

## **AES-2033| Mechanical Engineering Technology II – systems (CRN2306)**

### **Course Syllabus — Mechanical Engineering Technology II - Systems (AES-2033)**

**Credit Hours:** 2 Credit hours

**Prerequisites:** Mechanical Engineering Tech I - equipment (AES-2031)

**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 refrigeration machines; heating, ventilation, and air conditioning systems; steam turbines; and diesel engines.

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

**Schedule and Duration:** 15 weeks plus examination week; lecture: 2 hours/week (2 Credit Hours)

## Course Objectives

The overall course objective is to develop student basic knowledge in the function and operation of mechanical systems in industrial plants, specifically refrigeration machines; heating, ventilation, and air conditioning systems; steam turbines; and diesel engines.

## 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 refrigeration machines

**CLO2:** Demonstrate knowledge and understanding of heating, ventilation, and air conditioning (HVAC).

**CLO3:** Demonstrate knowledge and understanding of steam turbines.

**CLO4:** Demonstrate knowledge and understanding of diesel engines.

### Course Topics

- CT1: Theory, construction, and application of steam turbines:** impulse and reaction turbines, turbine arrangements and steam flow, high-pressure and low-pressure turbines.
- CT2: Theory, construction, and application of Diesel engines:** accessories/support systems, failure mechanisms and symptoms, main structural components, main moving components.
- CT3: Theory, construction, and application of air conditioning, heating and ventilation systems, including refrigeration machines and the basic refrigeration cycle:** purpose of HVAC systems, air handling and basic types of fans, filtration systems, hydronic systems, heat sources, methods of cooling, refrigeration cycle, compressors, condensers, receivers, evaporators, accumulators and metering devices. Failure mechanisms and symptoms associated with a refrigeration system.
- CT4: Efficiency of steam turbines:** turbine staging and compounding, turbine general equation, turbine efficiency, moisture separator, reheaters, bearings, glands, turbine support systems, and failure mechanisms.
- CT5: Basic Diesel engine operation:** the 4-stroke and 2-stroke diesel cycles, fuel control, speed control, protection systems.

### 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		
CLO2			H		
CLO3	H			H	
CLO4		H			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			
CLO2	H	L			
CLO3	H	L			
CLO4	H	L			

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
1-4	Refrigeration machines	Refrigeration cycle. Reciprocating, centrifugal, rotary, screw, and scroll compressors. Factors that affect compressor performance. Condensers, receivers, evaporators, and accumulators. Metering devices. Failure mechanisms and symptoms associated with a refrigeration system.	GPC Chapter 7
5-8	HVAC systems	Purpose of HVAC systems. Air systems. Filtration systems. Hydronic systems. Heat sources that are used in HVAC systems. Heat pumps. Methods of cooling. Cooling towers. Air handling and basic types of fans. Dampers.	GPC Chapter 8
8	Midterm examination	Midterm examination and performance review	
9-12	Steam turbines	Impulse turbines and reaction turbines. Turbine staging and compounding. Turbine general equation and turbine efficiency. Steam flow. Bearings and glands. Turbine support systems and failure mechanisms.	GPC Chapter 10
13-15	Diesel engines	Major components. Support systems and terminology. The 4-stroke and 2-stroke diesel cycles. Fuel control and speed control. Protection systems and failures.	GPC Chapter 11
16	Final Examination	Comprehensive Examination and performance review	