Mechanical Engineering Dept. Department

Syllabus
ME 458: Design of Thermo-Fluid Systems (3-0-3)

Course Catalog Description:

Application of thermodynamics, mechanical engineering design, fluid mechanics, and heat transfer in the design of thermo fluid systems. Introduction to system-oriented design methods. Thermo fluid system component analysis, selection and design. Component and system modeling, simulation, economics and optimization.

Course Pre-requisites:

- ME 204: Thermodynamics II
- ME 315: Heat Transfer

Course Objectives:

1. To integrate students' knowledge in thermodynamics, fluid mechanics and heat transfer, through design projects associated with real life thermal fluid systems.
2. To introduce students to techniques, and provide them with experience, in using computer-based design tools such as EES (Engineering Equation Solver), SOLIDWORKS Flow Simulation etc. to solve thermal fluid system design related problems.
3. To develop in students the ability to define thermal system design objectives and understand the basis and criteria of design for environment, safety and reliability, manufacturability and sustainability.
4. To develop effective interaction skills for teamwork and communication, with emphasis on shared responsibility among team members

Course Learning Outcomes:

CLO1. Apply design processes and procedures to design thermal systems and work on individual components of a composite system.

CLO2. Understand the basis and criteria of design for environment, safety and reliability, manufacturability and sustainability.

CLO3. Simulate and optimize a thermal-fluid system using a computer (EES, Excel, MATLAB, SolidWorks).

CLO4. Use the library and internet to search for technical information. Write technical reports and memos. Keep a journal of all project related activities

CLO5. Work as a team, dividing up tasks, setting deadlines, reviewing each other's work. Work under a leader with a common objective, resolving conflicts.

CLO6. Apply codes of ethics and conduct for engineers in the workplace.

Learning Resources:

- Design of Fluid Thermal Systems, Janna, W.S., Cengage Learning, 4th Ed, 2015.
- Design and Optimization of Thermal Systems, Jaluria, Y., 2nd ed., McGraw-Hill, 2007. Thermo-Fluids Systems Design, McDonald, A. G., and Magande, H. L., John Wiley, 2012. Instructor's Handouts are provided (when found necessary). ASME, ASTM and TEMA standards.
- Web sites related to Thermal Fluid Systems.
- EES, SolidWorks Simulation, EPANet, ASME, ASTM, TEMA standards.

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Assignments	10, 11, 13, 14	20.0%
4 poster presentations (2 group and 2 individual)	4, 8, 12, 15	20.0%
3 Project reports (2 group and 1 individual)	4, 8, 15	40.0%
Exams	8, 16	20.0%

Lecture Weekly Schedule:

Week#	Topics
1	Engineering Design Process, Design of Thermal Systems.
2	Design for Environment, Safety and Reliability.
3	Ethical concerns, Manufacturability and Sustainability.
4	Review of Fluid Mechanics, Piping systems, Pumps.
5	Fans, Compressors, Turbines.
6	Review of Heat Transfer.
7	Heat Transfer equipment system analysis.
8	Power consuming and power producing Systems.
9	Mathematical Modeling of Thermal Equipment and Systems.
10	Mathematical Modeling of Thermal Equipment and Systems. (Continue)
11	System Simulation and Computer Aided Design.
12	Design Optimization and System Performance Evaluation.
13	Exergy and Thermo-economic Analysis, Life Cycle Cost, Cost Estimation.
14	Related Special Topics and Project.
15	Related Special Topics and Project. (Continue)