

TKU212111P

Basic Science Lab. Work
Praktikum Sains Dasar

BASIC INFORMATION

| | |
|------------------------------|---|
| Course Credit | 1 / 150 minutes per Week |
| Course Type | Required |
| Course Classification | Basic Science |
| Prerequisites | Electricity & Magnetism, Fluid, Heat & Waves, Classical Mechanics, Linear Algebra |

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Fundamental and Engineering Knowledge (KP.1) Data and Experiments (KP.4)

Learning Outcomes

- LO1** Students are able to understand basic science (physics and mathematics) concepts through simple basic science experiments.
- LO2** Students are able to perform experiments related to basic science topics, and perform data analysis to obtain the value of unknown system's parameters.

COURSE DESCRIPTION

Basic Science Lab. Work complements the basic science courses, especially the physics courses (Electricity & Magnetism, Fluid, Heat & Waves, Classical Mechanics). In this course, students are able to improve their understanding regarding the concepts and theories explained during the physics courses through several basic science experiments. Students are required to gather some data during the experiments, and perform data analysis to obtain the value of unknown system parameters by adopting the Linear Regression technique. Students is required to take all physics courses (Electricity & Magnetism, Fluid, Heat & Waves, Classical Mechanics) as well as Linear Algebra course before taking this course.

TOPICS

1. Measurement, Uncertainty and Linear Regression

- 1.1 Measurement and Uncertainty
- 1.2 Significant Figures
- 1.3 Linear Regression

2. Center of Mass and Moment of Inertia of Rigid Body

- 2.1 Determining the Center of Mass of a Rigid Body
- 2.2 Determining the Moment of Inertia of a Rigid Body using Calculation
- 2.3 Determining the Moment of Inertia of a Rigid Body using Experiment

3. Wave Optics

- 3.1 Determining Laser Wavelength (Using Ruler Diffraction and/or Diffraction Grating)
- 3.2 Determining Track Spacing (Pitch) of Unrecorded CD and DVD

4. Resistance, Capacitance, Inductance and Electromagnetic Induction

- 4.1 Introduction to Electrical Measuring Equipment : Multimeter and LCR Meter
- 4.2 Determining the Resistivity of a Conductor
- 4.3 Determining the Dielectric Constant of a Material
- 4.4 Determining the Inductance of a Coil
- 4.5 Dependency between Induced Voltage and Turn Ratio

5. AC Circuit

- 5.1 Introduction to Electrical Measuring Equipment : Oscilloscope
- 5.2 RC Circuit
- 5.3 RL Circuit
- 5.4 RLC Circuit
- 5.5 Black Box (Determining Components' Type and/or Value)

6. Magnetic Field, Magnetic Force and Electromagnetic Induction

- 6.1 Magnetic Field : Helmholtz Coil
- 6.2 Magnetic Force : Homopolar Motor
- 6.3 Electromagnetic Induction : Homopolar Generator

7. Vector Addition and Static Equilibrium

- 7.1 Vector Addition Concept
- 7.2 Equilibrium of Point Masses System
- 7.3 Equilibrium of Rigid Bodies System

8. Dielectric Breakdown

- 8.1 Breakdown Voltage (DC) of Dielectric Material
- 8.2 Breakdown Voltage (AC) of Dielectric Material

REFERENCES

- [1] Young & Freedman, 2008, University Physics with Modern Physics, Addison-Wesley Publishing Co., Boston
- [2] Halliday-Resnick-Walker, 2004, Fundamentals of Physics, John Wiley & Sons, Inc., New York
- [3] Randall D. Knight, 2008, Physics for Scientists and Engineers, Addison-Wesley Publishing Co., Boston