

**The University of Jordan
School of Engineering**



Department	Course Name		Course Number	Semester	
Mechanical Engineering	Refrigeration systems		0904453		
2019 Course Catalog Description					
Basic definitions and concepts, review of vapor compression and absorption cycles, compressors, condensers, evaporators, expansion devices, refrigerants, cooling towers, components of an absorption cycles, controls.					
Instructors					
Name	E-mail	Sec	Office Hours		Lecture Time
Text Books					
	Text book 1		Text book 2		
Title	Refrigeration systems and Application				
Author(s)	Dincer Ibrahim				
Publisher, Year, Edition	Wiley, 2017, 3 rd Edition				
References					
Books	ASHRAE Handbook (Fundamentals volume)				
Journals					
Internet links	https://www.ashrae.org/				
Prerequisites					
Prerequisites by topic	1. First and second law of thermodynamics 2. Thermodynamics of mixtures 3. Basics of fluid mechanics 4. Basics of convection, conduction and radiation heat transfer 5. Heat exchangers				
Prerequisites by course	Thermodynamics (2) - 0904342 + Heat Transfer (1) 0904441				
Co-requisites by course	-				
Prerequisite for	-				
Topics Covered					
Week	Topics		Chapter in Text	Sections	
1-2	Introduction and applications of refrigeration and air conditioning		1	1-2	
3	The vapor-compression cycle		10	3	
4	Compressors		11	4	
5	Condensers and evaporator		12	5	
6	Expansion devices		13	6	
7	Vapor-compression system analysis		14	7	
8	Refrigerants: ozone depletion and new refrigerants		15 & outlines	8	
9	Multi-pressure systems.		16	9	
11-15	Absorption Refrigeration Systems: Lithium Bromide and Aqua-Ammonia		17	11-15	

Mapping of Course Outcomes to ABET Student Outcomes

SOs	Course Outcomes
4	1. Evaluate the refrigeration loads of cold stores, and design a suitable refrigeration system that satisfies the loads. 2. Understand the end user requirement for a refrigeration plant and design an appropriate refrigeration system. 3. Analyze the performance of the vapor compression and absorption cycles. 4. Study the basic principles of the operation of compressors and their types 5. Size and select the proper compressors and refrigeration plant components. 6. Understand the effect of the selection of refrigeration systems components materials on their performance and the environment.
7	7. Explain the vital rule of refrigeration systems on the life quality of humankind in residential and commercial buildings.

Evaluation	
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Assessment Tools	Expected Due Date	Weight
Presentation		10 %
Midterm Exam		30 %
Project		10 %
Final Exam		50 %

