COURSE DESCRIPTION CARD

Faculty of Electrical Engineering									
Field of study	**Electrical and Electronics Engineering**							**Degree level and programme type**	**Bachelor's degree**
Specialization/ diploma path	**-**							**Study profile**	**-**
Course name	**Instrumentation and Measurements**							**Course code**	**IS-FEE-10078W**
								Course type	**elective**
Forms and number of hours of tuition	**L**	**C**	**LC**	**P**	**SW**	**FW**	**S**	**Semester**	**winter**
	15		**30**					**No. of ECTS credits**	**5**
Entry requirements	**-**								
Course objectives	To understand the basic working principles of electrical and electronic measuring instruments. To receive the skills to managing and operating analogue and digital instruments for a particular application. To learn the ways of presenting and interpreting results. To calculate the uncertainty of the direct and undirect single and multiple measurements.								
Course content	Introduction to metrology and measuring instruments; errors and uncertainties; instrument transformers and their applications; resistance, voltage and current measurements; power and energy measurements; impedance measurement; frequency measurement; analog-to-digital converters; digital oscilloscope.								
Teaching methods	lecture, laboratory classes								
Assessment method	**lecture - written exam; laboratory classes- evaluation of written report, assessment of preparation to do exercises, evaluation of completing a measurement task.**								

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	interprets the results of measurements and presents them in an appropriate form	
LO2	performs propre measurements of electrical quantities	
LO3	calculates limiting errors and uncertainties	
LO4	applies appropriate methods to measure basic electrical quantities	
LO5	implements and operates appropriate equipment in a measuring experiment	

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	passing short tests before laboratory classes, making a report, passing an exam	**L, LC**
LO2	making a report about laboratory exercise, completing a measurement task	**LC**
LO3	making a report, passing an exam	**L,LC**

LO4	evaluation of completing a measurement task, passing an exam	**L,LC**
LO5	evaluation of completing a measurement task, making a report	**LC**
Student workload (in hours)		**No. of hours**
Calculation	lecture attendance	**15**
	participation in classes, laboratory classes, etc.	**30**
	preparation for classes, laboratory classes, projects, seminars, etc.	**30**
	working on projects, reports, etc.	**20**
	participation in student-teacher sessions related to the classes/seminar/project	**10**
	implementation of project tasks	**0**
	preparation for and participation in exams/tests	**20**
	TOTAL:	**125**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	**57**	**2**
Student workload – practical activities	**90**	**3**

Basic references	1. Carr J. J.: Elements of electronic Instrumentation and Measurement. Pearson Education, 2003. 2. Bentley J.: Principles of Measurements Systems. Pearson Education, 2005. 3. Doeblin E. O.: Measurement systems: Application and design, 5th edition. McGraw- Hill, 2003. 4. Sydenham P., Thorn R.: Handbook of Measuring Systems Design. Jon Wiley & Sons, Ltd., 2005
Supplementary references	1. Webster J. G.: The measurement, instrumentation, and sensors handbook. CRC Press LLC 1999. 2. Potter R.W.: The art of measurement. Theory and Practice. Prentice Hall PTR 2000. 3. Webster J. G., Eren H. : Measurement, instrumentation, and sensors handbook : spatial, mechanical, thermal, and radiation measurement. CRC/Taylor & Francis, 2014. 4. JCGM - Joint Committee of Guides in Metrology, Evaluation of measurement data – Guide to the expression of uncertainty in measurement, 2008.

Organisational unit conducting the course	**Department of Electrotechnics, Power Electronics and Power Engineering**	**Date of issuing the programme**
Author of the programme	**Jaroslaw Makal, Ph.D.**	**20.01.2020**

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar