Kielce University of Technology

FACULTY OF MECHATRONICS AND MECHANICAL ENGINEERING

Annex 9
to the Rector's Ordinance No. 35/19
of 12 June 2019

COURSE SPECIFICATION

Course code	**M#1-S1-ME-210a**
Course title in Polish	**Podstawy Szybkiego Prototypowania**
Course title in English	**Fundamental of Rapid Prototyping**
Valid from (academic year)	**2019/2020**

GENERAL INFORMATION

Programme of study	**MECHANICAL ENGINEERING**
Level of qualification	**first-cycle**
Type of education	**academic**
Mode of study	**full-time**
Specialism	**all**
Department responsible	**Department of Manufacturing Engineering and Metrology**
Course leader	**dr hab. Inż. Jerzy Bochnia, prof PŚk**
Approved by	

COURSE OVERVIEW

Course type	**basic**
Course status	**elective**
Language of instruction	English
Semester of delivery	**semester 2**
Pre-requisites	**None**
Examination required (YES/NO)	NO
ECTS value	**2**

Mode of instruction	**lecture**	**class**	**laboratory**	**project**	**seminar**
No. of hours per semester	**15**		**15**		

LEARNING OUTCOMES

Category of outcome	Out-come code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	Has ordered knowledge of computer science and graphics engineering and modern information technologies assisting in solving various types of issues engineering related to mechanics and machine construction.	MiBM1_W05
	W02	Has detailed knowledge of part manufacturing techniques machines, including subtractive and non-usable techniques, methods bonding materials, taking into account additive and laser technologies, and issues of rapid prototyping and reverse engineering, also has basic knowledge on the construction of various types of systems used for processing and shaping of materials	MiBM_W10
Skills	U01	Can work individually and in a team; can estimate time needed to complete the commissioned task; is able to establish a work schedule ensuring meeting deadlines.	MiBM1_U20
	U02	Has the ability to self-educate, to solve and implementation of new tasks and improvement of professional competences.	MiBM1_U21
Competence	K01	He is aware of the responsibility for his own work, he understands the need to submit to the rules of working in a team and taking responsibility for jointly implemented works.	MiBM1_K04
	K02	Is aware of the social role of a technical university graduate and understands the need to communicate to the public in comprehensible manner of information on the achievements related to the field of study mechanics and mechanical engineering.	MiBM1_K06

COURSE CONTENT

Type of instruction*	Topics covered
lecture	The role of rapid prototyping in the preparation and implementation of a new product for production. General characteristics of rapid prototyping methods. Construction and principle of operation technological machines (3D printers) used in additive technologies. Characteristics of technologies using liquid resins, e.g. stereolithography (SLA) and photo-curable resins, e.g. PolyJet. Characteristics of technologies using powders, e.g. selective laser sintering (SLS), consolidation of powders with a binder (3D-Printing), selective laser melting (SLM). Characteristics of the technology of "extruded" melt deposition material (FDM) and other technologies. Types of materials used in additives technologies and their physical properties

laboratory	Overview of health and safety rules, organization of laboratory work. Characteristics of the applied in the laboratory of additive technologies and the principles of operation of individual laboratory devices. Selection of a 3D element saved in a file with the extension * stl. Performing the following laboratory exercises: 1. Preparation for operation of the device in 3DP technology. Getting to know the ZPrint ™ Software and the user's manual. 2. Preparation for operation of the device in PolyJet Matrix technology. Acquaintance with Objet Studio software and user manual. 3. Preparation for operation of the device in SLS technology. Getting to know the software and the user manual. 4. Preparation for operation of the device in FDM technology. Getting to know the Makerbot software and the user manual. 5. Loading the data (selected 3D model), placing it on the work platform and preparing for 3D printing. Preparation of a solid model in a selected technology. Finishing the model.

*) Please delete rows in the table above that are not applicable.

ASSESSMENT METHODS

Outcome code	Methods of assessment *(Mark with an X where applicable)*					
	Oral examination	Written examination	Test	Project	Report	Other
W01			X			
W02			X			
U01			X		X	
U02					X	
K01					X	X
K02						X

ASSESSMENT TYPE AND CRITERIA

Mode of instruction*	Assessment type	Assessment criteria
lecture	**non-examination assessment**	*The pass mark is a minimum of 50% of test*
laboratory	non-examination assessment	Attendance. Obtaining at least 50% of points from the final test Obtaining positive ratings from all reports.

*) Please delete rows in the table above that are not applicable.

OVERALL STUDENT WORKLOAD

ECTS weighting								
	Activity type	**Student workload**					**Unit**
1.	Scheduled contact hours	L	C	Lab	P	S	h
		15		15			
2.	Other contact hours (office hours, examination)	2		2			h
3.	**Total number of contact hours**	**34**					h
4.	**Number of ECTS credits for contact hours**	**1,4**					ECTS

5.	**Number of independent study hours**	**16**	h
6.	**Number of ECTS credits for independent study hours**	**6**	ECTS
7.	**Number of practical hours**	**25**	h
8.	**Number of ECTS credits for practical hours**	**1**	ECTS
9.	**Total study time**	**50**	h
10.	**ECTS credits for the course** *1 ECTS credit = 25-30 hours of study time*	**2**	ECTS

READING LIST

1. Chlebus E.: Innowacyjne Technologie Rapid Prototyping - Rapid Tooling w rozwoju produktu. Oficyna wydawnicza Politechniki Wrocławskiej, 2003
2. Chlebus E.: Techniki komputerowe Cax w inżynierii produkcji. Warszawa 2000
3. Przybylski W., Deja M.: Komputerowo wspomagane wytwarzanie maszyn – podstawy i zastosowanie, WNT, Warszawa 2007.
4. Bochnia J.: Wybrane właściwości fizyczne materiałów otrzymywanych technologiami przyrostowymi. Wydawnictwo Politechniki Świętokrzyskiej, Kielce 2018.
5. Instrukcje obsługi drukarek 3D: Connex 350, Formiga P100, ZPrinter 650, Dimension 1200ES.
6. Artykuły naukowo techniczne z czasopism polskich i zagranicznych.