



# POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

## COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

### 1. GENERAL COURSE INFORMATION

<b>1.1 Course name</b>	Technology II			
<b>1.2 Study program/s</b>	Undergraduate professional study Sustainable Development			
<b>1.3 Course status (O,E)</b>	O	<b>1.6 Mode of instruction (number of hours)</b>	<b>Lectures</b>	30
<b>1.4 Course code</b>	4044		<b>Exercises</b>	30
<b>1.5 Course abbreviation</b>	T II		<b>Seminars</b>	
<b>1.6 Semester</b>	4		<b>E-learning</b>	
<b>1.7 ECTS</b>	5	<b>1.7 Place and time of instruction</b>	Premises of the Polytechnic of Međimurje in Čakovec, according to the schedule published on the website.	

### 2. TEACHING STAFF

<b>2.1 Course leader/s-title</b>	dr.sc. Mario Šercer	<b>contact</b>	mario.sercer@mev.hr
		<b>contact</b>	
<b>2.2 Assistant/s- title</b>		<b>contact</b>	
		<b>contact</b>	
<b>2.3 Instruction held by- title</b>		<b>contact</b>	

### 3. COURSE DESCRIPTION

<b>3.1 Course goals</b>	Students will get acquainted with casting technology, polymer processing procedures, corrosion protection procedures and the basics of additive production procedures.							
<b>3.2 Prerequisites</b>	Passed the course Technology of Material Resources and attended the course Technology I.							
<b>3.3 Course outcomes</b>	<p>After successfully completing the course, students will be able to:</p> <p>I1 - understand melting, molding, casting and solidification;            I2 - distinguish basic casting procedures and classification of casting procedures;            I3 - define the basic types of polymeric materials and their properties;            I4 - distinguish basic polymer processing procedures;            I5 - identify corrosion processes and classify corrosion protection methods;            I6 - analyze the possibilities and needs of the application of additive production procedures in the context of modern development and production.</p>							
<b>3.4 Course content</b>	Through the course, students will be introduced to the basics of casting technology; by casting processes into disposable and permanent molds, melting and preparation of the melt for casting. They will get acquainted with the basic types of polymeric materials, their properties and the basics of polymer processing. They will also get acquainted with the most common forms of corrosion damage to mechanical structures and modern methods used in corrosion protection technologies. Introduction to additive production and its application.							
<b>3.5 Types of coursework</b>	x	Lectures	x	Exercises		Blended e-learning	Individual activities	Laboratory

		Seminars and workshops	x	Distant learning	x	Field classes		Multimedia and network		Mentorship																																																																						
		Other																																																																														
<b>3.6 Language of instruction</b>																																																																																
<b>3.7 Monitoring students' work (enter the number of ECTS credits for each activity so that the total number of ECTS credits is equal to the total ECTS value of the course, 1 ECTS = 30 hours)</b>	2	Class attendance		Seminars		Essay																																																																										
		Class activity		Project		Report/paper																																																																										
	2	Midterm exams		Practical task		Continuous knowledge check																																																																										
	2	Written exam		Experimental work																																																																												
	1	Oral exam		Research																																																																												
<b>3.8 Assessment and evaluation of students' work during classes and at the final exam</b>	<table border="1"> <thead> <tr> <th>Activity specification</th> <th>Percent %</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td colspan="3" style="text-align: center;">Assessment during instruction</td> </tr> <tr> <td>Attendance</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Class activity</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Midterm exam 1</td> <td>20%</td> <td>20</td> </tr> <tr> <td>Midterm exam 2</td> <td>20%</td> <td>20</td> </tr> <tr> <td>Midterm exam 3</td> <td>20%</td> <td>20</td> </tr> <tr> <td colspan="3" style="text-align: center;"><i>Exam assessment for the students who failed to fulfil all the obligatory requirements during the semester</i></td> </tr> <tr> <td>Written exam</td> <td>30%</td> <td>30</td> </tr> <tr> <td><b>Total:</b></td> <td><b>100%</b></td> <td><b>100</b></td> </tr> </tbody> </table>										Activity specification	Percent %	Points	Assessment during instruction			Attendance	5%	5	Class activity	5%	5	Midterm exam 1	20%	20	Midterm exam 2	20%	20	Midterm exam 3	20%	20	<i>Exam assessment for the students who failed to fulfil all the obligatory requirements during the semester</i>			Written exam	30%	30	<b>Total:</b>	<b>100%</b>	<b>100</b>																																								
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<b>3.10 Specific features related with taking the course</b>	<p>A student achieved a positive grade if he / she regularly attended classes (10%), passed the written part of the exam (60%) and the oral part of the exam (30%). Students who did not take the colloquium access the written part of the exam where all learning outcomes are checked. Successfully solved three colloquia during the semester are a substitute for the written part of the exam. The final grade is obtained in the oral part of the exam. All learning outcomes are checked in the oral part of the exam.</p>																																																																															

