

MODULE DESCRIPTION

Module code	Z-ZIP2-0402
Module name	Zintegrowane systemy wytwarzania
Module name in English	Integrated Manufacturing Systems
Valid from academic year	2016/2017

A. MODULE PLACEMENT IN THE SYLLABUS

Field of study	Management and Production Engineering
Level of education	2nd degree <i>(1st degree / 2nd degree)</i>
Studies profile	General <i>(general / practical)</i>
Form and method of conducting classes	Full-time <i>(full-time / part-time)</i>
Specialisation	All
Unit conducting the module	The Department of Manufacturing Engineering and Metrology
Module co-ordinator	Edward Miko, PhD hab., Eng., Professor of the University
Approved by:	

B. MODULE OVERVIEW

Type of subject/group of subjects	Basic <i>(basic / major / specialist subject / conjoint / other HES)</i>
Module status	Compulsory <i>(compulsory / non-compulsory)</i>
Language of conducting classes	English
Module placement in the syllabus - semester	1st semester
Subject realisation in the academic year	Summer semester <i>(winter semester/ summer)</i>
Initial requirements	No requirements <i>(module codes / module names)</i>
Examination	No <i>(yes / no)</i>
Number of ECTS credit points	2

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	15		15		

C. TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	The aim of the subject is to familiarize students with automation and robotization of production, as well as transport systems and tool systems used in production. Familiarization with CIM systems.
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Effect symbol	Teaching results	Teaching methods (l/lab/p/other)	Reference to subject effects	Reference to effects of a field of study
W_01	The student has the knowledge within the scope of technological structure and possibilities for automation of processing stations and flexible processing systems.	l/lab	K_W10 K_W11	T2A_W04 T2A_W05
W_02	The student has the knowledge within the scope of direct numerical control (DNC) and computer integrated manufacturing.	l/lab	K_W10 K_W11	T2A_W04 T2A_W05
W_03	The student has the knowledge within the scope of storing and transporting the used flexible manufacturing systems.	l/lab	K_W10 K_W11	T2A_W04 T2A_W05
U_01	The student knows how to send the programme to the controller of the machine tool. The student knows how to define and edit tools in the table of CNC machine tools. The student knows how to prepare the tool storage for a particular technological task	l/lab	K_U03 K_U04	T2A_U08 T2A_U15 T2A_U17 T2A_U03 T2A_U08
U_02	The student knows how to perform the procedure of editing, testing and launching the processing programme for the machine tool. The student is able to perform to automated loading of the tool to the spindle of the CNC milling center. The student knows how to create, define, and launch the automated measurement of tool parameters. The student knows how to programme the turrent and measure the parameters of tools with the measuring probe.	l/lab	K_U03 K_U04	T2A_U08 T2A_U15 T2A_U17 T2A_U03 T2A_U08
U_03	The student knows how to create the geometry of an object, prepare the processing technology, and generate the processing programme.	l/lab	K_U03 K_U04	T2A_U08 T2A_U15 T2A_U17 T2A_U03 T2A_U08
K_01	The student is aware of the meaning of professional behavior and compliance with professional ethics.	l/lab	K_K03	T2A_K03 T2A_K05 T2A_K07 T2A_U19
K_02	The student is aware of the necessity of automation and robotization development in the modern production systems.	l/lab	K_K01	T2A_K01 T2A_K06

Teaching contents:

1. Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
1	Computerized Numerical Control - CNC, Direct numerical control - DNC.	W_01

		W_02 K_02
2	The structure of the autonomous machining station. Transport and storage of workpieces in the autonomous machining station. Transport and tools storage in the autonomous machining station	W_01 W_03 K_01
3	A device for manipulating workpieces. The instrumentation in flexible manufacturing systems.	W_01 W_03
4	Numerically controlled machine tools and CNC machining centers. Cutting tools and tooling systems used in numerically controlled machine tools and CNC machining centers.	U_01
5	Flexible manufacturing systems. Flexible automation individual production and small series production - basic concepts, development factors.	W_01 W_03
6	The structure of a flexible machining system. The structure of the autonomous station machining. The movement of the workpieces in a flexible manufacturing systems. The flow system of tools in flexible manufacturing systems.	W_01 W_03 K_01
7	The use of industrial robots in flexible automated production. Automatic monitoring of tools, workpieces and machine tools in machining processes	W_01 W_03 K_01
8	Computer integration of production. The concept and architecture of CIM systems. The role of databases and computer networks in the integration of production.	W_02 K_02

