

### COURSE DESCRIPTION CARD

Course name	Electromagnetic compatibility				
Course type	optional	Course code	SDPB0002	ECTS credits	2
Forms and number of hours	lecture: 20 h	Scientific discipline	automation, electronics and electrical engineering		
Course objectives	<p><b>Knowledge:</b> Acquainting with the world achievements covering theoretical foundations and selected cognitive and practical issues concerning:</p> <ul style="list-style-type: none"><li>• phenomena and threats related to the generation, propagation and impact of electromagnetic disturbances on electrical and electronic devices and systems as well as living organisms;</li><li>• technical law and standardization in the field of electromagnetic compatibility (EMC);</li><li>• EMC test methods for equipment introduced on the market and selected aspects of scientific research on threats and electromagnetic compatibility of electrical and electronic devices and systems.</li></ul> <p><b>Skills:</b> Developing the ability to analyze and evaluate selected aspects of electromagnetic compatibility in the field of scientific research or expert work of one's own or other people, and the ability to act for one's own development and inspire the development of others in the field of EMC.</p> <p><b>Social competences:</b> Preparation for a critical assessment of achievements in the field of electromagnetic compatibility and own contribution to the development of this specialty, and to recognize the importance of knowledge in solving EMC problems.</p>				
Course content	<ol style="list-style-type: none"><li>1. Introduction to electromagnetic compatibility (EMC). Technical law, product certification, EMC standards.</li><li>2. Sources of electromagnetic disturbances: properties, parameters and characteristics of disturbances and the threats they pose. Principles of interfering effects of signals, electromagnetic couplings.</li><li>3. Testing the immunity of electrical and electronic devices to electromagnetic disturbances (methods and principles of testing, stands, test apparatus, exposure levels, evaluation criteria).</li><li>4. Testing the emission from electrical and electronic devices (methods and principles of testing, stands, test equipment, admissible levels, evaluation criteria).</li><li>5. Selected aspects of scientific research on threats and electromagnetic compatibility of electrical and electronic devices and systems.</li><li>6. Selected practical aspects of electromagnetic compatibility (assessment of threats posed by sources of electromagnetic disturbances, protection against disturbances, impact of disturbances on living organisms).</li><li>7. Selected problems of electromagnetic compatibility in the field of doctoral students' own research and/or in relation to reference source materials.</li></ol>				
Teaching methods	Lecture enriched with discussion and presentations prepared by the audience; Students' own studies based on their own research and/or reference source materials.				
Assessment method	Lecture: Test; Presentations and the activity and level of discussion during the classes.				

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study for the 8 <sup>th</sup> level of Polish Qualification Framework (PRK)	Methods of assessing the learning outcomes
L01	The doctoral student characterizes the sources of electromagnetic disturbances and the phenomena and threats related to the generation, propagation and impact of disturbances on electrical and electronic devices and systems and living organisms.	SD_W1, SD_W5	Test; Presentations, activity, level of discussion.
L02	The doctoral student refers the issues of electromagnetic compatibility to standardization and technical law; Understands the importance of these issues in the context of non-technical determinants of scientific activity and the principles of knowledge transfer to the economic sphere and commercialization of the results of scientific activity.	SD_W2, SD_W6, SD_W7	Test; Presentations, activity, level of discussion.
L03	The doctoral student describes the basic methods of electromagnetic compatibility testing of devices introduced on the market and selected aspects of scientific research on threats and electromagnetic compatibility of electrical and electronic devices and systems.	SD_W1, SD_W2, SD_W3, SD_W7	Test; Presentations, activity, level of discussion.
L04	The doctoral student is able to critically analyse and evaluate a selected aspect of electromagnetic compatibility in the field of scientific research or expert work of his own or other people, and to discuss it with a view to his own and other people's development.	SD_U2, SD_U5, SD_U6, SD_U9, SD_K1	Presentations, activity, level of discussion.

Student workload (in hours)	
Lecture	20
Consultations	2
The unassisted student work, preparation of presentations	20
Preparation for the test	10
Total	52
ECTS credits	2

Basic references	<ol style="list-style-type: none"> <li>Więckowski T. W., Badania kompatybilności elektromagnetycznej urządzeń elektrycznych i elektronicznych; Oficyna Wydawnicza Politechniki Wrocławskiej; Wrocław 2001.</li> <li>Machczyński W., Wprowadzenie do kompatybilności elektromagnetycznej; Wydawnictwa Politechniki Poznańskiej; Poznań 2010.</li> <li>Ruszel P., Kompatybilność elektromagnetyczna elektronicznych urządzeń pomiarowych; Oficyna Wydawnicza Politechniki Wrocławskiej; Wrocław 2008.</li> <li>Sroka J., Niepewność pomiarowa w badaniach EMC: pomiary emisyjności radioelektrycznej; Oficyna Wydawnicza Politechniki Warszawskiej; Warszawa 2009.</li> <li>Brejwo W., Wybrane zagadnienia kompatybilności elektromagnetycznej; Wojskowa Akademia Techniczna; Warszawa 2009.</li> <li>Williams T., EMC for product designers: (meeting the European EMC directive); Newnes; Oxford 2000.</li> </ol>
Supplementary references	<ol style="list-style-type: none"> <li>Ott H. W., Electromagnetic compatibility engineering; J. Wiley; New York 2009.</li> <li>Kodali V. P., Engineering electromagnetic compatibility: principles, measurements, technologies and computer models; IEEE; Piscataway 2000.</li> <li>Williams T., EMC for systems and installations; Newness; Oxford 2000.</li> <li>Sowa A., Ochrona urządzeń oraz systemów elektronicznych przed narażeniami piorunowymi; Oficyna Wydawnicza Politechniki Białostockiej; Białystok 2011.</li> <li>Markowska R., Sowa A., Ochrona odgromowa obiektów radiokomunikacyjnych; Oficyna Wydawnicza Politechniki Białostockiej; Białystok 2013.</li> <li>Vijayaraghavan G., Brawn M., Grounding, bonding, shielding and surge protection; Newnes; 2004.</li> </ol>
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