

Thermodynamics

Code: MK3MHOTL04GX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Engineering Physics, Mathematics II

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Definitions and Fundamental Ideas of Thermodynamics. Changing the State of a System with Heat and Work. Zeroth Law of Thermodynamics. The isotherm, isochor, isobar, adiabatic and polytropic process. The First Law of Thermodynamics: Conservation of Energy. Corollaries of the First Law. Generalized Representation of Thermodynamic Cycles. The Carnot Cycle. Entropy. The second law of Thermodynamics. Reversibility and Irreversibility in Natural Processes. Technical work. Enthalpy. Exergy. Mixtures: Partial pressure, Dalton's laws. Gas mixtures. Gas mixtures. Real gases. Steam. Humid air. T-s diagram. Energy cycles.

Heat transfer. Basic forms of heat transfer. Fundamental equations. General differential equation of heat conduction. Steady state and transient conduction. Thermal resistance. Conduction (plane walls, cylindrical walls, spherical walls). Convection: concepts and basic relations, boundary layers, similarity concept. Free convection, forced convection (the Reynolds, Grasshof, Prandtl, Nusselt numbers).

Literature:

Compulsory:

- Lakatos Á. Basics of heat transfer and fluid mechanics. 2014, Terc Kft.
- Robert Balmer (2006) Thermo-dynamics, Jaico Publishing House, ISBN: 817224262X, 868 pages
- James R. Ogden (1998) Thermodynamics Problem Solver, Research and Education Association, ISBN: 0878915559, 1104 pages.
- Warren M. Rohsenow, James P. Hartnett, Young I. Cho (1998), Handbook of Heat Transfer, McGraw-Hill New York, ISBN: 0070535558 / 9780070535558, 1344 pages.

Schedule

1st week Registration week

2nd week:

Lecture: Definitions and Fundamental Ideas of Thermodynamics. Changing the State of a System with Heat and Work. Zeroth Law of Thermodynamics

Practice: Solving problems in the theme of the lecture

4th week:

Lecture: Corollaries of the First Law. Generalized Representation of Thermodynamic Cycles.

Practice: Solving problems in the theme of the lecture

6th week:

Lecture: Reversibility and and Irreversibility in Natural Processes. Technical work. Enthalpy. Exergy.

Practice: Solving problems in the theme of the lecture

3rd week:

Lecture: The isotherm, isochor, isobar, adiabatic and polytropic process. The First Law of Thermodynamics: Conservation of Energy

Practice: Solving problems in the theme of the lecture

5th week:

Lecture: The Carnot Cycle. Entropy. The second law of Thermodynamics.

Practice: Solving problems in the theme of the lecture

7th week:

Lecture: Mixtures: Partial pressure, Dalton's laws. Gas mixtures. Gas mixtures. Real gases.

Practice: Solving problems in the theme of the lecture

8th week: 1st drawing week	
9th week: Lecture: Steam. Humid air. T-s diagram. Practice: Solving problems in the theme of the lecture	10th week: Lecture: Energy cycles. Carnot's Cycle, Joule's cycle. Practice: Solving problems in the theme of the lecture
11th week: Lecture: Heat transfer. Basic forms of heat transfer Practice: Solving problems in the theme of the lecture threaded joints in section and on view.	12th week: Lecture: Fundamental equations. General differential equation of heat conduction. Steady state and transient conduction. Practice: Solving problems in the theme of the lecture
13th week: Lecture: Thermal resistance. Conduction (plane walls, cylindrical walls, spherical walls). Convection: concepts and basic relations, boundary layers, similarity concept. Practice: Solving problems in the theme of the lecture	14th week: Lecture: Free convection, forced convection (the Reynolds, Grasshof, Prandtl, Nusselt numbers). Practice: Solving problems in the theme of the lecture
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance on the lectures is recommended, but not compulsory.

Participation at practice is compulsory. Student must attend the practices and may not miss more than three practice during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. Student can't make up a practice with another group. The attendance on practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test is in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for grade:

The course ends with exam grade. Based on the average of the test results $\times 0.3$ + the exam grade from the theory $\times 0.7$ the mid-semester grade is calculated as an average of them:

The minimum requirement for the mid-term, end-term tests and for the exam is 50%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score	Grade
0-50	fail (1)
51-60	pass (2)
61-74	satisfactory (3)
75-89	good (4)
90-100	excellent (5)