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| **Course code** | CC4 |
| **Type and description** | CC - Basic programme rules for Mechanical Engineering |
| **ECTS credit** | 1 |
| **Course name** | **Mechanics of Solids and Structures** |
| **Course name in Polish** | **Mechanika Materiałów albo Mechanika Ciała Stałego i Konstrukcji** |
| **Language of instruction** | English |
| **Course level** | 8 PRK |
| **Course coordinator** | **dr hab. inz. Radosław Mania** |
| **Course instructors** |  |
| **Delivery methods and course duration** | |  | **Lecture** | **Tutorials** | **Laboratory** | **Project** | **Seminar** | **Other** | **Total of teaching hours during semester** | | --- | --- | --- | --- | --- | --- | --- | --- | | Contact hours | 15 |  |  | 5 |  | 0 | 15 | | E-learning | No | No | No | No | No | No |  | | Assessment criteria (weightage) | 60,00 |  |  | 40 |  | 0,00 |  | |
| **Course objective** | The main objective of this course is:  1. giving a good foundation for the development of solutions to a selected class of problems in mechanics of solids (materials).  2. to develop the ability to provide analytical and experimental methods of structural analysis.  3. to develop an understanding of the governing material models (composite materials, elastic-plastic theories).  4. Broadening of applied mechanics for theoretical formulations and developments, variational formulations, inventing in engineering and sciences with regard to real materials. |
| **Learning outcomes** | 1. apply governing models for chosen materials - orthotropic, elastic-plastic materials, brittle, hybrid - W1, U1, K1  2. define composite material properties for engineering structures and calculate strains and stresses for given set of applied loads - U2, U3, K3  3. asses load carrying capacity of orthotropic members in the scope of strength and failure criteria - W2, U1, U2 |
| **Assessment methods** | effect W1, U1, U2, U3, …. - final exam in writing  effect - presentation  effect W2,K1, K3 – project presentation  Final grades is determined as:  Writing exam result - 60%  Project presentation - 40% |
| **Prerequisites** |  |
| **Course content with delivery methods** | LECTURE  1. Hooke's law for 3D and 2D for anisotropic materials (especially orthotropic composite),  2. strength hypotheses and criteria of failure,  3. stress tensor, strain tensor, invariants.  4. analysis of the state of stress and deformation of orthotropic materials,  5. fatigue strength of metals and composites,  6. fundamentals of fracture mechanics, stress intensity coefficient, energy release coefficient, introduction of composites to failure.  7. geometric and physical non-linearities,  8. constitutive models for elastic-plastic materials, theories of plastic deformation and plastic flow. |
| **Basic reference materials** | 1. Lecture presentations  2. Fung Y.C., Foundations of Solid Mechanics, Prentice-Hall, 1965,  3. Gibson R. F., Principles of Composite Material Mechanics. Boca Raton: CRC Press, 2007.  4. Lubliner J., Theory of Plasticity, Pearson Ed., 2006.  4. Sadd M.H., Elasticity Theory, Applications, and Numerics, Elsevier, 2014.  5. Schijve J., Fatigue of Structures and Materials, Springer, 2009. |
| **Other reference materials** | current papers and publications |
| **Average student workload outside classroom** | 10h |
| **Comments** |  |
| **Last update** | 08.04.2019 |