King Saud University
College of Engineering
Mechanical Engineering Department

COURSE OUTLINE

Thermal Fluid Systems (ME379)

Instructor(s): Prof. Abdelrahman El-Leathy

1. Course Description

The main objective of this course is to provide the student with thermal-fluid applications. This course aims at providing the students with design experience in the thermal-fluid area through real life design problems and to relate basic theories to the engineering thermal-fluid applications.

The students will be able to:

1. Utilize his knowledge of thermodynamics, heat transfer and fluid mechanics in the design of integrated thermal systems
2. Utilize accurate and efficient computational methods for the solution of thermal system models.

Teamwork experience and communication skills are highly stressed. The students will gain some hands-on experience with the tools of investigation used for thermal and fluid systems and learn how to approach and solve problems typically encountered in engineering experimental work.

2. Number of Credits

3 (3,1,0)

3. Required Background or Experience

Prerequisites by course:

ME 377 Thermodynamics II
ME 378 Heat Transfer

4. Textbook

1. Janna, W.S., Design of Fluid Thermal Systems, 3rd or latest edition, Cengage Learning, Global Engineering 2011.

5. Reference

1. W. F. Stoecker, Design of Thermal Systems, McGraw Hill, 2nd Edition.
2. B.K. Hodge and R.P. Taylor, Analysis and Design of Energy Systems, Prentice Hall.
3. W. F. Stoecker, Design of Thermal Systems, McGraw Hill, 2nd Edition.
4. F. C. McQuiston, J. D. Parker, and J. D. Spitler, Heating, Ventilating, and Air-Conditioning: Analysis and Design, John Wiley
5. Bejan, A., Tsatsaronis, G and Moran, Michel, "Thermal Design and Optimization" John Wiley and Sons, Inc., 1996.
6. Jaluria, Y., Design and Optimisation of Thermal Systems, McGraw- Hill, 1998.
7. Burmeister, L.C., Elements of Thermal-Fluid System Design, Prentice Hall, 1998.

6. Course Content

The following topics will be covered in this course:

I- Introduction to Thermal-Fluid Systems
II- Piping Systems I (standards, friction factor concept and minor losses)
III- Piping Systems II (problem optimization, piping symbols and system curves)
IV- Flows through parallel pipe setups.
V- Pumps and Piping Systems (classifications and types of pumps, pump testing, cavitation, pump analyses, specific speed, basic piping system design and Performance characteristics of compressors and fans.
VI- The optimum thickness for insulating pipes.
VII- Double Pipe Heat Exchangers (Perform design and analysis, Perform Effectiveness-NTU analysis)
VIII- Shell and Tube Heat Exchangers (construction, parts and nomenclatures of shell and tube exchangers, design and analyses and optimum outlet conditions)
IX- Plate, Frame and Cross Flow Heat Exchangers

7. Instructional Methods

Lectures & **Tutorials.** Three 65-minute lecture sessions and one 65 minutes tutorial session per week.

8. Course Assessment

Homework:

There will be assignments that will be assigned at the end of each chapter and will be collected as announced by the instructor. Students may discuss homework; however, the students are advised to write up all solutions and submit them individually. Some homework problems will be used in quizzes and maybe in exams. **Late assignments will not be accepted**.

Tests

Midterm exam 1 - TBD
Midterm exam 2 –TBD

Final Exam

This will be a three-hour examination and the date and time will be announced by the University timetabling office prior to exams.

Mark Scheme

The final course grade will be weighted according to the following scheme:

(1)	Assignments	10%
(4)	Term Project	20%
(5)	2 Midterm exams	30%
(6)	Final Exam	40%
	Total:	100%