COURSE DESCRIPTION CARD

<table>
<tr><td colspan="10">Faculty of Electrical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="6">Electrical and Electronics Engineering</td><td>Degree level and programme type</td><td>Bachelor's degree</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6">-</td><td>Study profile</td><td>-</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Electromagnetism - Engineering Physics</td><td>Course code</td><td>IS-FEE-10046W</td></tr>
<tr><td>Course type</td><td>elective</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>winter</td></tr>
<tr><td>15</td><td></td><td></td><td></td><td>15</td><td></td><td></td><td>No. of ECTS credits</td><td>2</td></tr>
<tr><td>Entry requirements</td><td colspan="9">-</td></tr>
<tr><td>Course objectives</td><td colspan="9">To acquaint students with chosen electromagnetic phenomena. To show students mathematical formulation of the electromagnetic field theory, inc. vector calculus. Prestatation of some examples concerning electric, magnetic and current flow fields.</td></tr>
<tr><td>Course content</td><td colspan="9">Lecture: Principles of vector calculus: vector algebra, vector analysis. Assumptions of electromagnetic field (EM) theory, Electrostatics (Coulomb's law, electrostatic field). Magnetostatics (Ampère's law, magnetostatic field). Currents and conductors: current distributions, continuity of current, static electroconductive field, power losses. Electromagnetic potentials. Interface conditions. Maxwell's macroscopic equations, the energy theorem. Electrodynamics (equation of continuity for electric chargé, displacement current, electromotive force, Faraday's law of induction). Electromagnetic field: equations, power and the Poynting vector, conditions of continuity, interactions between the EM waves and materials. Electric polarisation and displacement, electric multipole moments, magnetisation, energy. Specialization workshop: Solving selected issues related to electrostatic, magnetostatics and current flow problems. The examples are solved using some computer applications and numerical methods.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">understands and knows the mathematical formulation of the EM field theory;</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture - final written test (at least 50% of points are necessary to pass).
Workshop - written reports and tests.</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="8">Learning outcomes</td><td>Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="8">understands and knows the mathematical formulation of the EM field theory;</td><td></td></tr>
<tr><td>LO2</td><td colspan="8">is able to explain some field phenomena;</td><td></td></tr>
<tr><td>LO3</td><td colspan="8">understands the principles of EM field, including some practical aspects (eg. Positive and spurious efects)l</td><td></td></tr>
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LO4	explain some principles of EM field;	
LO5		
Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	test, evaluation of students' reports and written tests	**L, SW**
LO2	test, evaluation of students' reports and written tests	**L, SW**
LO3	test, evaluation of students' reports and written tests	**L, SW**
LO4	test, evaluation of students' reports and written tests	**L, SW**
LO5		
Student workload (in hours)		**No. of hours**
Calculation	Lecture attendance:	**15**
	Preparation for workshops:	**10**
	Participation in workshops:	**15**
	Work on reports from workshop classes and/or work on home assignments	**7**
	Participation in student-teacher sessions related to lectures and workshops:	**3**
	Preparation for and attendance at the final test from lectures:	**10**
	TOTAL:	**60**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	**30**	**1**
Student workload – practical activities	**32**	**1,5**

Basic references	1. Lehner G.: Electromagnetic field theory for engineers and physicists. Springer, New York, 2010. 2. Brandao Faria J. A.: Electromagnetic foundations of electrical engineering. J. Wiley & Sons, Chichester, 2008. 3. Griffiths D: Introduction to Electrodynamics. Cambridge University Press, Cambridge, 2017. 4. Orfanidis S. J.: Electromagnetic waves and antennas. Rudgers University, online version.
Supplementary references	1. Morgenthaler F. R.: The power and beauty of electromagnetic fields. John Wiley & Sons, Hoboken, 2011. 2. Stratton J. A.: Electromagnetic theory. J. Wiley & Sons, New York, 2007. 3. Bhag G. S., Hiziroglu H. R.: Electromagnetic field theory fundamentals. Cambridge University Press, Cambridge, 2009.

Organisational unit conducting the course	**Department of Electrotechnics, Power Electronics and Power Engineering**	**Date of issuing the programme**
Author of the programme	**Boguslaw Butrylo, D.Sc., Ph.D., Assoc. Prof.**	**2020-12-13**

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