

## MENG 4018

### Thermodynamics

#### Catalog Description

4018. Thermodynamics (3) (F) 3 lecture hours per week. (P): ENGR 3012. First and second law analysis. Power and refrigeration cycles. Application of basic principles to engineering problems involving ideal gas mixtures, psychrometrics, real gas mixtures, and combustion.

#### Text:

1. Sonntag, Richard E., Claus Borgnakke, and Gordon J. Van Wylen. *Fundamentals of Thermodynamics*, Sixth Edition, John Wiley and Sons, 2002, ISBN 978-0-471-15232-3
2. National Council of Examiners for Engineering and Surveying, *Fundamentals of Engineering Supplied-Reference Handbook (8th Edition)*, 2008, ISBN 978-1-932613-30-8.

#### Objectives:

At the completion of this course, students will be able to:

- Perform a complete thermodynamic analysis of a non-ideal Rankine power cycle with reheat and regeneration.
- Perform a complete thermodynamic analysis of a non-ideal vapor-compression refrigeration cycle.
- Perform a complete thermodynamic analysis of a non-ideal air-standard Brayton cycle with regeneration and reheat.
- Calculate cycle efficiency for an ideal air-standard Otto or Diesel cycle using constant and variable specific heats.
- Perform a Second Law Analysis of a power-producing system
- Given the thermodynamic properties of the components of a mixture of ideal gases, calculate the thermodynamic properties of the mixture.
- Calculate the rate of heat transfer for a process involving a mixture of ideal gases with a condensing component.
- Analyze a combustion process using conservation of mass and the first law of thermodynamics, including calculation of heat release or adiabatic flame temperature.

#### Course Content:

- Review of equations and concepts from thermodynamics I (6 classes)
- Vapor power cycles (8 classes)
- Refrigeration cycles (6 Classes)
- Gas power cycles (8 Classes)
- Second law Efficiency, Irreversibility, Availability (3 classes)
- Mixtures of ideal gases (3 Classes)
- Mixtures of gases with a condensing component (2 classes)
- Chemical reactions (6 classes)
- Exams (2 classes)

#### Grading:

Grading		Assessment	
A	90% or better	Homework/Assignments	10%
B	80% or better	Tests (2)	60%

C	70% or better		Final Exam	30%
D	60% or better		Total	100%
F	Less than 60%			