**COURSE DESCRIPTION CARD**

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| **Course name** | **Selected topics of mathematics in construction and environmental engineering** | | | | |
| **Course type** | **optional** | **Course code** | **SDPB0029** | **ECTS credits** | **1** |
| **Forms and number of hours** | **lecture: 10h** | **Scientific discipline** | **civil engineering and transport; environmental engineering, mining and energy** | | |
| **Course objectives** | Knowledge of mathematical methods of description and problem solving in the construction and environmental engineering; mathematical preparation in the field of geometry, ordinary and partial differential equations to study problems in the civil engineering and environment. | | | | |
| **Course content** | 1: geometry: polyhedra, curves and surfaces (rectangular, minimal, free) in the design of building structures;<br>2: metric spaces and Voronoi diagrams in construction and environmental engineering;<br>3: differential equations in construction and environmental engineering:<br>3a: problems in the field of mechanics, hydromechanics, acoustics, mass and heat transfer;<br>3b: methods of solving partial equations - boundary problems (eg Ritz, finite differences methods);<br>4: variational methods of solving selected problems in the field of construction and environmental engineering. | | | | |
| **Teaching methods** | a lecture supplemented with project (presentations) prepared by the audience based on the indicated sources | | | | |
| **Assessment method** | exam | | | | |

| **Symbol of learning outcome** | **Learning outcomes** | **Reference to thelearning outcomes forthe field of study for the 8th levelof Polish Qualification Framework (PRK)** | **Methods of assessing the learning outcomes** |
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| **LO1** | knows examples of the use of geometry in the design of building structures;has knowledge of the use of curves and surfaces in civil and environmental engineering; | SD_W1, SD_W2, SD_U1 | exam |
| **LO2** | knows the concept and examples of metric spaces and Voronoi diagrams and knows how to use optimization in the field of civil engineering and the environment in solving selected problems; | SD_W1, SD_W2, SD_U1 | exam |
| **LO3** | knows the concept of a differential equation, knows how to formulate a task describing a practical problem using a differential equation;and solve the relevant problem in the field of civil and environmental engineering; | SD_W1, SD_W2, SD_U1 | exam |

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| **LO4** | knows various methods (Ritz, finite differences, ...) for solving boundary problems of partial differential equations; | SD_W1, SD_W2, SD_U1 | exam |
| **LO4** | is able to critically assess his ability to observe physical phenomena in terms of the use of knowledge in the field of mathematics. | SD_K1 | exam |

| **Student workload (in hours)** | |
|---|---|
| **Lecture** | 10 |
| **Consultations** | 1 |
| **The unassisted studentwork** | 10 |
| **Implementation of project tasks and preparation for and participation in exams/tests** | 5 |
| **Total** | **26** |
| **ECTS credits** | **1** |

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| **Basic references** | 1. Vick B.: Applied Engineering Mathematics, Taylor & Francis Ltd 2020.<br>2. Miersemann E.: Partial Differential Equations. Lecture Notes. 2012. http://www.math.uni-leipzig.de/~miersemann/pdebook.pdf [Access: March 2021]<br>3. Glasgow L.A.: Applied Mathematics for Science and Engineering. Wiley, 2014.<br>4. Pottmann H., Asperl A., Hofer M. and Kilian A.: Architectural Geometry. Bentley Institute Press, 2007. |
| **Supplementary references** | 1. Myint T., Debnath L.: Linear Partial Differential Equations for Scientists and Engineers, Birkhäuser, 2006.<br>2. Jain M.: Application of Mathematics in Civil Engineering. http://ijiet.com/wp-content/uploads/2017/06/11.pdf[Access: March 2021]. |
| **Author of the programme** | Edwin Koźniewski DSc, PhD (CET) |
| **Date of issuing the programme** | March 2021 |