SYLLABUS OF A MODULE

Polish name of a module	**PRZETWÓRSTWO POLIMERÓW**
English name of a module	**POLYMER PROCESSING**
ISCED classification - Code	0715
ISCED classification - Field of study	*Mechanics and metal trades*
Languages of instruction	*English*
Level of qualification:	*2 – MSc (EQF 7)*
Number of ECTS credit points	*8*
Examination:	*A - assignment*

Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
45	0	75	0	0	0

MODULE DESCRIPTION

MODULE OBJECTIVES

O1. Provide theory of different polymer processing methods and acquire capabilities to adjust processing parameters.

O2. Provide knowledge of plastic part design basics and tool design basics and acquire basic skills in design using a CAD software.

O3. To acquire capabilities to perform simulation of injection moulding process and provide knowledge about computer aided engineering in polymer processing.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of physics, chemistry, mathematics, mechanics and thermodynamics.
2. Fundamentals of materials science.
3. Safety rules during the use of laboratory equipment and technological machines.
4. Capability of using source literature.
5. Capability of individual work and collaboration in a group.
6. Data analysis and presentation of results.

LEARNING OUTCOMES

LO 1 – Knowledge on polymeric materials and their application.
LO 2 – Knowledge on different polymer processing methods - process, tools, products.
LO 3 – Knowledge on plastic part design and tool design basics.
LO 4 - Knowledge on injection moulding simulation method.
LO 5 - Ability to adjust basic processing parameters in selected polymer processing methods.
LO 6 - Ability to design simple injection moulded part.
LO 7 - Ability to perform simulation of conventional injection moulding process.

MODULE CONTENT

Type of classes – lecture	**Number of hours**
Lec 1-2 - Polymers, plastics, blends, composites – materials for polymer processing	**2**
Lec 3-5 - Properties of polymeric materials, testing of plastics	**3**
Lec 6-8 - Injection moulding	**3**
Lec 9-10 - Non-conventional injection moulding processes	**2**
Lec 11 - Metal injection moulding	**1**
Lec 12-13 - Extrusion	**2**
Lec 14 - Extrusion blow moulding	**1**
Lec 15 - Blown film extrusion, coextrusion	**1**
Lec 16 - Calendering	**1**
Lec 17 - Casting of polymer resins, resin infusion process	**1**
Lec 18 - Rotational moulding	**1**
Lec 19- Fiber spinning	**1**
Lec 20 - Compression moulding	**1**
Lec 21 - Thermoforming	**1**
Lec 22 - Welding of plastics	**1**
Lec 23 - Polymer coatings manufacturing	**1**
Lec 24 - EPS products manufacturing, EPS cutting	**1**
Lec 25-26 - Rubber processing	**2**
Lec 27-28 - Rapid Prototyping, Rapid Tooling, Additive Manufacturing in plastics industry	**2**
Lec 29-33 - Plastic part design	**5**
Lec 34-38 - Tool design for polymer processing	**5**
Lec 39-45 - Simulation of polymer processing – basics	**7**
Sum	**45**
Type of classes– laboratory.	**Number of hours**
Lab 1-2 - Identification of polymers	**2**
Lab 3-4 - Melt Flow Rate measurement	**2**
Lab 5-14 - Mechanical and thermal properties of plastics - testing	**10**
Lab 15-19 - Injection moulding	**5**
Lab 20-24 - Extrusion, extrusion blow moulding	**5**
Lab 25-26 - Compression moulding of thermoset resins	**2**
Lab 27-28 - Thermoforming	**2**
Lab 29-30 - EPS (Expanded Polystyrene) product manufacturing and EPS cutting	**2**
Lab 31 - Welding of plastic films and other products	**1**
Lab 32-35 - Silicone mould making	**4**
Lab 36 - Casting of polymer resins	**1**
Lab 37-38 - Resin infusion process	**2**
Lab 39 - Polymer coatings manufacturing by fluidization	**1**
Lab 40-41 - Rubber processing – compression moulding	**2**
Lab 42-43 – 3D printing – Fused Deposition Method	**2**
Lab 44-50 - Plastics part design (e.g. injection moulded part) – computer laboratory	**7**
Lab 51-60 - Tool design (e.g. injection mould) – computer laboratory	**10**
Lab 61-75 - Simulation of injection moulding – computer laboratory	**15**
Sum	**75**

TEACHING TOOLS

1. - lecture with the use of multimedia presentations
2. - stands equipped with machines and other equipment for polymer processing and testing
3. - instructions to laboratory exercises
4. - computer laboratory, software for injection moulding simulation, software for plastic part design and tool design

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for laboratory exercises
F2. - assessment of the ability to apply the acquired knowledge while doing the exercises
F3. - evaluation of reports on the implementation of exercises covered by the curriculum
F4. - assessment of activity during classes
S1. - assessment of the ability to solve the problems posed and the manner of presentation obtained results - pass mark *
S2. - assessment of mastery of the teaching material being the subject of the lecture - tests

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
1. Contact hours with teacher		
1.1	Lectures	45
1.2	Tutorials	0
1.3	Laboratory	75
1.4	Seminar	0
1.5	Project	0
1.6	Consulting teacher during their duty hours	5
1.7	Examination	0
	Total number of contact hours with teacher:	125
2. Student's individual work		
2.1	Preparation for tutorials and tests	0
2.2	Preparation for laboratory exercises, writing reports on laboratories	25
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	25
2.5	Preparation for examination	0
2.6	Individual study of literature	25
	Total number of hours of student's individual work:	75
	Overall student's workload:	200
Overall number of ECTS credits for the module		8 ECTS
Number of ECTS points that student receives in classes requiring teacher's supervision:		5 ECTS
Number of **ECTS** credits acquired during practical classes including laboratory exercises and projects:		4 ECTS

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Osswald T.A., Baur E., Brinkmann S., Oberbach K., Schmachtenberg E.: International Plastics Handbook, Hanser Publishers, Munich 2006.
2. Rauwendaal C.: Understanding Extrusion. 2nd Edition, Hanser Publishers, Munich, Hanser Publications, Cincinnati, 2010.
3. Davis, B., Gramann, P., Rios, A., Osswald, T.: Compression Molding, HANSER 2003.
4. James L. Throne: Understanding Thermoforming, HANSER 2008
5. Autodesk Moldflow Insight. Design and Concept. Empimeth Consult. Lublin 2010.
6. Glenn L. Beall, James L. Throne: Hollow Plastic Parts: Design and Manufacture, HANSER 2004.
7. Malloy R.A.: Plastic Part Design for Injection Molding. An Introduction, HANSER 2011.
8. Menges G., Michaeli W., Mohren P.: How to Make Injection Moulds, Hanser Publishers, Munich 2001.
9. Stoeckhert, K. Menning, G.: Mould-Making Handbook, Hanser Publishers, Munich 1998.
10. Beaumont J.P.: Runner and Gating Design Handbook. Tools for Successful Injection Moulding, Hanser, Munich, Cincinnati, 2004.
11. Michaeli W.: Extrusion dies for plastics and rubber: design and engineering computations, Carl Hanser Verlag, Munich, 2003.

MODULE COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

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