MODULE DESCRIPTION

Module code	**Z-ZIP-0118**
Module name	**Technologie laserowe i plazmowe**
Module name in English	**Laser and Plasma Technologies**
Valid from academic year	**2016/2017**

A. MODULE PLACEMENT IN THE SYLLABUS

Field of study	**Management and Production Engineering**
Level of education	**2nd degree** *(1st degree / 2nd degree)*
Studies profile	**General** *(general / practical)*
Form and method of conducting classes	**Full-time** *(full-time / part-time)*
Specialisation	**All**
Unit conducting the module	**The Department of Automation and Robotics CLTM**
Module co-ordinator	
Approved by:	

B. MODULE OVERVIEW

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

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	**15**		**10**		

C. TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	To provide students with the knowledge of the classification, design and applications of lasers and laser-related technologies. To provide student with hands-on experience in laser cutting, welding, cladding and heat treatment with the use of laser machines in the laboratory

Effect symbol	Teaching results	Teaching methods *(l/c/lab/p/other)*	Reference to subject effects	Reference to effects of a field of study
W_01	Has a knowledge of modern production techniques which use lasers and support equipment – coordinate tables, industrial robots	l/lab	K_W10	T2A_W04
W_02	Has a knowledge of the opportunities and methods for laser assembly programming and incorporating them into the production management IT systems	l/lab	K_W04	T2A_W03 S2A_W06
U_01	Can use the knowledge of basic sciences to develop modern production engineering solutions, including automatic control methods and state-of-the-art technologies	l/lab	K_U03	T2A_U08 T2A_U15 T2A_U17
U_02	Can independently broaden his/her knowledge concerning the development of production systems	l/lab	K_U07	T2A_U05 T2A_U09
K_01	Is aware of the relationship between engineering activity focused on production process upgrade and the development of regional business	l/lab	K_K02	T2A_K02 T2A_K04 T2A_U19

Teaching contents:

1. Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
1	Introduction. Brief historical outline of the development of lasers. Factors boosting the development of laser technology. Basic definitions: laser, coordinate measuring table, manipulator, robot.	W_01 W_02 U_01 U_02 K_01
2	Basic systems and assemblies of an industrial laser machine. Flow diagram. Flow diagram of logical relationships between the laser system assemblies. Classification of lasers by intended use, laser beam generation mode, head and table drive.	W_01 W_02 U_01 U_02 K_01
3	Classification and description of laser technologies in industrial applications: cutting, welding, cladding, heat treatment.	W_01 W_02 U_01 U_02 K_01
4	Plasma technologies – description, properties, characteristics, basic technologies.	W_01 W_02 U_01 U_02 K_01
5	Plasma technology applications, examples, selection criteria, parameters.	W_01 W_02 U_01 U_02

		K_01
6	Other (non-industrial) applications of lasers.	W_01 W_02 U_01 U_02 K_01
7	Presentation and discussion of video materials about laser industrial applications and plasma technologies.	W_01 W_02 U_01 U_02 K_01
8	Written assessment of students' knowledge (a test).	

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 laboratory class and safety rules. Laser and X-Y coordinate table programming.	W_01 W_02 U_01 U_02 K_01
2	Laser cutting – preparing and programming table movements.	W_01 W_02 U_01 U_02 K_01
3	Laser welding – selecting parameters and programming table movements.	W_01 W_02 U_01 U_02 K_01
4	Surface heat treatment – selecting parameters and programming table movements.	W_01 W_02 U_01 U_02 K_01
5	Laser-industrial robot coordination.	W_01 W_02 U_01 U_02 K_01

4. The characteristics of project assignments

The methods of assessing teaching results

Effect symbol	**Methods of assessing teaching results** *(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)*
W_01	Test, laboratory reports – discussion.
W_02	Test, laboratory reports – discussion.
U_01	Laboratory reports – discussion.
U_02	Laboratory reports – discussion.
K_01	Laboratory reports – discussion.

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	**10**
4	Participation in tutorials (2-3 times per semester)	**2**
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	
8		
9	**Number of hours requiring a lecturer's assistance**	**27** *(sum)*
10	**Number of ECTS credit points which are allocated for assisted work** *(1 ECTS point=25-30 hours)*	**1**
11	Unassisted study of lecture subjects	**10**
12	Unassisted preparation for classes	
13	Unassisted preparation for tests	
14	Unassisted preparation for laboratories	**6**
15	Preparing reports	**8**
15	Preparing for a final laboratory test	**4**
17	Preparing a project or documentation	
18	Preparing for an examination	
19		
20	**Number of hours of a student's unassisted work**	**28** *(sum)*
21	**Number of ECTS credit points which a student receives for unassisted work** *(1 ECTS point=25-30 hours)*	**1**
22	**Total number of hours of a student's work**	**55**
23	**ECTS points per module** *1 ECTS point=25-30 hours*	**2**
24	**Work input connected with practical classes** *Total number of hours connected with practical classes*	**30**
25	**Number of ECTS credit points which a student receives for practical classes** (1 ECTS point=25-30 hours)	**1**

E. LITERATURE

Literature list	1. Steen W.M., Mazumder J., *Laser Material Processing*. 4th ed. London: Springer; 2010. 2. Ion J.C., *Laser Processing of Engineering Materials: Principles, Procedure and Industrial Application.* 1st ed. Amsterdam: Elsevier; 2005. 3. Chrissolouris G., *Laser Machining. Theory and Practice.* 1st ed. New York: Springer-Verlag; 1991. 4. Ready J.F., *LIA Handbook of Laser Materials Processing.* 1st ed. Orlando: Laser Institute of America; 2001. 5. Burakowski T., Wierzchoń T., *Inżynieria powierzchni metali,* WNT, Warszawa 1995. 6. Klimpel A., *Spawanie zgrzewanie i ciecie metali,* Wyd. WNT, 1999.

	7. Klimpel A., *Napawanie i natryskiwanie cieplne,* Wyd. WNT, 1999. 8. Kusiński J., *Lasery i ich zastosowanie w inżynierii materiałowej,* Wyd. Nauk. Akapit, 2000. 9. Ziętek B., *Lasery*, Wyd. Naukowe Uniwerystetu Mikołaja Kopernika, Toruń 2009.
Module website	