



COURSE TITLE: Fuel Combustion

Number of contact hours: 45

Duration: 1 semester (fall / spring)

ECTS credits: 4

Programme description: This course introduces with different types of fuels, methods of determining the heat of combustion and calorific value for different types of fuels and conducting exhaust gas analysis. The objectives of this integrated subject are to learn about different designs of burners used in the energy industry, taking into account the specifics of their work and the parameters they achieve.

Learning Objectives: Students of this course understand the chemical and thermodynamic principles of combustion, are able to analyze combustion reactions and energy release. Students are able to evaluate combustion efficiency and pollutant formation, design and optimize combustion systems for industrial applications and address environmental and sustainability issues in combustion processes.

Course Outline

1. Introduction to Combustion. Basics and importance of combustion processes.
2. Thermochemistry, stoichiometry, heat of reaction, and energy balances. Elementary composition of fuels.
3. Exhaust gas analysis. Incomplete and complete combustion.
4. Air demand for combustion of solid, liquid and gaseous fuel.
5. Methods of determining the calorific value and heat of combustion of solid and liquid fuels. Determination of the combustion heat of solid fuels using a bomb calorimeter.
6. Construction of burners used in the power industry. Methods of selection and calculation of a pulverized fuel burner used in the power industry.
7. Dew point temperature calculation for solid and gaseous fuels depending on fuel composition.
8. Determining the combustion triangle for different fuels.

Course type: lectures (15), exercises (30)

Literature:

1. Annamalai K., *Combustion science and engineering*, CRC Press, 2007.
2. Orłowski P., Dobrzanski W., Szwarc E., *Kotły parowe, konstrukcje obliczenia* (in polish), WNT, 1979.
3. Wójcicki S., *Spalanie* (in polish), WNT, 1969.
4. Wilk A., *Termodynamika techniczna* (in polish), WSiP, 1996.

Assessment method: written assessment

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