<table>
<tr><td>Course code</td><td></td></tr>
<tr><td>Type and description</td><td>Background Course</td></tr>
<tr><td>ECTS credit</td><td>2</td></tr>
<tr><td>Course name</td><td>Mathematical modelling I</td></tr>
<tr><td>Course name in Polish</td><td>Matematyczne modelowanie I</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>Przemysław Perlikowski</td></tr>
<tr><td>Course instructors</td><td>Przemysław Perlikowski, Radosław Mania, Grzegorz Kudra</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>15</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>15</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></td></tr>
<tr><td>Assessment criteria (weightage)</td><td>100,00</td><td></td><td></td><td></td><td></td><td>0,00</td><td></td></tr>
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<tr><td>Course objective</td><td>1. To enable students to acquire knowledge in the field of mathematical methods of vibration analysis of mechanical systems

2. Theoretical formulations (stability problems, variational formulations, bifurcations) in applied mechanics with regard to mechanical systems.

3. Providing a good foundation for the development of solutions to a selected class of problems in the mechanics of solids (materials).

4. To develop an understanding of the governing material models (composite materials, elastic-plastic theories).</td></tr>
<tr><td>Learning outcomes</td><td>After the course, a PhD student will be able to:

1. understand and apply notions, theorems and methods of the theory of dynamical systems: effects W1, U3, K2;

2. understand and apply stability measures to ensure stability and robustness of dynamical systems: effects W1, K1, K2

3. apply governing models for chosen materials and structures - W1, K1

4. define material properties for engineering structures and calculate strains and stresses for a given set of applied loads - U3, K1

5. asses load carrying capacity of specific members in the scope of strength and failure criteria – W4, U3</td></tr>
<tr><td>Assessment methods</td><td>Effects W1, W4, U3, K1, K2 – writing and oral examination

The final evaluation is based on: Exam - 100%</td></tr>
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Prerequisites	The contents of the master degree course on the differential and integral calculus, calculus, dynamics of machines and strength of materials.
Course content with delivery methods	Lecture: 1. Nonlinear vibrations of mechanical systems with geometric and physical non-linearities (smooth systems), 2. Parametric vibrations, 3. Dynamics of systems with discontiuties, 4. Strength hypotheses and criteria of failure, 5. Stress tensor, strain tensor, invariants, 6. Analysis of the state of stress and deformation of isotropic and orthotropic materials and structures.
Basic reference materials	1. Balachandran, Balakumar, and Edward B. Magrab. Vibrations. Cambridge University Press, 2018. 2. Den Hartog, Jacob Pieter. Mechanical vibrations. Courier Corporation, 1985. 3. Fung Y.C., Foundations of Solid Mechanics, Prentice-Hall, 1965, 4. Gibson R. F., Principles of Composite Material Mechanics. Boca Raton: CRC Press, 2007. 5. D.W.A. Rees, Mechanics of Solids and Structures, Imperial College Press, 2000. 6. J.N. Reddy, Mechanics Of Laminated Composite Plates and Shells, Theory and Analysis, CRC PRESS, 2004. 7. Sadd M.H., Elasticity Theory, Applications, and Numerics, Elsevier, 2014. 8. Awrejcewicz J.: Classical Mechanics. Dynamics. Springer, 2012.
Other reference materials	Scientific papers
Average student workload outside classroom	35 h
Comments	
Last update	