BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
FACULTY OF MECHANICAL ENGINEERING

SUBJECT DATASHEET

I. SUBJECT DESCRIPTION

1. GENERAL DATA

1.1. Subject name (in Hungarian, in English)

Heat transfer G ● Heat Transfer G

1.2. Neptun code

BMEGEENBGHK

1.3. Type

study unit with contact hours

1.4. Course types and number of hours (weekly / semester)

course type	number of hours (weekly)	nature (connected / stand-alone)
lecture (theory)	2	-
exercise	2	individual
laboratory exercise	-	-

1.5. Type of assessments (quality evaluation)

mid-term grade

1.6. ECTS

4

1.7. Subject coordinator

name:	Dr. Kovács Róbert Sándor
post:	associate professor
contact:	kovacsrobert@energia.bme.hu

1.8. Host organization

Department of Energy Engineering (http://www.energia.bme.hu/)

1.9. Course homepage

https://edu.gpk.bme.hu/course/view.php?id=365

1.10. Course language

hungarian, english, german

1.11. Primary curriculum type

mandatory

1.12. Direct prerequisites

Strong prerequisite: -

Weak prerequisite: -

Parallel prerequisite: -

Milestone prerequisite: -

Excluding condition: BMEGEENAEHK, BMEGEENBEHK, BMEGEENAEG2

(the subject cannot be taken if you have previously completed any of the following subjects or groups of subjects)

2. AIMS AND ACHIEVEMENTS

2.1. Aim

The aim of the course is to introduce students to the basic ways of energy propagation and the basic connections of quantitative description. Discusses the solution of constant and time-varying thermal conductivity problems. Discusses the phenomenon of heat transfer in the case of natural and forced flow without state change and the practical determination of the heat transfer coefficient. Discusses the phenomenon of source and condensation heat transfer and practical calculations. Discusses heat transfer in heat exchangers, describes logarithmic mean temperature and NTU methods for thermal engineering sizing of heat exchangers. It introduces the basic connections of heat radiation (Stefan-Boltzmann law, Wien's law, Planck's law, Kirchhoff law) and the ways of practical calculation of heat radiation between bodies. Finally, the subject also covers the methods of measuring the basic thermal material properties.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- Knows the commonly used concepts of heat transfer.
- Knows the basic mechanisms of heat propagation and their basic relationships.
- Knows the first, second and third type boundary conditions of thermal conduction problems.
- The student understands the Fourier equation and the description of the stationary temperature distribution of simple bodies.
- Informed about internal heat source heat conduction basics and temperature distribution solutions.
- Understands the basic contexts of thermal engineering calculations related to fins.
- The student understands the equations describing the heat balance and heat transfer of heat exchangers and the related methods of thermal engineering.
- The student understands the differential equation of time-varying thermal conductivity, the similarity numbers of thermal conductivity and the practical application of its dimensionless basic solution.
- Understands the basic equations of heat transfer and the similarity numbers that can be obtained from them.
- The student is familiar with the basic design of recuperative, regenerative and mixing heat exchangers.

B. Ability

- The student is able to describe real systems with abstract heat transfer models.
- The student is able to describe heat transfer processes in systems using mathematical models.
- The student is capable of multi-aspect analysis of thermal engineering systems and processes.
- The student understands the sub-processes of complex heat transport processes and their quantitative description.
- Explores the theoretical and practical background needed to identify simpler heat transport problems and solves them.
- With IT knowledge, the student handles high, computationally intensive tasks.
- The student expresses his thoughts in an orderly form orally and in writing.

- Effectively solves complex engineering tasks.
- The student distinguishes between different analytical solution methods.
- Based on the collected information, the student analyzes the solution process of complex thermal engineering tasks.

C. Attitude

- The student seeks to collaborate with the instructor and fellow students in expanding knowledge.
- The student expands the technical knowledge through the continuous acquisition of new results from the literature.
- Open to the use of information technology tools.
- The student seeks to learn about and routinely use the tools needed to solve thermodynamic problems.
- The student strives for an accurate and error-free solution.

D. Independence and responsibility

- The student independently thinks through heat transfer tasks and problems and solves them based on specific resources.
- Accepts well-founded scientific critical remarks.
- In some situations, as part of a team, the student cooperates with fellow students to solve tasks.
- The student supports a systematic, multi-faceted approach in his thinking.
- The student is committed to the highest level and quality of work expected.

2.3. Teaching methodology

Lectures, computational exercises, written and oral communication, use of modern IT tools and techniques, optional homework and group work, work organization techniques. The knowledge presented in the lecture is acquired by the students by solving classroom calculation exercises and optional homework. Through homework, they have the opportunity for greater independence as well as deepening their knowledge.

