

COURSE NUMBER: ME 5341, 4 credits	COURSE TITLE: Case Studies in Thermal Engineering and Design
TERMS OFFERED: Fall, Spring (evenings via extension)	PREREQUISITES: ME3332 Thermal Science II, ME3333 Thermal Science III
TEXTBOOKS/REQUIRED MATERIAL: None	PREPARED BY: E. M. Sparrow DATE OF PREPARATION: May 23, 2007
COURSE LEADER(S): E. M. Sparrow	CLASS/LABORATORY SCHEDULE: CONTRIBUTION OF COURSE TO MEETING PROFESSIONAL OBJECTIVES: 100 % Engineering Topics
CATALOG DESCRIPTION: Modeling and numerical simulation tools and their application to real-world and industrial problems involving fluid mechanics, convection heat transfer, and conduction heat transfer.	COURSE TOPICS: <ol style="list-style-type: none"> 1. Advanced computational tools for heat conduction, fluid flow, convective heat transfer, structures, thermal stresses. 2. Fundamental physical processes in heat transfer and fluid mechanics conveyed via displays of results from numerical solutions. 3. Assessment of validity of standard simplifying assumptions used in academic models of heat transfer and fluid flow problems. 4. Methodology for modeling of complex physical and industrial problems and numerical implementation of the models. 5. Homework problems provide practice using numerical tools. 6. Computer laboratory sessions provide one-on-one, hand's-on instruction. 7. Three projects are each based on actual industrial problems. 8. Each project is presented as a formal report emphasizing excellence in communications.

COURSE OBJECTIVES	<ol style="list-style-type: none"> 1. To promote understanding of the fundamentals processes that underlie heat transfer and fluid flow. 2. To demonstrate how to apply the fundamentals to complex, single and multi-mode problems. 3. To convey the thought processes by which complex problems are modeled. 4. To teach how to physical models are translated into mathematical models. 5. To show the differences between academic and real world problems, with emphasis on design and implementation. 6. To ensure that all students have high competence in the operational aspects of advanced numerical software for heat transfer and fluid flow. 7. To emphasize the importance of written communications in the form of reports and to convey the principles of report writing. 8. To set forth the necessity of knowing the background literature via search engines and to discuss the attributes of various of the available search engines.
COURSE OUTCOMES	<p>(Letters shown in brackets are linked to program outcomes a-k)</p> <ol style="list-style-type: none"> 1. The students develop an ability to frame open-ended problems to identify the missing information and determine reasonable solution techniques among several candidate methods. [a, c, e, g, h] 2. The students learn to translate physical models into mathematical models [a, c, e, g, h, k] 3. The students master advanced numerical-simulation tools to enable them to solve complex real-world problems [a, e, j, k] 4. The students develop skills in searching the literature to find the necessary information to complete the design or analysis of a complex heat transfer system [a, b, d, f, g] 5. The students learn the flaws in the models taught to them in earlier courses which did not make use of numerical simulation [a, e] 6. The students learn how to present a profession report, including a problem statement, a statement of the objectives, a well-documented solution procedure and a discussion of the results. [a, c, e, f, g, k]
ASSESSMENT TOOLS:	<ol style="list-style-type: none"> 1. Quality of designs based on numerical simulation 2. Student performance in the computer laboratory 3. Student capability in identifying unique phenomena 4. Classroom discussion 5. Insights conveyed by students in written reports

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Nature of Changes:

This Syllabus was revised by Dr. Sparrow May 23, 2007. It was updated to reflect the current course topics, objectives, expected outcomes, and assessment tools.