natural exponent fit in DataStudio software.	Q3, W12, L12
13	Calculate equivalent capacitance in case of parallel or series combination of capacitors (e.g., 0.1-0.3 μF) 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.	Q3, W13, L13
14	Verify 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, W14, L14
15	Calculate induced emf from the oscillations of induction wand (EM8099) in magnetic field experimentally and compare theoretical and experimental values.	Q3,W15, L15
16	Plot the magnetic fields of different coils (single, double, solenoid) versus position by using Helmholtz coil base (EM6715), field coils (EM6711) and primary & secondary coils (SE8653) and analyze each graph that magnetic field strength is inversely proportional to the distance from the coil(s).	W16, P L16

Week	Course Contents/Topics	CLO
	LAB MANUAL- PHYSICS LABORATORY FOR ENGINEER	
01	To discover the relationship of centripetal force with mass, velocity and radial distance to study simple harmonic motion as circular motion.	01
02	To find the coefficient of static friction and the coefficient of kinetic friction for different surfaces.	02
03	To find the rotational inertia of a ring and a disk.	03
04	To find the spring constant for several springs (Hooke's Law).	04
05	To calculate the period of oscillation is measured from a plot of the angular displacement versus time from a torsional pendulum.	05
06	To explore the dependence of the period of a simple pendulum on the acceleration due to gravity.	06
07	To calculate the ratio of specific heat by using the period of oscillation.	07
08	To verify the inverse-square relationship of Coulomb's law and find the value of Coulomb's constant from Coulomb torsional balance.	08
09	To calculate the charge on an electron with Millikan's oil drop experiment.	09
10	Determine the role of resistors and capacitors in electronic circuits.	10
11	To verify Ohm's law.	11
12	To evaluate a time constant of a capacitor.	12
13	To calculate the equivalent capacitance in series and in parallel combination of capacitors.	13
14	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.	14
15	To calculate induced emf in a circuit by Faraday's law of induction.	15
16	To plot the magnetic fields of different coils (single, double, solenoid) versus position.	16

Assessment Tools	Weightage
Quizzes (3)	20%
Laboratory Performance	30%
Project	10%
Written Reports	10%
Final Exam	30%

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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