

**MECHANICAL ENGINEERING PROGRAM**  
**ABET COURSE SYLLABUS**

**ME 457 Refrigeration Principles and Design. (4 Units) Elective**

- Course Description:** (2019-20 Catalog) Basic engineering principles of refrigeration processes including: vapor compression cycles, multipressure systems, absorption systems, steam jet cooling, air cycles, and low temperature refrigeration. 3 lectures, 1 laboratory.
- Prerequisite Courses:** ME 341 and ME 350.
- Prerequisites by Topic:** Fluid Mechanics I and Heat Transfer.
- Textbook:** (and/or other required material) Fundamentals of Refrigeration, ASHRAE Learning Institute, 2010
- References:** ASHRAE Handbook—Fundamentals, ASHRAE, 2017.
- Course Coordinator/Instructor:** Steffen Peuker, Assistant Professor of ME
- Course Learning Outcomes:** This course provides students with an introduction to basic engineering principles of refrigeration processes systems and their application. In particular the student will be able to:
1. Define and describe major refrigeration processes, including psychrometrics, and cycles.
  2. Analyze multistage and cascade refrigeration cycles.
  3. Analyze and describe the major components of refrigeration systems.
  4. Apply the concepts of fluid flow to refrigeration systems.
  5. Analyze and design pressure vessels related to refrigeration.
  6. Describe the different primary components of an HVAC system.
  7. Demonstrate knowledge of refrigerant management.
  8. Demonstrate knowledge about refrigerants code and standards.
  9. Demonstrate knowledge on how refrigerants impact the environment.
  10. Describe the processes of product cooling/freezing.
  11. Demonstrate an understanding of system operation.
  12. Demonstrate an understanding of practical issues related to refrigeration systems.
  13. Work professionally within a team, provide peer feedback, and demonstrate written and verbal skills.

**Relationship of Course to Mechanical Engineering Student Outcomes:**

SO 1: Mastered (M)  
SO 2: Mastered (M)  
SO 3:  
SO 4:  
SO 5:  
SO 6:  
SO 7:

**Topics Covered:**

1. Fundamentals of Refrigeration and Thermodynamics (review)
2. Multistage and Cascade Refrigeration Cycles
3. Evaporators, Condensers
4. Compressors
5. Flow in Pipes, Valves, Pumps, Expansion Devices
6. Refrigerant Selection
7. Refrigerant Management
8. Pressure Vessels
9. Product Cooling, Freezing Loads
10. Cooling Secondary Fluids

**Laboratory Projects:**

Design Project: design, build and test a vapor compression system

**Class/Lab Schedule:**

Three 50-minute lectures per week. One 170-minute lab per week.

**Contribution of Course to Meeting the Professional Component:**

(a) College-level mathematics and basic sciences:	0 credits
(b) Engineering Topics:	3 credits
Design:	1 credit
(c) General Education:	0 credits
(d) Other:	0 credits

**Prepared by:**  
Steffen Peuker

**Date:**  
6/12/19

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