2. Teaching contents as regards classes

Class number	Teaching contents	Reference to teaching results for a module

3. Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module
1	Introduction to practical classes Presentation of the rules for conducting and passing the laboratory classes. Familiarization with the health and safety rules in the laboratory. Description of the subject of practical classes. Introduction and presentation of the interface of SolidEdge software.	W_03
2	Creating a 3D model of an object with SolidEdge according to the instructions of the lecturer. Preparation of processing technology, selection of machine tool, tools, the mounting system, and the parameters of processing.	W_03 U_03 K_01
3	Introduction to designing in Mastercam X4 software. Mastercam interface. The most important interface elements. Making use of the Design module to create 2D and 3D geometry. Working in 3D environment, rules for creating basic construction plans, changing plans, and transformation. Blocks manager, working on imported blocks.	U_03 K_02
4	Preparation of a technological process in CAM system of an object created with SolidEdge; selection of output material; dividing the process into operation, treatments, shifts, settings, determining the processing bases and the mounting method, working with the tool manager; selection of machining tools, creating new tools, attributing parameters of machining.	W_03 U_01

5	Preparation of processing programme of details according to the drawing based on Mastercam X4. Selection of post-processor. Generation of NC code.	U_01 U_03
6	Familiarizing students with the software Programming Station iTNC 530. Presentation of the basic features of the programme, familiarizing with the interface and operation of the programme.	U_01
7	Transmission of the programme prepared in CAM system to the controller of the machine tool. Preparation of the machine tool to perform the programme, simulation, programme testing.	U_01 K_01
8	Examination.	

4. The characteristics of project assignments

The methods of assessing teaching results

Effect symbol	Methods of assessing teaching results <i>(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)</i>
W_01	A written exam consisting of 5 questions from the scope of knowledge concerning the material presented during lectures. Student's grade depends on the number of points gathered during the exam. A positive grade requires 3 points. The very good grade requires 4.5÷5 points.
W_02	A written exam consisting of 5 questions from the scope of knowledge concerning the material presented during lectures. Student's grade depends on the number of points gathered during the exam. A positive grade requires 3 points. The very good grade requires 4.5÷5 points.
W_03	A written exam consisting of 5 questions from the scope of knowledge concerning the material presented during lectures. Student's grade depends on the number of points gathered during the exam. A positive grade requires 3 points. The very good grade requires 4.5÷5 points.
U_01	Elaboration of reports from each laboratory classes. A final test in form of 5 questions covering the scope of skills and knowledge acquired during the laboratory classes. The scale of grades is the same as for the lectures.
U_02	Elaboration of reports from each laboratory classes. A final test in form of 5 questions covering the scope of skills and knowledge acquired during the laboratory classes. The scale of grades is the same as for the lectures.
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K_01	Supervision of students works during laboratory classes.
K_02	Supervision of students works during laboratory classes.

D. STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	Student's workload
1	Participation in lectures	15
2	Participation in classes	
3	Participation in laboratories	15
4	Participation in tutorials (2-3 times per semester)	10
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	
8		
9	Number of hours requiring a lecturer's assistance	40 <i>(sum)</i>
10	Number of ECTS credit points which are allocated for assisted work <i>(1 ECTS point=25-30 hours)</i>	1.3
11	Unassisted study of lecture subjects	8
12	Unassisted preparation for classes	
13	Unassisted preparation for tests	10
14	Unassisted preparation for laboratories	12
15	Preparing reports	10
15	Preparing for a final laboratory test	6
17	Preparing a project or documentation	
18	Preparing for an examination	
19		
20	Number of hours of a student's unassisted work	46 <i>(sum)</i>
21	Number of ECTS credit points which a student receives for unassisted work <i>(1 ECTS point=25-30 hours)</i>	1.7
22	Total number of hours of a student's work	86
23	ECTS points per module <i>1 ECTS point=25-30 hours</i>	2
24	Work input connected with practical classes <i>Total number of hours connected with practical classes</i>	43
25	Number of ECTS credit points which a student receives for practical classes <i>(1 ECTS point=25-30 hours)</i>	1.5

E. LITERATURE

Literature list	<ol style="list-style-type: none"> 1. Benhabib B., <i>Manufacturing: Design, Production, Automation, and Integration (Manufacturing Engineering and Materials Processing)</i>, 1st Edition. 2. Rembold U., <i>Computer Integrated Manufacturing And Engineering</i>, 1st Edition. 3. Groover M.P., <i>Automation, Production Systems, and Computer - Integrated Manufacturing</i>, 3rd Edition.
Module website	