STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Strength of Materials II**		Code **1010601141010204572**
Field of study **Mechanical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 4**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **2** Classes: **1** Laboratory: **1** Project/seminars: **-**		No. of credits **5**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **5 100%** **5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Understanding of mathematical problems(function analysis, algebraic transformation, differential equations) and mechanical problems (equilibrium of force sets, mechanical energy). Mastery of the knowledge in scope of the "Strength of Materials I"
2	**Skills**	Effective activity at the range of analysis and illustrating of functions. Manipulation of fundamental geometrical and trigonometric relations. Competence in differential equations solving. Competence in using of physical units.
3	**Social competencies**	Consciousness of connections and interdependence between mathematical knowledge, physical description and technical applications.

Assumptions and objectives of the course:

-Recognition of theoretical and practical problems connected with strength analysis basing on mechanical properties of materials as the ground for proper projecting and designing of machines and devices.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Methods of determination of normal and shear stresses in beam cross-sections and strength conclusions - sizing of the cross-sections. - [K1A_W10]
2. Methods of deflection curve elements determination - beam displacements. - [K1A_W10]
3. The ways of statically undetermined beams analysis. - [K1A_W10]
4. Formulation of the strength conditions in complex states: oblique bending, eccentric compression/tension, bending with torsion and the like. - [K1A_W10]
5. Methods of buckling calculation of compressed bars. - [K1A_W10]
6. Slender beams analysis - axially and transversely loaded. - [K1A_W10]

Skills:

1. Ability of beam displacement determination - [K1A_U11]
2. Competence in strength calculations for complex states regarding strain energy theory. - [K1A_U11]
3. Practical skill of material mechanical properties testing and tensometer measuring. - [K1A_U11]

Social competencies:

1. Readiness to joint action on the field of strength analysis in teams projecting machines and devices. - [K1A_K04]

Assessment methods of study outcomes

-Classes - two tests performed in the semester. Within each one a practical problem to be solved in writing.

-Lab - reports on test events, general theoretical knowledge.

-Lecture - written exam: solving of some exercises and simple strength problems.

Course description

-Normal and shear stresses in beams under bending. Differential equation of the deflection curve of a beam. Clebsch's method. Moment-area method (Mohr).Implementation of superposition principle for displacement determination in beams-flexibility method and the equation of three moments. Strength criteria in composed stress state. Complex strength cases: oblique bending, eccentric compression/tension, bending with longitudinal forces, bending with torsion,general case. Problems of elastic stability of structures -exemplary compressed bar buckling. Stress and displacement analysis of slender beams on axial and transverse load.

Practical tests of mechanical material properties. Measuring of strain state and specification of stresses.

Basic bibliography:

1. Z. Dyląg, A. Jakubowicz, Z. Orłoś, Wytrzymałość materiałów (t. I i II), WNT, Warszawa 1996
2. J. Zielnica, Wytrzymałość materiałów, Wyd. PP, Poznań 1996
3. M. Niezgodziński, T. Niezgodziński, Zadania z wytrzymałości materiałów, WNT, Warszawa 2000
4. Badania eksperymentalne z wytrzymałości materiałów, red. S. Joniak, Wyd. PP, Poznań 2002

Additional bibliography:

1. M. Ostwald, Podstawy wytrzymałości materiałów, Wyd. PP, Poznań 2003
2. M. Ostwald, Wytrzymałość materiałów ? zbiór zadań, Wyd. PP, Poznań 2008
3. K. Magnucki, W. Szyc, Wytrzymałość materiałów w zadaniach, Wyd. Naukowe PWN, Warszawa-Poznań 1999
4. H. Głowacki, Mechanika techniczna ? wytrzymałość materiałów, Ofic. Wyd. Polit. Warsz. 2000
5. M. Banasiak, K. Grossman, M. Trombski, Zbiór zadań z wytrzymałości materiałów, Wyd. Naukowe PWN, Warszawa 1998
6. Ćwiczenia laboratoryjne z wytrzymałości materiałów, red, M Banasiak, Wyd. Naukowe PWN, Warszawa 2000

Result of average student's workload

Activity	Time (working hours)
1. Preparation for the lecture.	5
2. Participation in the lecture	30
3. Fixing the lecture	8
4. Consultation for the lecture	2
5. Preparing to exam	10
6. Participation in the exam	2
7. Preparation of practical classes	6
8. Participation in the classes	15
9. Preparation for the lab	5
10. Participation in the lab	15
11. Fixing the classes and the lab	8
12. Consultation for the classes and the lab	3
13. Preparing to pass the classes and the lab	8
14. Participation in the completion of the classes and the lab	3

Student's workload

Source of workload	hours	ECTS
Total workload	115	5
Contact hours	70	4
Practical activities	20	1