Code	III.4.
Course Title (English)	Engineering Physics-Mechanics III
Course Title (Polish)	Fizyka techniczna – Mech. tech. z wytrz. materiałów III
Credits	6 ECTS

Language of instruction **English**

Compulsory for Profile: Computer Modelling and Simulation (CMS), Intelligent Energy (IE), Biotechnology for Environmental Protection (BI), Business and Technology (BT)

Type of studies BSc studies

Unit running the programme Institute of Mechanics and Machine Design Fundamentals

***Course coordinator** and academic teachers* **Jacek Przybylski, Assoc. Prof**., Jacek Przybylski**,** Assoc**.** Prof., (Lec., Tut.)

Form of classes and number of hours

Semester	Lec.	Tut.	Lab.	Proj.	Sem.	Credit points
3	30	15	15	-	-	6

Learning outcomes

The course is a foundation to advanced techniques that allow students to design structures, predict failures and understand the physical properties of materials. After the course student acquires knowledge in the mechanics of materials to demonstrate a basic working knowledge of the fundamental concepts and problem-solving techniques associated with stress, strain, simple constitutive theory, and with applications involving axial loading, torsion, shear and bending, including introductory-level statically indeterminate systems.

By solving number of problems during tutorials student accumulates significant practice in formulation and analysis a variety of application problems.

During laboratories student gains experience in fundamental materials testing (tension-compression tests, hardness tests, fatigue test) and strain measuring during deformation of structures.

Prerequisites Engineering Physics – Mechanics I and II (P12), basic knowledge of differential and integration calculus, Mathematics I and II

Course description

LECTURE

Tension and Compression. Normal stress and strain, Stress-strain diagrams
Hooke's Law . Modulus of elasticity – Young's modulus.
Axially Loaded Members. Displacements of axially loaded members. Statically indeterminate structures. Temperature stresses. Strain energy.
Shear. Shear stress & strain, allowable stresses & loads. Shear modulus – modulus of

rigidity.
Torsion. Torsion of circular bars. Nonuniform torsion. Pure shear, relation between Young's and shear modulus. Statically indeterminate torsion problems.
Bending. Bending theory. Second moment of area. Beams, shear force and bending moment. Shear force and bending moment diagrams.
Stresses in Beams. Bending and curvature of beams. Normal stresses - strains in beams. Shear stresses in beams
Stress concentrations. Toughness. Fatigue and creep.

TUTORIALS: see lecture content

LABORATORY
Five one-hour laboratory demonstrations on basic strength of materials properties of metals (tension-compression tests, yield stress test, hardness tests, fatigue test) and strain measuring during deformation of structures.

PROJECT
Not applicable

SEMINAR
Not applicable

Form of assessment Exam

Basic reference materials

1. Set of lecture notes and problems for individual solution. Handouts for tutorial classes.
2. Edwin J. Hearn**:** "Mechanics of Materials", 2nd Edition, 1985, Pergamon Press, Oxford, reprinted 1992, Vol1 and Vol 2
3. James M. Gere, Stephen P. Timoshenko: "Mechanics of Materials", 3rd Edition 1991, Chapman and Hall, London, reprinted 1993
4. Peter P. Benham, Robert J. Crawford, „Mechanics of Engineering Materials" 2nd Edition, 1988, Longman Scientific and Technical, John Wiley and Sons, Singapore

Other reference materials

For Polish-speaking students:

1. a set of lectures by Prof. A. Garstecki presented in: http://www.ikb.poznan.pl/almamater/wyklady/wytrzymalosc_materialow_03-04/index.htm
2. Z.Dyląg, A.Jakubowicz, Z.Orłoś: Wytrzymałość materiałów. Tom 1, WNT, W-wa 2003
3. Z.Dyląg, A.Jakubowicz, Z.Orłoś: Wytrzymałość materiałów. Tom 2, WNT, W-wa 2003
4. M.E.Niezgodziński, T.Niezgodziński, Zadania z wytrzymałości materiałów, WNT, Warszawa, 1997.
5. M.Banasiak, K.Grossman, M.Trombski, Zbiór zadań z wytrzymałości materiałów, PWN, Warszawa, 1998.

e-mail of the course coordinator and academic teachers	jacek.pr@imipkm.pcz.czest.pl
Average student workload (teaching hours + individ.)	5 hours of teaching hours + 3 hours of individual work per week
Remarks:	
Updated on: 04.04.2012	