Contribution of Course to Meet the Professional Components	
1. Professionalism	Students will be able to: 1.1. Demonstrate a commitment to the profession of nursing. 1.2. Demonstrate a commitment to the profession of nursing. 1.3. Demonstrate a commitment to the profession of nursing. 1.4. Demonstrate a commitment to the profession of nursing. 1.5. Demonstrate a commitment to the profession of nursing. 1.6. Demonstrate a commitment to the profession of nursing. 1.7. Demonstrate a commitment to the profession of nursing. 1.8. Demonstrate a commitment to the profession of nursing. 1.9. Demonstrate a commitment to the profession of nursing. 1.10. Demonstrate a commitment to the profession of nursing.
2. Communication	Students will be able to: 2.1. Demonstrate effective communication skills. 2.2. Demonstrate effective communication skills. 2.3. Demonstrate effective communication skills. 2.4. Demonstrate effective communication skills. 2.5. Demonstrate effective communication skills. 2.6. Demonstrate effective communication skills. 2.7. Demonstrate effective communication skills. 2.8. Demonstrate effective communication skills. 2.9. Demonstrate effective communication skills. 2.10. Demonstrate effective communication skills.
3. Critical Thinking	Students will be able to: 3.1. Demonstrate critical thinking skills. 3.2. Demonstrate critical thinking skills. 3.3. Demonstrate critical thinking skills. 3.4. Demonstrate critical thinking skills. 3.5. Demonstrate critical thinking skills. 3.6. Demonstrate critical thinking skills. 3.7. Demonstrate critical thinking skills. 3.8. Demonstrate critical thinking skills. 3.9. Demonstrate critical thinking skills. 3.10. Demonstrate critical thinking skills.
4. Leadership	Students will be able to: 4.1. Demonstrate leadership skills. 4.2. Demonstrate leadership skills. 4.3. Demonstrate leadership skills. 4.4. Demonstrate leadership skills. 4.5. Demonstrate leadership skills. 4.6. Demonstrate leadership skills. 4.7. Demonstrate leadership skills. 4.8. Demonstrate leadership skills. 4.9. Demonstrate leadership skills. 4.10. Demonstrate leadership skills.
5. Teamwork	Students will be able to: 5.1. Demonstrate teamwork skills. 5.2. Demonstrate teamwork skills. 5.3. Demonstrate teamwork skills. 5.4. Demonstrate teamwork skills. 5.5. Demonstrate teamwork skills. 5.6. Demonstrate teamwork skills. 5.7. Demonstrate teamwork skills. 5.8. Demonstrate teamwork skills. 5.9. Demonstrate teamwork skills. 5.10. Demonstrate teamwork skills.
6. Research	Students will be able to: 6.1. Demonstrate research skills. 6.2. Demonstrate research skills. 6.3. Demonstrate research skills. 6.4. Demonstrate research skills. 6.5. Demonstrate research skills. 6.6. Demonstrate research skills. 6.7. Demonstrate research skills. 6.8. Demonstrate research skills. 6.9. Demonstrate research skills. 6.10. Demonstrate research skills.
7. Quality Improvement	Students will be able to: 7.1. Demonstrate quality improvement skills. 7.2. Demonstrate quality improvement skills. 7.3. Demonstrate quality improvement skills. 7.4. Demonstrate quality improvement skills. 7.5. Demonstrate quality improvement skills. 7.6. Demonstrate quality improvement skills. 7.7. Demonstrate quality improvement skills. 7.8. Demonstrate quality improvement skills. 7.9. Demonstrate quality improvement skills. 7.10. Demonstrate quality improvement skills.
8. Healthcare Policy	Students will be able to: 8.1. Demonstrate healthcare policy skills. 8.2. Demonstrate healthcare policy skills. 8.3. Demonstrate healthcare policy skills. 8.4. Demonstrate healthcare policy skills. 8.5. Demonstrate healthcare policy skills. 8.6. Demonstrate healthcare policy skills. 8.7. Demonstrate healthcare policy skills. 8.8. Demonstrate healthcare policy skills. 8.9. Demonstrate healthcare policy skills. 8.10. Demonstrate healthcare policy skills.
9. Healthcare Law	Students will be able to: 9.1. Demonstrate healthcare law skills. 9.2. Demonstrate healthcare law skills. 9.3. Demonstrate healthcare law skills. 9.4. Demonstrate healthcare law skills. 9.5. Demonstrate healthcare law skills. 9.6. Demonstrate healthcare law skills. 9.7. Demonstrate healthcare law skills. 9.8. Demonstrate healthcare law skills. 9.9. Demonstrate healthcare law skills. 9.10. Demonstrate healthcare law skills.
10. Healthcare Ethics	Students will be able to: 10.1. Demonstrate healthcare ethics skills. 10.2. Demonstrate healthcare ethics skills. 10.3. Demonstrate healthcare ethics skills. 10.4. Demonstrate healthcare ethics skills. 10.5. Demonstrate healthcare ethics skills. 10.6. Demonstrate healthcare ethics skills. 10.7. Demonstrate healthcare ethics skills. 10.8. Demonstrate healthcare ethics skills. 10.9. Demonstrate healthcare ethics skills. 10.10. Demonstrate healthcare ethics skills.

The course contributes to building the knowledge and skills required for the sizing and design of refrigeration systems.
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Relationship to Student Outcomes	
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SOs	1	2	3	4	5	6	7
Availability				X			X

Relationship to Mechanical Engineering Program Objectives (MEPOs)	
1. Design a mechanical system or component that meets specified requirements and constraints, taking into account the needs of the customer, the environment, and the manufacturing process.	1.1. Design a mechanical system or component that meets specified requirements and constraints, taking into account the needs of the customer, the environment, and the manufacturing process.
2. Apply engineering design to the solution of mechanical problems, using appropriate design tools and techniques.	2.1. Apply engineering design to the solution of mechanical problems, using appropriate design tools and techniques.
3. Analyze and design mechanical systems, components, and structures, using appropriate analysis tools and techniques.	3.1. Analyze and design mechanical systems, components, and structures, using appropriate analysis tools and techniques.
4. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.	4.1. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.
5. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.	5.1. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.
6. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.	6.1. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.
7. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.	7.1. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.
8. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.	8.1. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.
9. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.	9.1. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.
10. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.	10.1. Apply mechanical engineering principles to the design and analysis of mechanical systems, components, and structures.

MEPO1	MEPO2	MEPO3	MEPO4	MEPO5

ABET Student Outcomes (SOs)	
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1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Updated by ABET Committee, 2024
