<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>Numerical methods in engineering</td></tr>
<tr><td>Course name in Polish</td><td>Metody numeryczne 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 Piotr Ostrowski</td></tr>
<tr><td>Course instructors</td><td>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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</td></tr>
<tr><td>Course objective</td><td>Aims of the course:
1. to extend knowledge in the field of linear algebra and discrete mathematics,
2. to know how to solve equation numerically,
3. to know how to solve system of algebraic equations,
4. to know how to calculate integral numerically,
5. to know how to solve differential equations numerically.</td></tr>
<tr><td>Learning outcomes</td><td>After the course student:
1. knows how to calculate integral numerically (W1),
2. knows and understands basic grounds of methods related to solver algorithms: system of linear algebraic equations, differential equations (U1),
3. knows and understands iterative methods in root finding (W1),
4. can solve numerically any linear problem and interpret results (W1, W2),
5. can present obtained results (U2).</td></tr>
<tr><td>Assessment methods</td><td>Verification methods of learning outcomes:
effects no. 1-5: by worksheet project.

The final grade is composed of:
75% - project
25% - oral presentation of achieved solutions in project.</td></tr>
<tr><td>Prerequisites</td><td></td></tr>
<tr><td>Course content with delivery methods</td><td>Significant figures, accuracy, precision.
Round-off and truncation errors.
Methods of root finding: bisection, Newton-Raphson method and secant method.
Linear algebraic equations: Gauss elimination, LU decomposition.
Numeric integration and differentiation.
Optimization: direct method, gradient method.
Curve fitting, least squares method.
Solvability of differential equations.</td></tr>
<tr><td>Basic reference materials</td><td>S.C. Chapra, R.P. Canale, Numerical Methods for Engineers, McGraw-Hill 2015</td></tr>
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Other reference materials	
Average student workload outside classroom	15h
Comments	
Last update	July 2020