2.4. Support materials

a) Textbooks

Bergman, Lavine, Incropera, Dewitt: Fundamentals of Heat and Mass Transfer, John Wiley & Sons, 2011, ISBN 9780471457282

b) Lecture notes

T. Környey .: Heat transfer, Lecture notes, Műegyetemi Kiadó, 2012

c) Online materials

https://edu.gpk.bme.hu

2.5. Validity of the course description

Start of validity:	2025. February 1.
End of validity:	2029. July 15.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

Learning outcomes are assessed on the basis of two midterm tests (two summative learning performance assessments), optional homework, and active participation in seminars. Homework is optional, it cannot be retaken. It is not possible to retake the midterm evaluations one by one, they can be retaken together at the designated time during the retake period.

3.2 Assessment methods

A. Detailed description of mid-term assessments

Mid-term assessment

type: summative assessment

count: 2

purpose, description: The complex, written way of evaluating the competence elements of the subject and knowledge, ability type in the form of a midterm test. The test basically focuses on the application of the acquired knowledge, so it concentrates on problem recognition and solution. The topics covered in the midterm test are determined by the lecturer of the subject in agreement with the supervisors, the available working time is 90 minutes.

B. Detailed description of assessments performed during the examination period (if relevant)

Elements of the exam:

1. written partial exam
   -
2. oral partial exam
   -
3. practical partial exam
   -
4. inclusion of mid-term results
   -

3.3 The weight of mid-term assessments in signing or in final grading

identifier	weight
Mid-term assessment	100 %

3.4 The weight of partial exams in grade (if relevant)

type	weight
written partial exam	0 %
oral partial exam	0 %
practical partial exam	0 %
inclusion of mid-term results	0 %

3.5 Determination of the grade

grade ● [ECTS]	the grade expressed in percents
very good(5) ● Excellent [A]	above 90%
very good(5) ● Very Good [B]	85% .. 90%
good(4) ● Good [C]	75% .. 85%
satisfactory(3) ● Satisfactory [D]	65% .. 75%
sufficient(2) ● Pass [E]	50% .. 65%
insufficient(1) ● Fail [F]	below 50%

The lower limit specified for each grade already belongs to that grade.

3.6 Attendance and participation requirements

Must be present at at least **0%** (rounded down) of lectures.

At least **70%** the exercises (rounded down) must be actively attended.

3.7 Special rules for improving, retaken and replacement

The special rules for improving, retaken and replacement shall be interpreted and applied in conjunction with the general rules of the CoS (TVSZ).

Need mid-term assessment to individually complete?

NO

The way of retaking or improving a summary assessment for the first time:

the summative assessments can be retaken or improved only combined

Is the retaking-improving of a summary assessment allowed, and if so, than which form:

one single, combined retake or grade-improving exam is possible for all assesments

Taking into account the previous result in case of improvement, retaken-improvement:

out of multiple results, the best one is to be taken into account

3.8 Study work required to complete the course

Activity	hours / semester
participation in contact classes	56
mid-term preparation for practices	14
preparation for summary assessments	32
additional time required to complete the subject	18
summary	**120**

3.9. Validity of subject requirements

Start of validity: 2025. February 1.

End of validity: 2029. July 15.

4. ADDITIONAL INFORMATION

4.1 Primary course

The primary (main) course of the subject in which it is advertised and to which the competencies are related:

Mechanical engineering

4.2 Link to the purpose and (special) compensations of the Regulation KKK

This course aims to improve the following competencies defined in the Regulation KKK>

a) knowledge

- Student has the knowledge of the theories and contexts of fundamental importance in the field of engineering and of the terminology which underpins them.
- Student is familiar with the general and specific mathematical, scientific and social principles, rules, contexts and procedures needed to operate in the field of engineering.

b) ability

- Student has the ability to apply the general and specific mathematical, scientific and social principles, rules, relationships and procedures acquired in solving problems in the field of engineering.
- Student has the ability to approach and solve specific problems within student's field of specialisation in a multi-disciplinary and interdisciplinary manner.

c) attitude

- Student strives to meet and enforce quality standards.
- Student is committed to high quality work and sets an example to student's colleagues in this respect.

d) independence and responsibility

- Student takes responsibility for the sub-processes under student's management.
- Student has the ability to work independently on engineering tasks.

4.3 Prerequisites for completing the course

Knowledge type competencies	
(a set of prior knowledge, the existence of which is not obligatory, but greatly facilitates the successful completion of the subject)	-

Ability type competencies	
(a set of prior abilities and skills, the existence of which is not obligatory, but greatly contributes to the successful completion of the subject)	-