STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Strength of Materials		**1010101121010110028**

Field of study	Profile of study (general academic, practical)	Year /Semester
Civil Engineering First-cycle Studies	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **45**	Classes: **30**	Laboratory: **15**	Project/seminars: **30**	**9**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**9 100%**
Technical sciences	**9 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Mathematics: algebra (including matrix calculus), mathematical analysis (including differential and integral calculus), geometry, planimetry, trigonometry - level 6 of KRK. Physics at level 5 of KRK. Theoretical mechanics: knowledge of the equilibrium equations and internal forces in rod elements of a structure - level 6 of KRK.
2	**Skills**	Mathematics: skills of calculation of derivatives and integrals of functions, the ability to use matrix calculus - level 6 of KRK. Physics: ability to apply the principles of Newton - level 5 of KRK. Theoretical mechanics: the ability to use the balance equations to determine the reactions and internal forces in statically determined bar systems - level 6 of KRK.
3	**Social competencies**	Students can work in groups. The student is able to participate in the social life of the university. The student follows the rules of ethics.

Assumptions and objectives of the course:

Acquire the knowledge, skills and competence in solving problems of stress, strain and displacement in the rod elements of the structure and mechanics of materials

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

Knowledge:

1. Student knows basic terms of strength of materials: stress, strain, displacement, axis of inertia and main axes of the cross-section, isotropy, homogeneity (obtained at lectures) - [K_W04, K_W05]

2. Student knows constitutive and geometrical relations, strength hypothesis for linear theory (obtained at lectures) - [K_W04, K_W05]

3. Student knows basis of experimental methods in strength of materials (obtained at lectures and laboratory classes) - [K_W04, K_W05]

Skills:

1. Student is able to determine the stress state in the points of the rod cross-section in the basic cases of action of internal forces (obtained at classes and project classes) - [K_U04]

2. Student is able to determine displacements of the beam structure using equilibrium differential equations (obtained at lectures and classes) - [K_U04]

3. Student is able to determine the critical load for basic cases of the axially loaded column (obtained at classes and project classes) - [K_U11]

4. Student is able to perform simple laboratory experiments leading to the designation of basic material parameters and strength of building materials (obtained at laboratory classes) - [K_U13]

Social competencies:

1. Student understands the need for learning; can inspire and organize the process of learning of other people (obtained at lectures and classes) - [K_K03]

2. Student is able to cooperate in a group accepting different roles in the group (obtained at laboratory and project classes) - [K_K01]

3. Student is responsible for safety of the own work and work of the team (obtained at laboratory classes) - [K_K05]

4. Student is able to present the results of his own work (obtained at laboratory and project classes) - [K_K09]

Assessment methods of study outcomes

Lectures

Written exam (duration 120 min.) on the date specified at the beginning of the semester (the effect K_W04, K_W05, K_U04, K_U11, K_K03).

Classes are passed in the case of positive marks (at least 3.0) of 2 test (duration of each 90 min.). The terms of tests are given at the beginning of the semester (the effect K_W04, K_W05, K_U04, K_U11, K_K03).

Laboratory classes are passed in the case of positive marks (at least 3,0) of all reports of laboratory exercises and a minimum of 1 test. The report shall be defending by the team executing the laboratory exercise (oral or written form) (effect K_U13, K_K09, K_K05, K_K01).

Project classes are passed in the case of positive marks (at least 3,0) of all project tasks. The project tasks should be individually defended (oral or written form) (effect K_U04, K_U11, K_K01, K_K09).

Scale of the evaluation:

excellent (5,0)

good (4,5)

average (4,0)

passing (3,5)

near failed (3,0)

failed (2,0)

Course description

Idealization of structural models: 1D (rod, truss, beam, column, frame, arch, grid), 2D (plate, slab, shell), 3D (block). Calculation of the effects of actions. The geometrical characteristics of plane figures. Boundary Value Problem of linear elasticity. Internal forces in statically determined rod structures. State of stress and strain in special cases: axial tension, pure bending, bending with shear force, skew bending, eccentric tension, torsion. Displacements of beams. Elastic energy. Constitutive relations for materials. Plasticity. Measures of equivalent stress. Load capacity of beams and columns. Stability of a column. Rheological phenomena. Experimental methods.

Basic bibliography:

1. A. Gawęcki, Mechanika materiałów i konstrukcji prętowych, tomy 1 i 2, Wyd. Pol. Pozn. 19982.

2. A. Garstecki, M. Dębiński, Wytrzymałość materiałów, Podręcznik internetowy, www.ikb.poznan.pl.http://www.ikb.poznan.pl/almamater/wyklady/wytrzymalosc_materialow_04-05/

3. A. Boruszak, R. Sygulski, K. Wrześniowski, Wytrzymałość materiałów, doświadczalne metody badań, PWN, 1984.

Additional bibliography:

1. S. Piechnik, Wytrzymałość materiałów, Politechnika Krakowska, Kraków 1999

2. A. Jakubowicz, Z. Orłoś, Wytrzymałość Materiałów, tomy 1 i 2, WNT, Warszawa, 1999 i 1997

3. Z. Cywiński, Mechanika budowli w zadaniach. Układy statycznie wyznaczalne, PWN Warszawa 1999

4. S. Timoshenko, Strength of Materials, Krieger Pub Co, 3rd edition, 1983.

5. J. Grabowski, A. Iwanczewska, Zbiór zadań z wytrzymałości materiałów, Oficyna Wydawnicza Politechniki Warszawskiej, 1994.

Result of average student's workload

Activity	Time (working hours)

1. Participation in the lectures (contact hours)	45
2. Participation in the classes (contact hours)	30
3. Participation in the laboratory classes (contact hours, practical)	15
4. Participation in the project classes (contact hours, practical)	30
5. Preparations for laboratory classes (self-study)	15
6. Reports from laboratory experiments (self-study)	15
7. Completion (at home) project exercises (self-study)	60
8. Participation in the consultations (contact hours)	5
9. Exercises before classes tests (self-study)	25
10. Exercises before projects defense (self-study)	15
11. Exercises before the final exam (self-study)	12
12. Participation in the final exam (contact hours)	3

Student's workload

Source of workload	hours	ECTS
Total workload	270	9
Contact hours	128	4
Practical activities	45	2