Mechanical Engineering Dept. Department

Syllabus
ME 433: Fundamentals of Combustion (3-0-3)

Course Catalog Description:

Combustion modes, Chemical thermodynamics and chemical kinetics, Conservation equations of reacting flows, Multi-species transport, Ignition, Flammability and extinction, Premixed and non-premixed flames, Combustion instabilities, Turbulent combustion, Liquid and solid burning, Pollutant emissions.

Course Pre-requisites:

- ME 203: Thermodynamics I
- ME 204: Thermodynamics II

Course Objectives:

1. To teach students the fundamentals of combustion thermodynamics and chemistry.
2. To provide students with the ability to analyze and examine existing combustion processes.
3. To familiarize the students with designing burners/combustors.

Course Learning Outcomes:

CLO1. be able to understand the fundamentals of combustion science and the various modes and classifications of combustion processes.

CLO2. be able to properly study an existing combustion process to analyze and assess its performance and efficiency based on the underlying physics and chemistry principles.

CLO3. be able to collect the right set of data for an existing combustion system and carry out any subsequent processing and analysis.

CLO4. be able to design a basic working prototype of a burner and combustor.

CLO5. be aware of the technological advances in the practical combustion devices such as internal combustion engines, gas turbine engines, etc.

Learning Resources:

- An Introduction to Combustion: Concepts and Applications; 3rd Edition, Stephen R. Turns

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Homework	None	8.0%
Minute papers	None	10.0%
In-class participation	None	5.0%
Mini-quizzes	None	15.0%
Team Project	None	15.0%
Major Exam	None	15.0%
Final Exam	None	32.0%

Lecture Weekly Schedule:

Week#	Topics
1	Introduction to combustion
2	Thermodynamics of combustion
3	Thermochemistry of combustion
4	Thermochemistry of combustion (Continue)
5	Chemical kinetics
6	Chemical kinetics (Continue)
7	Governing equations of reacting flows
8	Modes of combustion: premixed and diffusion flames
9	Modes of combustion: premixed and diffusion flames (Continue)
10	Laminar and turbulent flames
11	Laminar and turbulent flames (Continue)
12	Combustion instabilities
13	Combustion instabilities (Continue)
14	Liquid and solid burning
15	Combustion emissions