Course Syllabus — Physics Principles Laboratory (AES1017)

Credit Hours: 1 Credit hour

Co-requisites: Physics Principles (AES1016)

QFE Level: 5

Knowledge: Comprehensive, specialized knowledge within a broad field of work or discipline, including an understanding of the underlying theoretical and abstract concepts with significant depth in some areas. A broad understanding of allied knowledge and theories in related fields of work or disciplines including related regulations, standards, codes, conventions and procedures. An understanding of information assembly, retrieval methods and logical problem-solving techniques from a range of sources. Recognition of sources of current knowledge and the integration of concepts from related fields. Literacy to comprehend and/or produce coherent texts covering complex relations from an array of information and contexts. Numeracy covering an array of mathematical procedures and representations and contexts.

Skills: Technical, creative and conceptual skills appropriate to solving a wide-range of problems associated with a field of work or discipline that include a comprehensive range of specialist cognitive and practical skills appropriate to diagnosing and implementing solutions to abstract, familiar and nonroutine problems within a field of work or discipline. Use of appropriate information retrieval methods and tools and techniques associated with the field of work or discipline. Comprehensive communication and information technology skills to present, explain and/or critique complex matters. Literacy skills to comprehend and/or produce, from array of information, coherent texts covering complex relations. Numeracy skills to select, apply, reflect and communicate an array of mathematical procedures and representations and contexts

Competence:

Autonomy and responsibility: Can take responsibility for coordinating the implementation of appropriate approaches to complex work procedures and processes, resources or learning, including leading teams within a technical or paraprofessional activity. Can exercise coordination and/or supervision in routine, familiar and some nonroutine work or learning contexts. Can coordinate technical, design processes in routine, familiar, nonroutine and an array of contexts with support available, if required. Can express an internalized, personal world view, in the context of an understanding of socio-cultural relationships.

Role in context: Can function with autonomy in technical and coordination contexts and support paraprofessional roles under guidance can function both independently and in a coordination role with multiple groups. Can take responsibility for coordinating the development of individuals and groups. Can review and develop the performance of self and others.

Self-development: Can evaluate own learning and identify learning needs in a familiar environment. Can take responsibility for and plan own learning within a managed and nonroutine environment. Can comprehend and observe ethical standards.

Course Description

This lab is an experimental course intended to complement AES1016 Physics Principles. The purpose of the lab course is to explore some of the main concepts experimentally. Students will conduct, analyze and interpret experiments on velocity and acceleration, forces and energy, rotational motion, and conservation laws. Students prepare lab reports working either individually or in teams.

AES1017| Physics Principles Laboratory

Instructors: TBD, TBD@adpoly.ac.ae

Schedule and Duration: 14 weeks at 2 hours/week. The laboratory starts in the second week of the semester and experiments are conducted every two weeks. The interim weeks are used as mandatory tutorials to discuss laboratory results and analyses.

Course Objectives

The overall objective of the course is to develop student ability to experimentally solve problems in physics. It is coordinated with AES1016 Physics Principles and will include one and two-dimensional motion problems, units, velocity and acceleration, Newton's laws, conservation of momentum, work and energy, and rotational dynamics.

Textbook

1. ACAD Basic Curriculum, Physics, General Physics Corporation, Elkridge, Maryland, 2003.
2. Physics Principles Laboratory Manual [extracts from PASCO Scientific, Comprehensive Physics System Experiments, 2004]

Attendance:

Sessions start on the hour. Students arriving after the session starts will be counted absent. Students will receive warnings and potential penalties from the Student Services Office or their sponsor if they reach 5%, 10%, and 15% absence. After 15% absence, students will receive a FA (fail due to absence) grade.

Academic Honesty Policy:

Students must conduct their studies at AD Poly honestly, ethically, and in accordance with accepted standards of academic conduct. Any form of academic conduct which is contrary to these standards is academic misconduct, for which AD Poly may penalize the student.

