Course Code : **ME 721**

Course Title : **Theory of Combustion**

Credit Hours : **3**

Course Description

Introduction and Motivation to combustion study – Introduction to thermochemistry, Impact of the first law of thermodynamics on combustion process, Impact of second law of thermodynamics on chemical equilibrium, full-equilibrium, water gas equilibrium, Introduction to transport phenomena, Chemical kinetics, Reaction Mechanism, Coupling of chemical and thermal analysis of thermal systems, Experimental Investigation of flames, Conservation equation of reaction flows, Premixed flames, Pollutant formation and mechanisms, Technological methods for pollutant abatement.

Course Objectives

Understand the fundamentals and applications of combustion theory.
Understand the problem of energy conservation and improvement of combustion efficiency
Aware of combustion safety aspects and air pollution problems connected to combustion technologies.
Aware of standard practices in combustion and the emerging technologies.
Understand the special combustion challenges in the fields of sustainability and environment.

Course Topics

Week no. 1: Introduction and Motivation to combustion study – Introduction to thermochemistry.

Week no. 2: Impact of the first law of thermodynamics on combustion process.

Week no. 3: Impact of second law of thermodynamics on chemical equilibrium, full-equilibrium, water gas equilibrium.

Week no. 4: Introduction to transport phenomena.

Week no. 5: Chemical kinetics.

Week no. 6: Reaction Mechanism.

Week no. 7: Coupling of chemical and thermal analysis of thermal systems / 7^{th} week evaluation.

Week no. 8: Experimental Investigation of flames.

Week no. 9: Conservation equation of reaction flows.

Week no. 10: Premixed flames.

Week no. 11: Premixed flames.

Week no. 12: Pollutant formation and mechanisms / 12^{th} week evaluation

Week no. 13: Technological methods for pollutant abatement.

Week no. 14: Presentation on selected topics.

Week no. 15: Presentation on selected topics.

Week no. 16: Final Examination

References

- Stephen R. Turns. “An Introduction to Combustion: Concepts & Applications”, McGraw Hill, 2011.
- Irvin Glassman and Richard Yetter, “Combustion”, AP Publishers, 2008.
- J. Warnatz, Ulrich Maas and Robert W. Dibble, “Combustion: Physical and chemical fundamentals, modeling and simulation, experiments and pollutant formation”, Springer Publishers, 2010.
- D. B. Spalding, “Combustion and Mass Transfer,” Pergamon Press, Oxford, 1983