MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 457: Refrigeration Principles & Design (4) Required for HVAC&R Concentration, Elective for all others

Course Description: (2013-15 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, ME 343

Prerequisites by Topic:
1. Heat Transfer.
2. Fluid Mechanics.

Textbook: **(and/or other required material)** Fundamentals of Engineering Thermodynamics, 6th Edition, M. J. Moran and H. N. Shapiro, John Wiley & Sons, Inc., 2008.

References: Heating, Ventilating, & Air Conditioning, 5th Edition, McQuiston, Parker, and Spitler, 2000.

Course Coordinator/Instructor: Christopher C. Pascual, Professor of ME

Course Learning Outcomes: The student will be able to:
1. Understand the fundamentals of engineering processes, which have as their purpose the reduction of the temperature of substances.
2. Apply these fundamental principles to the quantitative solution of related analytical problems.
3. Analyze complex refrigeration systems including vapor-compression, absorption, cryogenic, and air cycle systems.
4. Design, build, and test a refrigeration system in a quarter-long project.

Relationship of Course to MECHANICAL ENGINEERING Program Outcomes:												
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*
H	**M**	**H**	**M**	**H**	**L**	**M**	**L**	**L**	**L**	**H**	**L**	**H**

Topics Covered: (recommended number of hours each)
1. Review of relevant thermodynamic principles.
2. Vapor compression refrigeration systems.
   a) Single-stage systems
   b) Multistage systems
   c) Compressors

d) Evaporators
e) Condensers
f) Expansion valves
g) Refrigerants
h) System dynamics

3. Ammonia/water and water/lithium bromide absorption systems.
4. Steam jet cooling.
5. Air refrigeration cycles.
6. Low temperature refrigeration (cryogenics).

Laboratory Projects:

1. Design, analyze, build, and test a vapor-compression refrigeration system based on design specifications presented to the small student teams. The students will work on the project in lab over the 10-week quarter.

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:	4 credits
Design?	Yes
(c)General Education:	0 credits
(d) Other:	0 credits

Prepared by: Chris Pascual **Date:** 05/23/14