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)

Polymer Materials Science and Engineering ● Polymer Materials Science and Engineering

1.2. Neptun code

BMEGEPTBG01

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)	3	-
exercise	-	-
laboratory exercise	2	coupled

1.5. Type of assessments (quality evaluation)

exam

1.6. ECTS

6

1.7. Subject coordinator

name:	Dr. Mészáros László
post:	associate professor
contact:	meszaros@pt.bme.hu

1.8. Host organization

Department of Polymer Engineering (http://www.pt.bme.hu)

1.9. Course homepage

http://www.pt.bme.hu/tantargy.php?id=117&l=m

1.10. Course language

hungarian, english, german

1.11. Primary curriculum type

mandatory

1.12. Direct prerequisites

Strong prerequisite:	BMEGEMTBGA1
Weak prerequisite:	-
Parallel prerequisite:	-
Milestone prerequisite:	-
Excluding condition:	BMEGEPTAG0P

(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 acquaint students with the structure of polymers as structural materials, the dependence of their properties on the structural structure, temperature, environmental influences, and the peculiarities of their stress-strain relationships. Basic polymer processing technologies such as compounding, extrusion, coextrusion, calendering, injection molding, rotational molding, and composite manufacturing technologies are discussed. In addition, we discuss the application technology of polymers and the possibilities of recycling.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- He is familiar with technical terms related to polymers and their processing techniques.
- He knows the characteristic physical and mechanical properties of polymers.
- He knows the molecular structure and molecular weight characteristics of polymers.
- Understands the basics of making artificial polymers.
- He is aware of the conditions for crystallization of polymers.
- Understands the time and temperature dependence of the mechanical properties of polymers and their response to dynamic stimuli.
- He is aware of the behavior of polymer melts (flow curve, viscosity curve) and the factors influencing it.
- Understands the basics and common features of polymer processing technologies.
- He is knowledgeable about extrusion, calendering, thermoforming, injection molding and hollow body manufacturing technologies.
- Knows the general construction and basic types of injection molding tools.
- He is informed about the materials of polymer matrix composites and the basic manufacturing technologies of composites.
- It systematizes the possibilities of recycling various polymers.

B. Ability

- Use the terms commonly used in polymer manufacturing correctly.
- Selects the right polymer for different applications.
- Calculates the different average molecular weights (Mn, Mw) of polymers.
- Describes the main influencing parameters of polymer production.
- It explores the relationships between crystallinity and crystallization and the physical properties of polymers.
- It describes the long-term behavior of polymers (creep, stress relaxation) with simple qualitative models.
- It distinguishes between Newtonian and non-Newtonian fluids.
- Selects the right manufacturing technology for polymer products with different geometries.
- It determines the most important parameters and their effect on polymer processing.
- Defines the parts and main functions of an injection molding tool.

- Able to produce simple composite parts by manual lamination.
- It distinguishes between recycling techniques for crosslinked and linear polymers.

C. Attitude

- It seeks collaboration with the instructor and fellow students.
- It expands your knowledge of polymer technology by continuously acquiring knowledge.
- Open to the use of information technology tools.
- He is constantly developing the tools he needs to solve problems.
- It strives for an accurate and error-free solution.
- It strives to implement the principles of sustainable development in polymer technology.

D. Independence and responsibility

- He / she independently thinks through the tasks and problems related to polymer technology and solves them based on specific sources.
- He accepts well-founded critical remarks about his work.
- In some situations, as part of a team, you work with your fellow students to solve tasks.
- With his knowledge, he makes a responsible, well-founded decision based on his analyzes.
- It is responsible for the accuracy and usability of the material properties it provides.
- He is committed to the precise execution of measurement and laboratory work.
- Collaborates with the instructor and fellow students to expand knowledge.

2.3. Teaching methodology

The teaching of the subject takes place in the framework of lectures and laboratory practice. The lectures basically introduce students to the information defined by the knowledge competence elements using the technique of frontal education. The application and skill-level acquisition of knowledge takes place in laboratory exercises, different tasks have to be solved in groups. Laboratory sessions promote the application of knowledge and the acquisition of skills at a practical level by presenting what has been said in lectures in practice and performing measurement tasks. Students acquire the competency elements of ability, attitude, and autonomy and responsibility essentially by completing laboratory exercises.

2.4. Support materials

a) Textbooks

J. R. Fried: Polymer Science & Technology, 3rd edition, Prentice Hall, 2014, Upper Saddle River, NJ, ISBN 978-0-13-703955-5.

G. W. Ehrenstein: Polymeric Materials (Structure-Properties-Applications), Carl Hanser Verlag, 2001, Munich, ISBN: 1569903107.

