

## AES-2031| Mechanical Engineering Technology I - equipment

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### Course Syllabus — Mechanical Engineering Technology I - Equipment (AES-2031)

**Credit Hours:** 3 Credit hours

**Prerequisites:** Physics Principles (AES-1016)

**Co-requisites:** Mechanical Engineering Technology I Laboratory (AES-2032)

**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 operating principles and types of valves, pumps, heat exchangers, steam traps, filters and strainers, air compressors, lubrication, and hangers and snubbers used in nuclear power plants.

## AES-2031| Mechanical Engineering Technology I - equipment

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**Instructors:** TBD, TBD@adpoly.ac.ae

**Schedule and Duration:** 15 weeks plus examination week; lecture: 3 hours/week; tutorial: 1 hours/week (3 Credit Hours)

### Course Objectives

The overall course objective is to develop student basic knowledge in (i) the function and operation of mechanical components in industrial plants, specifically valves, pumps, heat exchangers, steam traps, filters and strainers, and air compressors used in nuclear power plants; and, (ii) the principles of lubrication.

### Textbook

1. ACAD Basic Curriculum, Mechanical Science, 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:

**CLO1:** Demonstrate knowledge and understanding of mechanical valves.

**CLO2:** Demonstrate knowledge and understanding of mechanical pumps.

**CLO3:** Demonstrate knowledge and understanding of heat exchangers.

## AES-2031| Mechanical Engineering Technology I - equipment

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**CLO4:** Demonstrate knowledge and understanding of steam traps.

**CLO5:** Demonstrate knowledge and understanding of filters and strainers.

**CLO6:** Demonstrate knowledge and understanding of air compressors.

**CLO7:** Demonstrate knowledge of lubrication principles.

### Course Topics

**CT 1: Valves:** Purpose, Classification, and Components of Valves. Purpose and Function of Gate Valves, Globe, Butterfly, Diaphragm, and Check Valves. Handwheels and Mechanical Operators. Variations on Common Valves and Flow Characteristics.

**CT 2: Pumps:** Pump type and function. Centrifugal pumps part and functions. Types of centrifugal pumps. Types and symptoms of common pump programs. Types of positive displacement pumps. Screw-Type rotary pumps. Mechanical seal. Troubleshooting.

**CT 3: Heat Exchangers:** Heat exchangers and how they work. Heat exchanger in the plant. Condenser. Shell and Tube heat exchanger. Director contact heat exchanger. Typical heat exchanger maintenance programs. Trouble shooting heat exchanger programs.

**CT 4: Steam Traps, Filters and Strainers.** Steam trap introduction. Steam trap operation. Troubleshooting. Types of filters and strainers and their operation.

**CT 5: Air Compressors.** Types, basic operations, and hazards associated with pressurized air systems.

**CT 6: Lubrication principles.** Tribology. Sliding friction, rolling friction, and fluid friction. Hydrodynamic lubrication, hydrostatic lubrication, and boundary lubrication.

### 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)

**AES-2031| Mechanical Engineering Technology I - equipment**

	CT1	CT2	CT3	CT4	CT5	CT6
CLO1	H					
CLO2		H				
CLO3			H			
CLO4				H		
CLO5				H		
CLO6					H	
CLO7						H

H: High, M: Moderate, L: Low

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

	SO1	SO2	SO3	SO4	SO5
CLO1	H	L	H		
CLO2	H	L	H		
CLO3	H	L	H		
CLO4	H	L	H		
CLO5	H	L	H		
CLO6	H	L	H		
CLO7	H	L	H		

H: High, M: Moderate, L: Low

\* SOs correspond to the ABET Student Outcomes (see above).

**Week-by-Week Teaching Plan**

Week	Topic	Content	Textbook Reference
1-3	Valves	Valve types and structure, operation and maintenance	GPC Chapter 1
4-6	Pumps	Types and basic operation, cavitation, pressure head and pump components, positive displacement pumps, centrifugal pump, pump laws and characteristic curves.	GPC Chapter 2
7	Midterm and review	First midterm exam followed by performance review	
8	Heat Exchangers	Types and applications, Operation and maintenance	GPC Chapter 3
9	Steam Traps	Types and operation	GPC Chapter 4
10	Filters and Strainers	Types and operating principles	GPC Chapter 5
11	Air compressors	Types, operation, and hazards	GPC Chapter 6
12-13	Lubrication principles	Types and structure	GPC Chapter 9
14	Midterm and review	Second midterm exam followed by performance review	
15	Remedial Examination	Comprehensive Remedial Examination (if required)	
16	Final Examination		