

Module title: Fuel & Combustion

Module code: 24-14-308-01

Module credit: 2

Module objectives:

This course is presented for undergraduate students in mechanical engineering. This course is designed to introduce origins, nature, and conditioning of fuels. Mass and energy balance laws of combustion. Physical chemistry and chemical kinetics of combustion: reacting schemes and phenomenology of the modes of combustion. Fuel combustion technologies: conception and design of combustion heat transfer.

Term: Fall-September

Text: Richard E. Sonntag, Claus Borgnakke, Gordon J. Van Wylen, *Fundamentals of Thermodynamics*, Sixth edition, 2003.

Instructor information:

Name: Dr. Samira Payan
Academic rank: Associate professor
Email address: s_payan_usb@eng.usb.ac.ir

Assessments:

The students learning will be evaluated according to the below table:

Attendance:	10%
Project (paper report and oral presentation):	30%
Final-term exam:	60%

References

- [1] S.R. Turns, Introduction to Combustion, Mc Graw Hill, 2000. Compulsory.
- [2] K.K. Kuo, Principles of Combustion, Wiley, 2005. Recommended
- [3] T. Poinsoot & D. Veynante, Theoretical and Numerical Combustion, Edwards. Recommended

Module subjects:

- 1st week:** Types of fuels and their energetic study.
- 2nd week:** Origins of fuels.
- 3rd , 4th weeks:** Formation of fuels.
- 5th , 6th weeks:** Conditioning and specification of fuels.
- 7th week:** Application of fuels.

Project presentation

- 8th week:** Global mass and energy balance laws in combustion. Control and diagnostic techniques.

9st week: Thermochemistry

10st, 11st weeks: Chemical kinetics of combustion. Chain-branching mechanisms. Explosivity and flammability limits, flame adiabatic temperature.

12st, 13th weeks: Combustion and heat transfer technologies.

14st, 15st, and 16st weeks: Laminar premixed flames. Introduction to turbulent flows. Turbulent premixed flames and their applications.

Final-term exam