

## AES-1016| Physics Principles

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### Course Syllabus — Physics Principles (AES-1016)

**Credit Hours:** 3 Credit hours

**Prerequisites:** Mathematics Skills II (AES-1012)

**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 course covers the basic knowledge of physics. It encompasses understanding the concepts of units, velocity, acceleration, gravity and Newton's law, momentum, work, energy, and power; as well as problem solving related to these topics.

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**Schedule and Duration:** 5 weeks plus examination week. 10 hours lecture/week.

### Course Objectives

The overall objective of this course is to develop student understanding of physics from which students can demonstrate knowledge of units, unit conversion, velocity, acceleration, gravity and Newton's law, momentum, work, energy and power; and apply this knowledge to solve fundamental physics problems.

### Text Book

1. ACAD Basic Curriculum, Physics, General Physics Corporation, Elkridge, Maryland, 2003.

### 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:** Demonstrate knowledge of units and measurement

**CLO 2:** Calculate velocity and acceleration

**CLO 3:** Solve practical physical science problems associated with gravity and Newton's laws

**CLO 4:** Perform conservation of momentum calculations

**CLO 5:** Solve practical physical science problems associated with work

**CLO 6:** Solve practical physical science problems associated with energy and conservation of energy

**CLO 7:** Solve practical physical science problems associated with power

### Course Topics

- CT 1: Units and measurement.** Properties, fundamental and derived units, systems of measurement, unit conversion.
- CT 2: Velocity and acceleration.** Introduction to velocity, force, and acceleration; and equations associated to them.
- CT 3: Gravity and Newton's laws.** Newton's first, second and third laws; universal law of gravitation; free fall; projectiles; and motion along curves.
- CT 4: Work and momentum.** Introduction to momentum and work, momentum principles, work in mechanical, rotational, fluid, thermal and electrical systems.
- CT 5: Power, energy and conservation of energy.** Introduction to energy and power, forms of energy, conservation of energy law, thermal and mechanical power.

### 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
CLO1	H	M	M	M	M
CLO2	M	H	M	M	
CLO3	M		H	M	
CLO4	M			H	
CLO5	M			H	M
CLO6	M				H
CLO7	M				H

H: High, M: Moderate, L: Low

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

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	SO1	SO2	SO3	SO4	SO5
CLO1	H	M			
CLO2	H	M			
CLO3	H	M			
CLO4	H	M			
CLO5	H	M			
CLO6	H	M			
CLO7	H	M			
Average	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	20%
Midterm exam	30%
Final exam	50%
Total	100%

## Week-by-Week Teaching Plan

Week	Chapter	Topic	Content	Page
1	1.1-1.3	Course Introduction. introduction to units and measurement	Course schedule, properties, fundamental units	Chapter 1 Page 1-2
1	1.3-1.6	Fundamental units	Fundamental units, SI and British units, conversion of units, temperature units and conversion	Chapter 1 Pages 2-22
2	1.7-1.8	Derived units	Derived units and conversions; units for density, pressure, work, energy and power	Chapter 1 Pages 23-40
2	2.1-2.6	Velocity and acceleration	Introduction to velocity, force, and acceleration; calculations and problems solving with velocity, force and acceleration.	Chapter 2 Pages 1-17
3	3.1-3.5	Gravity and Newton's laws	Newton's first, second and third laws; weight, universal law of gravitation, falling bodies, projectile motions, and motion in curves.	Chapter 3 Pages 1-31
<b>Midterm Exam (week 3)</b>				
3	4.1-4.3	Momentum	Introduction to momentum, momentum principles, conservation of momentum, force and momentum relationships.	Chapter 4 Pages 1-22

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4	5.1-5.6	Work	Introduction to work, work in mechanical, rotational, fluid, thermal and electrical systems.	Chapter 5 Pages 1-11
4	6.1-6.3	Energy and conservation of energy	Introduction to energy. thermal, mechanical, potential and kinetic energy, and conservation of energy.	Chapter 6 Pages 1-21
5	7.1-7.2	Power	Introduction power, thermal and mechanical power, problems solving associated to the concept of power.	Chapter 7 Pages 1-9
6		<b>Final Examination</b>	<b>Comprehensive Examination</b>	