<b>3.11 Students obligations</b>	<p>Full-time students are required to attend at least 70% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. Part-time students are required to attend at least 30% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. If the student has not fulfilled all the obligations set by the course, he is obliged to attend the lectures again and meet the conditions for taking the exam.</p> <p>Attendance can be offset by online tuition, organised webinars and added assignments given by teachers. One lesson lasts 45 minutes, and several hours form a teaching unit. Absence from one teaching unit is counted as one absence. Delays and apologies are recorded separately. In that case, if the student missed more than 50% of classes, and has a justifiable reason/apology, the request should be submitted to the Department Council, which then decides on the justification of student absences with the obligatory opinion of the course leader.</p>	
<b>3.12 Written assignments</b>		
<b>3.13 Required reading</b>	<ol style="list-style-type: none"> <li>1.</li> <li>2.</li> <li>3.</li> <li>4.</li> </ol>	<p>Bauer, B, Mihalic Pokopec, I: Osnove tehnologije lijevanja, FSB, Zagreb, 2017.</p> <p>Čatić, I.: Uvod u proizvodnju polimernih tvorevina, Društvo plastičara i gumaraca, Zagreb, 1990.</p> <p>Juraga, I., Alar, V., Stojanović, I.: Korozija i zaštita premazima, FSB, Zagreb, 2014.</p> <p>Godec, D., Šercer, M.: Aditivna proizvodnja, FSB, Zagreb, 2015.</p>
<b>3.14 Additional reading</b>	<ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol>	<p>Roberge, P.R.: Handbook of corrosion engineering, McGraw Hill, New York, 1999.</p> <p>Diegel et al., A practical guide to design for additive manufacturing, Springer, 2020.</p>
<b>4 ADDITIONAL COURSE INFORMATION</b>		
<b>4.1 Quality control</b>	<p>The quality of the program, teaching process, teaching skills and level of mastery of the material will be established by conducting a written evaluation based on questionnaires, and in other standardised ways and in accordance with the by-laws of the Polytechnic of Međimurje in Čakovec.</p>	
<b>4.2 Contact the teacher</b>	<p>Students can contact the teacher during the office hours and during classes, while for short questions and explanations they can contact him/her any day during working hours by coming in person or by landline. It is also possible to ask questions by e-mail, which will be answered in 48 hours at the latest. It is desirable for students to come as often as possible for any possible questions during the teacher's office hours.</p>	
<b>4.3 Information about the course</b>	<p>It is the obligation of each student to be regularly informed about the course. All notifications about the classes or possible postponement of classes will be posted on the bulletin board and on the website of the Polytechnic at least 24 hours in advance.</p>	

<b>4.4 Course contribution to the study program</b>	<p>Use new technologies and techniques as part of the lifelong learning process</p> <p>Critically evaluate arguments, assumptions and data in order to form an opinion and contribute to the solution of the problem</p> <p>Apply the basics of thermoenergetics, thermodynamics and hydromechanics in the spatial design of thermodynamic systems</p> <p>Develop a technical plan in the field of design of mechanical thermotechnical systems</p> <p>Analyze the basic elements and networks in electrical engineering and justify the use of non-renewable and renewable energy sources, applicable to thermotechnical systems</p>
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**5. ANALYSIS OF COURSE TOPICS (the number of hours is equal to the number of lectures and exercises of the course)**

