

ICEE 3010: Engineering System and Problem Solving (Thermal / Fluid Systems)

This course is required for all Engineering majors.

Course Coordinator:

Gerald J. Micklow

Catalog Description:

Covers advanced topics in engineering fundamentals in thermodynamics, fluid mechanics and heat transfer. Lab covers application of principles discussed in class to thermal fluid systems

Course Structure:

Two 75-minute lectures and one one-hour laboratory/recitation session per week (three credits)

Prerequisites:

ICEE 1020, MATH 2172, ICEE 2010, PHYS 2350, MATH 3100

Required Materials:

Required Texts Include the following:

- *Fundamentals of Thermal-Fluid Sciences*, Cengel and Turner, 2nd Edition, McGraw Hill
- *Fundamental Of Engineering Supplied-Reference Handbook* (p) NCEES, 7th edition, Natl Council Of Examiners , ISBN: [1-932613-19-6](https://www.ncees.org/publications/eng-ref-handbook)

Course Outcomes:

After successful completion of the course, the student is expected to have the following competencies:

1. Able to solve thermo/fluids science problems that implement various combinations of thermodynamic, heat transfer, and/or fluid mechanics principles.
2. Able to distinguish between engineering design and engineering analysis.
3. Able to identify and formulate the fundamental thermal-fluid principles behind at least 6 technological applications.
4. Assess if a design is reasonable based on its success in meeting specified requirements.
5. As a member of an engineering team, critically analyze a thermal/fluids design, and effectively communicate the details to a technical audience.

Lecture Topics:

Basic Concepts, Thermo (1 lecture)
Pure substances (2 lectures)
Energy Transfer by Heat, Work and Mass (1 lecture)
First Law of Thermodynamics (4 lectures)
Second Law of Thermodynamics (2 lectures)
Entropy (2 lectures)
Vapor Power Cycles (2 lectures)
Refrigeration (2 Lectures)
Fluid Statics (1 lecture)
Momentum Equation (2 lectures)

Pipe Flow (3 lectures)
Conductive Heat Transfer (2 Lectures)
Convective Heat Transfer (2 lectures)

Laboratory Topics

1. Rules and Safety
2. Laboratory Report Format
3. Data Analysis
4. Calibration of a Pressure Gage
5. The Venturi as a Flow Measurement Device
6. Centrifugal Pump Performance Characteristics
7. Jet Impact Force on Vane
8. First Law Analysis of a Parallel Flow Heat Exchanger
9. Steady State Heat Conduction through a Composite Plane Wall
10. Computational Fluid Dynamics, Rectangular pipe with a bend.
11. Computational Fluid Dynamics, Airfoil

Relevant Program Outcomes:

Graduates of the Engineering Program will demonstrate

- b1) an ability to design and conduct experiments.
- b2) an ability to analyze and interpret data.
- e) an ability to identify, formulate, and solve engineering problems.
- g) an ability to communicate effectively.

Professional Component Content:

Math/Science: 0; Engineering: 3 credits; General Education: 0

Assessment Requirements:

Student Work Samples:

- Graded Homework, Laboratory reports (Outcomes b1, b2, and g)

Targeted Exam Questions:

- Solution of engineering problems (Outcome a, e)

Student Course Survey

Last Review:

March 26, 2008 by Gerald J. Micklow