

1. Course number and name
EML 4512 Thermal-Fluid Design
2. Credits and contact hours
3 cr, 2.5 contact hours (2 hrs. 30 min. lecture)
3. Instructor's or course coordinator's name
Instructor: Dr. Steven Van Sciver, Coordinator: Dr. Juan Ordonez
4. Text book, title, author, and year
Design of Fluid Thermal Systems - SI Version, Janna, W. S., 2010
 - a. *References, Additional Resources*
 - Fundamentals of Heat Transfer, Incropera, F.P. and DeWitt, D. P., 2006
 - Introduction to Thermodynamics and Heat Transfer, Cengel, Y. A., 2007
 - Introduction to Fluid Mechanics, Fox, R. W. and McDonald, A. T., 2003
 - Compact Heat Exchangers, Kays, W. M. and London, A. L., 1998
 - Two Phase Flow and Heat Transfer, Whalley, P. B., 1996
 - AL Braze Plate Fin Heat Exchangers, ALPEMA
5. Specific course information
 - a. *brief description of the content of the course (catalog description)*
This course is intended to develop the student's awareness and understanding of the relationship between fluid mechanics, thermodynamics, and heat transfer in consideration of design. Emphasis is placed upon energy systems components such as heat-exchangers, piping networks, and pumps. Includes a student project.
 - b. *prerequisites or corequisites*
Prerequisite: EML 3016C
 - c. indicate whether a required, elective, or selected elective course in the program
Selected Technical Elective course
6. Specific goals for the course
 - a. Course Outcomes
 1. Be able to design an integrated thermal fluid system [1, 6]
 2. Be able to select a piping system component and analyze its performance in a fluid system [2]
 3. Be able to calculate the pressure drop and heat transfer in a two phase (liquid/vapor) flow [3]
 4. Be able to analyze and select a prime mover (pump) for a specific application [4]
 5. Be able to design, analyze and specify a complex heat exchanger [5]
 6. Be able to analyze the thermodynamic performance of a thermal fluid system [7]

Numbers refer to Course Objectives below, e.g. for course outcome 1, [1, 6] refers to course objectives 1, 6.
 - b. Course Objectives and Relation to Student Outcomes
 1. Overall Goal: To develop an in-depth understanding of component technologies involved in thermal fluid systems
 2. To develop a practical understanding of piping systems design including specific components
 3. To learn the unique characteristics of two phase flow and its impact on systems
 4. To become familiar with the characteristics of pumps and other prime movers
 5. To learn methods for selection, design and optimization of heat exchangers for fluid systems

6. To learn methodologies for combining component technologies into operating thermal fluid systems
 7. To develop an understanding of how to optimize a thermal system through use of thermodynamic minimization procedure
7. Brief list of topics to be covered
- Fluid Properties & Units
 - Review of Fluid Mechanics
 - Piping Systems
 - Two Phase Flow
 - Prime Movers
 - Review of Heat Transfer Fundamentals
 - Heat Exchangers
 - Integrated systems and optimization