<table>
<tr><td>Course code</td><td></td></tr>
<tr><td>Type and description</td><td>EC– Elective Course in Discipline: Civil engineering and transport</td></tr>
<tr><td>ECTS credit</td><td>1</td></tr>
<tr><td>Course name</td><td>Mathematical Problems in Engineering</td></tr>
<tr><td>Course name in Polish</td><td>Wybrane zagadnienia matematyczne w inżynierii</td></tr>
<tr><td>Language of instruction</td><td>English</td></tr>
<tr><td>Course level</td><td>8 PRK</td></tr>
<tr><td>Course coordinator</td><td>dr hab inż. Marcin Koniorczyk, dr hab. inż. Piotr Ostrowski</td></tr>
<tr><td>Course instructors</td><td>dr hab inż. Marcin Koniorczyk, dr hab inż. Piotr Ostrowski</td></tr>
<tr><td>Delivery methods and course duration</td><td>
<table>
<tr><th></th><th>Lecture</th><th>Tutorials</th><th>Laboratory</th><th>Project</th><th>Seminar</th><th>Other</th><th>Total of teaching hours during semester</th></tr>
<tr><td>Contact hours</td><td>0</td><td>0</td><td>0</td><td>5</td><td>0</td><td>0</td><td>5</td></tr>
<tr><td>E-learning</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td><td>no</td></tr>
<tr><td>Assessment criteria (weightage)</td><td>0</td><td>0</td><td>0</td><td>100%</td><td>0</td><td>0</td><td>100%</td></tr>
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<tr><td>Course objective</td><td>Aims of the course is:
1. To present some mathematical techniques for the solution of engineering problems, like: optimisation, iterative procedures, convergence of solution.</td></tr>
<tr><td>Learning outcomes</td><td>After the course student:
1. knows the basic properties and examples of Hilbert spaces (W1),
2. knows the basic properties and examples of Sobolev spaces (W1),
3. knows the Fixt Point Theorem and its basic applications (W1),
4. knows how to apply the basic theorems concerning optimisation problems (U1),
5. knows the Ritz Method (W1) and will be able to apply the method for boundary value problems (U1),</td></tr>
<tr><td>Assessment methods</td><td>The student will be assessed based on the project</td></tr>
<tr><td>Prerequisites</td><td></td></tr>
<tr><td>Course content with delivery methods</td><td>Topological Spaces
Compactness, Continuity and Convexity
Duality in Banach Spaces
Weak formulation, Weak Convergence
Ritz Method for Variational Problems
Fix Point Theorem
Some Optimisation Problems
Lagrange multipliers, Kuhn-Tucker Theorem</td></tr>
<tr><td>Basic reference materials</td><td>1. W. Rudin, Functional Analysis, McGraw-Hill, Inc. 1991.
2. E. Zeidler, Applied Functional Analysis. Main Principles and Their Applications. Springer. 1995.
3. E. Zeidler, Applied Functional Analysis. Application to Mathematica Physics. 1995.</td></tr>
<tr><td>Other reference materials</td><td></td></tr>
<tr><td>Average student workload outside classroom</td><td>15h</td></tr>
<tr><td>Comments</td><td>September 2020</td></tr>
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Last update	July 2020