MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 448 Thermal System Design (4 Units) Required

Course Description: (2022-26 Catalog)	Design of thermal systems. Engineering economics, thermal component sizing, and simulation techniques applied to the design and performance analysis of thermal systems. 3 lectures, 1 laboratory.
Prerequisite Courses:	ME 303, ME 343, ME 347.
Prerequisites by Topic:	Coverage of all topics presumes completion of basic engineering science courses in thermodynamics, fluid mechanics and heat transfer.
Textbook: (and/or other required material)	Fundamentals of Heat and Mass Transfer, by Bergman and Lavine, 8th Edition, John Wiley, 2017. Fox and McDonald's Introduction to Fluid Mechanics, by Pritchard and Mitchell, 9th Edition, John Wiley, 2015. EES Engineering Equation Solver, F-Chart Software.
References:	Fundamentals of Engineering Thermodynamics, by Moran, Shapiro, Boettner, and Bailey, 8th Edition, 2014.
Course Coordinator/Instructor:	Christopher C. Pascual, Professor of ME
Course Learning Outcomes:	The student will be able to: 1. Solve heat transfer problems for temperature distribution and energy transfer rates using both analytical and numerical techniques. 2. Evaluate thermal systems based on life-cycle economics. 3. Analyze and choose an appropriate heat exchanger for a thermal system application. 4. Select an appropriate pump for a complex piping network. Evaluate the effect of pipe diameter, flow rate, pipe length, pipe roughness, and minor losses on system capital and operating costs. 5. Perform a thermal system simulation and solve for a workable solution using the method of successive substitution. 6. Design a thermal system.

Relationship of Course to Mechanical Engineering Student Outcomes:	SO 1: Mastered (M) SO 2: Mastered (M) SO 3: Mastered (M) SO 4: SO 5: Mastered (M) SO 6: SO 7: Mastered (M)
Topics Covered:	Heat Transfer and Multimode Heat Transfer Review (3 lectures) 2-D Conduction and Numerical Analysis (3 lectures) Engineering Economics (6 lectures) Heat Exchangers (5 lectures) Pumps and Piping Systems (5 lectures) System Simulation and Optimization (6 lectures)
Laboratory Projects:	1. EES Program (1 week) 2. Design Project(s) Including Parametric Study (8 weeks) 3. Optimization Problem (1 week)
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: Chris Pascual	**Date:** 8/16/22