Specifically, it is academic misconduct for a student to:

- Present copied, falsified, or improperly obtained data as if it were the result of laboratory work, field trips, or other investigatory work;
- Include in the student's individual work material which is the result of significant assistance from another person if that assistance was unacceptable according to the instructions or guidelines for that work;
- Cheat or attempt to cheat; or
- Plagiarize (knowingly presenting the work or property of another person as if it were one's own)

Abu Dhabi Polytechnic considers cheating or attempting to cheat a serious offense that will result in disciplinary action taken against involved individuals. Students caught cheating or attempting to cheat will earn an "F" grade in the course.

Course Learning Outcomes (CLOs):

Upon successful completion of the course a student should be able to:

CLO 1: Apply best practice in lab safety, including three-way communication

CLO 2: Write lab reports that adhere to high quality standards and meet submission deadlines

CLO 3: Conduct and analyze experiments involving velocity and acceleration.

CLO 4: Conduct and analyze experiments involving gravity and Newton's laws.

CLO 5: Conduct and analyze experiments involving work and momentum.

CLO 6: Conduct and analyze experiments involving power, energy and conservation of energy.

Course Topics:

CT 1: Laboratory safety and nuclear industry practices. Nawah safety protocols and communication practices.

[Note: the following Course Topics (CTs) map to the co-requisite course AES1016 Physics Principles which informs the content and timeframe of experiments.]

CT 2: Units and measurement. Properties, fundamental and derived units, systems of measurement, unit conversion. (Experiment 1)

CT 3: Velocity and acceleration. Introduction to velocity, force, and acceleration; and equations associated to them. (Experiment 2)

CT 4: Gravity and Newton's laws. Newton's first, second and third laws; universal law of gravitation; free fall; projectiles; and motion along curves. (Experiment 3)

CT 5: Work and momentum. Introduction to momentum and work, momentum principles, work in mechanical, rotational, fluid, thermal and electrical systems. (Experiments 4 and 5)

CT 6: Power, energy and conservation of energy. Introduction to energy and power, forms of energy, conservation of energy law, thermal and mechanical power. (Experiments 5 and 6)

ABET Student Outcomes:

The Higher Diploma in Nuclear Technology program student outcomes (SO) are taken from the 2019 ABET (Accreditation Board for Engineering and Technology) standard. Student Outcome 2 is from the associate degree standard and Student Outcomes 1, 3, 4, and 5 from the bachelor's degree standard.

SO1. An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly defined engineering problems appropriate to the discipline;

SO2. An ability to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;

SO3. An ability to apply written, oral, and graphical communication in broadly defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;

SO4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and

SO5. An ability to function effectively as a member as well as a leader on technical teams.

Table 1: Relation Course Topics (CTs) to Course Learning Outcomes (CLOs)

	CT1	CT2	CT3	CT4	CT5	CT6
CLO1	H		M	M	M	M
CLO2	H	H	H	H	H	H
CLO3	H	H	H	H	M	M
CLO4	H	H	M	H		
CLO5	H	H	M		H	H
CLO6	H	H	M			H

H: High, M: Moderate, L: Low

Table 2: Relation Course Learning Outcomes (CLOs) to Students Outcomes (SOs*)

	SO1	SO2	SO3	SO4	SO5
CLO1	M	L	H	L	M
CLO2	M	L	H	H	M
CLO3	M	L	H	H	M
CLO4	M	L	H	H	M
CLO5	M	L	H	H	M
CLO6	M	L	H	H	M
Average	M	L	H	H	M

H: High, M: Moderate, L: Low
* SOs correspond to the ABET Student Outcomes (see above).

Assessments: Weekly problem sets, quizzes, midterm exam, and final exam

Grading policy:

Quizzes	10%
Lab reports	90%
Total	100%

Week-by-Week Laboratory Plan

Week	Experiment	Laboratory Topic	Reference
2		Laboratory safety and introduction to the experimental method	
4	1	Sensors, units, and the period of a pendulum.	GPC Chapters 1
6	2	Velocity and acceleration	GPC Chapter 2 and Lab Manual
8	3	Newton's laws	GPC Chapter 3 and Lab Manual
10	4	Conservation of momentum	GPC Chapters 4 and 5 and Lab Manual
12	5	Work and energy	GPC Chapter 6,7 and Lab Manual
14	6	Rotational motion	Lab Manual