Czvikovszky T., Nagy P., Gaál J.: A polimertechnika alapjai, Műegyetemi Kiadó, Budapest, 2006. ISBN: 9634206212

b) Lecture notes

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c) Online materials

http://www.pt.bme.hu/

2.5. Validity of the course description

Start of validity:	2021. September 1.
End of validity:	2025. July 15.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

In the diligence period: The condition for obtaining a signature at the end of the semester is the successful completion of 10 laboratory practices without exception. At the beginning of the laboratory internships, students write a pop-up ZH, which is considered successful if the student writes it to more than 40%. The student can then take part in the lab exercise. Depending on the result of the incoming ZH, the student may collect points as follows: 41% -70%: 0 points; 71% -85%: 1 point; 86% -100%: 2 points. The subject ends with an oral exam, the success of which is conditional on passing more than 40%. The exam itself is 80 points, so the exam mark is determined on the basis of the following point limits: In case of credit points: 0-40: insufficient; 41-55: sufficient; 56-70: medium; 71-85: good; 86-100: jeles. Based on exam performance only: 0-32: insufficient; 33-44: sufficient; 45-56: medium; 57-68: good; 69-80: excellent. The student receives the grade based on the more favorable scoring system.

3.2 Assessment methods

A. Detailed description of mid-term assessments

Mid-term assessment

type: diagnostic assessment

count: 10

purpose, description: The condition for obtaining a signature at the end of the semester is the successful completion of 10 laboratory practices without exception. A student who does not show up by the start date of the lab will not be able to attend the lab. Only students who have brought the obligatory equipment with them can take part in the laboratory exercises: their own, blank protocol, calculator, identity card. During laboratory internships, students appear prepared based on pre-issued aids. At the beginning, students write a pop-up ZH (level assessment), which is considered successful if the student writes it to more than 40%. The student can then take part in the lab exercise.

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

Elements of the exam:

1. written partial exam

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2. oral partial exam

   obligation: mandatory (partial) exam unit, failing the unit results in fail (1) exam result

   description: In the oral exam, we ask for the material of the whole semester to be counted, ie in addition to the materials of the lectures, we also check the competence elements to be acquired in the laboratory practice. At the beginning of the exam, the student is given 3 questions related to different subject areas, which he or she has an adequate amount of preparation time to answer. The exam can be successful if the student gives meaningful answers to all the questions. Successful completion of the exam requires a performance of more than 40% on the exam.

3. practical partial exam

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4. inclusion of mid-term results

   obligation: optional (partial) exam unit, which can be taken into account only if it is favourable for the student

description:Laboratory points earned during the semester may count towards the exam. In laboratory exercises, depending on the result of the incoming ZH, the student may collect points as follows: 41% -70%: 0 points; 71% -85%: 1 point; 86% -100%: 2 points. The exam itself is 80 points, so the exam mark is determined on the basis of the following point limits: In case of credit points: 0-40: insufficient; 41-55: sufficient; 56-70: medium; 71-85: good; 86-100: jeles. Based on exam performance only: 0-32: insufficient; 33-44: sufficient; 45-56: medium; 57-68: good; 69-80: excellent. The student receives the grade based on the more favorable scoring system.

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

identifier	**weight**
Mid-term assessment	100 %

The condition for signing is that the score obtained in the mid-year assessments is at least **41%**.

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

type	**weight**
written partial exam	0 %
oral partial exam	100 %
practical partial exam	0 %
inclusion of mid-term results	20 %

3.5 Determination of the grade

grade ● [ECTS]	**the grade expressed in percents**
very good(5) ● Excellent [A]	above 91%
very good(5) ● Very Good [B]	86% .. 91%
good(4) ● Good [C]	71% .. 86%
satisfactory(3) ● Satisfactory [D]	55% .. 71%
sufficient(2) ● Pass [E]	41% .. 55%
insufficient(1) ● Fail [F]	below 41%

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

3.6 Attendance and participation requirements

Must be present at at least **70%** (rounded down) of lectures.

At least **100% of** laboratory practices (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).

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

new result overrides previous result

Completion of unfinished laboratory exercises:

missed laboratory practices must be performed in the teaching term at pre-arranged appointment

Repetition of laboratory exercises that performed incorrectly (eg.: mistake in documentation):

incorrectly performed laboratory practice (e.g. Incomplete/incorrect report) can be corrected by repeating the practice

3.8 Study work required to complete the course

Activity	**hours / semester**
participation in contact classes	70
preparation for laboratory practices	14
exam preparation	42
additional time required to complete the subject	50
summary	**176**

3.9. Validity of subject requirements

Start of validity: 2021. September 1.

End of validity: 2025. 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.

b) ability

- Student has the ability to apply an integrated knowledge of machinery, mechanical equipment, systems and processes, materials and technologies for mechanical engineering, and related electronics and information technology.

c) attitude

- Student strives to carry out their work in a complex approach based on a systems and process-oriented thinking.

d) independence and responsibility

- 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)	-