Course alpha, number, title	ME 416 Computer Assisted Design of Thermal Systems
Required or elective	Elective
Course (catalog) description	Classifying, cataloging and processing design information. Modeling of thermal equipment. Simulation and optimization of thermal systems. Computer based design projects.
Prerequisite(s)	(ME 410 or concurrently)
Textbook(s) and/or other required material	Course web site at: http://www.egr.msu.edu/classes/me416/
Class/Lab schedule:	Total Credits: 3 *Lecture/Laboratory/Discussion Hours: 3/2/0*
Topics covered	a. Basic Design Evaluation b. Design Information c. Modeling Thermal Equipment d. Selection of Thermal Equipment e. Simulation of Thermal Systems f. Optimization by Operating Conditions g. Optimization by Component Selection
Course learning objectives	<u>1. Basic Concepts of Design</u> a. Students are able to participate in and conduct brainstorming sessions b. Students are able to evaluate design alternatives <u>2. Expert Systems and Property Data Bases</u> a. Students are able to determine thermodynamic properties using mathematical models b. Students are able to represent design data in terms of curve fits c. Students are able to develop a computerized property data base <u>3. Optimization</u> a. Students are able to determine an appropriate cost function b. Students are able to perform a simple optimization <u>4. Modeling and Design of Thermal Equipment</u> a. Students are able to calculate the performance of turbomachinery b. Students are able to calculate the performance of heat exchangers c. Students are able to make equipment selection decisions d. Students are able to design a heat exchanger - <u>5. Engineering Economics</u> a. Students are able to understand the time value of money b. Students are able to perform a present worth analysis c. Students are able to perform interest calculations <u>6. System Design and Simulation</u> a. Students are able to calculate heating and cooling loads b. Students are able to calculate state and system parameters for thermal systems c. Students are able to design the operating conditions for a thermal system d. Students are able to understand the interaction between equipment selection and system performance - -

7. Computer Skills

a. Students are able to write programs in MATLAB
b. Students are be able to program in Excel
c. Students are able to use the Solver function in Excel
d. Students are able to graph in Excel

Relationship of course to ME program outcomes

The following measurement standard is used to evaluate the relationship between the course outcomes and the educational-program outcomes:
3 = Strong Emphasis, 2 = Some Emphasis, 1 = Little or No Emphasis.

(a) an ability to apply knowledge of mathematics, science, and engineering—3
(b) an ability to design and conduct experiments, as well as to analyze and interpret data—1
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability—3
(d) an ability to function on multidisciplinary teams—3
(e) an ability to identify, formulate, and solve engineering problems—3
(f) an understanding of professional and ethical responsibility—2
(g) an ability to communicate effectively—2
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context —1
(i) a recognition of the need for and the ability to engage in life-long learning—1
(j) a knowledge of contemporary issues—1
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice—3
(l) application of advanced mathematics—1
(m) design, build, and test in mechanical systems area—1
(n) design, build, and test in thermal/fluids area—1
(o) capstone design experience—1

Contribution to professional component:

17% Engineering Science 83% Engineering Design

Person(s) who prepared this description

Craig Somerton

Date of Preparation

March 17, 2010