<b>LECTURES</b>				
<b>Hours</b>	<b>Topic and description</b>	<b>Method</b>	<b>Learning outcomes</b>	<b>Course outcome</b>
		<ul style="list-style-type: none"> <li>• Direct teaching (lecture, instruction, pp presentation)</li> <li>• Discovery learning (individual, lead, discussion)</li> <li>• Group learning</li> <li>• Case study</li> <li>• Field classes...</li> </ul>		
1.	Foundry as a production process. Basic terms. Division of casting processes.	direct teaching	Explain the basic concepts in foundry. Distinguish divisions of casting procedures.	11, 12
2.	Casting in the sand. Shell casting, precision casting, casting in full molds.	direct teaching	Define the basic properties of an individual casting process in disposable molds.	12
3.	Casting into permanent molds.	direct teaching	Define the basic properties of an individual casting process in permanent molds.	12
4.	Melting. Solidification. Defects in castings.	direct teaching	Explain the melt preparation process. Define solidification of alloys. Distinguish defects on castings.	11, 12
5.	Introduction and historical development of polymer products production. Polymer division. Mechanical and thermal properties of polymers.	direct teaching	Distinguish polymeric materials, define their basic mechanical and thermal properties.	13

6.	Continuous processing of polymer products.	direct teaching	Distinguish continuous polymer processing procedures.	14
7.	Cyclic processes for processing polymer products.	direct teaching	Distinguish cyclic polymer processing procedures.	14
8.	Application of polymer formations.	direct teaching	Define and explain the field of application of polymer products.	13, 14
9.	Chemical and electrochemical corrosion. Corrosive environments.	direct teaching	Explain chemical and electrochemical corrosion. Distinguish corrosive environments.	15
10.	Occurrences of corrosion damage.	direct teaching	Define the basic characteristics of the manifestations of corrosion damage.	15
11.	Coating protection. Metallic and non-metallic coatings. Basics, coating division, areas of application.	direct teaching	Distinguish between metallic and non-metallic coatings and their areas of application.	15
12.	Electrical corrosion protection methods. Corrosion behavior of important construction materials.	direct teaching	Explain electrical methods of corrosion protection. Define the corrosion behavior of important construction materials.	15
13.	Introduction to additive technologies. Basic principles of additive technologies.	direct teaching	Define additive technology and basic principles.	16
14.	Additive production processes (3DP, FDM, SLA, SLS, DMLS).	direct teaching	Distinguish individual additive production technology.	16
15.	Selection of optimal additive technology process, economic effect of additive production.	direct teaching	Explain the application and economic effect of additive production.	16
<b>EXERCISES/ SEMINARS</b>				
<b>Hours</b>	<b>Topic and description</b>	<b>Method</b>	<b>Learning outcomes</b>	<b>Course outcome</b>

		<ul style="list-style-type: none"> <li>• Direct teaching (lecture, instruction, pp presentation)</li> <li>• Discovery learning (individual, lead, discussion)</li> <li>• Group learning</li> <li>• Case study</li> <li>• Field classes...</li> </ul>		
1.	Introduction to casting technology. Advantages and disadvantages. The main partners of the foundry industry.	direct teaching	Explain the importance of the foundry industry and the application of castings.	I1
2.	Modeling and inflow system.	discovery learning	Explain the basic principles of model construction and inflow system.	I1, I2
3.	Preparation of melt and melting furnace.	direct teaching	Define melt preparation for gray and ductile iron and Al alloys. Distinguish types of melting furnaces.	I1
4.	Visit to the Ferro-preis foundry.	field work	Explain the principles of molding and casting.	I1, I2
5.	Mid-term exam I	Checking outcomes I1 and I2.		
6.	Introduction to the types of polymeric materials.	direct teaching	Define the basic properties of polymeric materials and method of production.	I3
7.	Plastomer injection molding.	direct teaching	Define plastomer injection molding.	I4
8.	Additive processes for the production of polymer products.	direct teaching	List additive processes for the production of polymeric products.	I4
9.	Visit to firm Plastometalik.	field work	Explain the production and application of polymers.	I3, I4
10.	Mid-term exam II	Checking outcomes I1 and I2.		
11.	Occurrences of corrosion.	direct teaching	Distinguish the manifestations of corrosion.	I5
12.	Methods of protection of mechanical structures.	direct teaching	Define corrosion protection methods.	I5

<b>13.</b>	Work on Stratasys F900.	discovery learning	Explain the FDM procedure.	16
<b>14.</b>	Work on EOS M290.	discovery learning	Explain the DMLS procedure.	16
<b>15.</b>	Mid-term exam III	Checking outcomes I1 and I2.		