



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Synthesis of polymeric materials [S1TCh2>SMP]

### Course

Field of study

Chemical Technology

Year/Semester

3/5

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

0

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

### Number of credit points

1,00

### Coordinators

dr hab. inż. Agnieszka Marcinkowska prof. PP  
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### Lecturers

### Prerequisites

Student starting this subject should have knowledge of the basic principles of general, organic, physical chemistry, and chemical engineering. Student should have the ability to obtain information from scientific literature, databases and other properly selected sources.

### Course objective

Gaining basic knowledge about polymers, polymer materials, their synthesis (chain and step polymerization reactions, steps of polymerization reactions, kinetics of polymerization), properties and areas of application.

### Course-related learning outcomes

Knowledge:

Student has expanded and well-established knowledge in the field of polymer structure, polymer preparation methods and their properties (K\_W08). The student has a basic knowledge of development trends in the field of polymeric materials and their applications in the plastics industry (K\_W09). The student knows the basic methods used to solve simple tasks in the field of polymer material technology (K\_W15).

## Skills:

Student has the ability to obtain and critically evaluate information from literature and other sources (K\_U01). Student works both individually and in a group (K\_U02). Student distinguishes between types of reactions in obtaining polymers and has the ability to select them for chemical processes (K\_U18).

## Social competences:

Student understands the need of further continuous education in area of polymer chemistry (K\_K01). the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the environment and the associated responsibility for decisions (K\_K02). Students can work in a team and are aware of their responsibility for their work (K\_K03).

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Stationary form: Solving problems during classes. A written colloquium consisting of 4 - 6 open questions concerning the issues presented in the exercises (the student obtains a pass by achieving at least 51% of the points). Online form: Solving problems during classes and oral colloquium (reactions, tasks) conducted in the "live view" mode with the webcam turned on during a direct conversation with the teacher, on the eKursy platform.

## Programme content

Issues: basic knowledge about polymers, polymer materials, their synthesis (chain and step polymerization reactions, steps of polymerization reactions, kinetics of polymerization), properties and areas of application.

## Course topics

Radical polymerization: radical polymerization stages: initiation (and initiators), propagation, termination (types, consequences of chain transfer reactions, regulation of molecular weight, kinetics of free radical polymerization). Ion polymerization (anionic and cationic): initiators, monomers, stages and mechanism of polymerization, living polymerization. Polycondensation: types of polycondensation, comparison of radical polymerization and polycondensation, the most important characteristics and quantities describing the process, equilibrium and non-equilibrium polycondensation, bifunctional and multifunctional polycondensation, Carothers equation. Polyaddition, characteristics, examples. Crosslinking of polymers: crosslinking methods, examples, vulcanization.

## Teaching methods

Auditorium exercises: solving tasks.

## Bibliography

### Basic:

1. Z. Floriańczyk, S. Penczek, *Chemia Polimerów*, t.I i II, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001.
2. W. Szlezyngier, *Tworzywa sztuczne*, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 1996.
3. J. Pielichowski, A. Puszyński, *Technologia tworzyw sztucznych*, WNT, Warszawa 2003.
4. J. Pielichowski, A. Puszyński, *Chemia polimerów*, TEZA, Kraków 2004.
5. J.F. Rabek, *Współczesna wiedza o polimerach*, PWN, Warszawa 2008.
6. B. Łaczyński, *Tworzywa wielkocząsteczkowe: rodzaje i własności*, WNT, Warszawa 1982.

### Additional:

1. I. Gruin, *Materiały polimerowe*, PWN, Warszawa 2003
2. D. Żuchowska, *Polimery konstrukcyjne*, WNT, Warszawa 2000
3. K. Czaja, *Poliolefiny*, WNT, Warszawa 2005
4. *Principles of Polymerization*, 4-th edition, G. Odian, Wiley-Interscience:Hoboken, New York, 2004
5. *Principles of Polymer Chemistry*, 2-nd edition, A.Ravve, Kluwer Academic/Plenum Publishers, New York, 2000
6. *Handbook of radical polymerization*, K. Matyjaszewski, T.P. Dawis, Wiley Interscience, 2002

## Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,50