STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Strenght of Materials**		Code **1010102121010110028**
Field of study **Civil Engineering Second-cycle Studies**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 2**
Elective path/specialty **Structural Engineering**	Subject offered in: **polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **1** Classes: **-** Laboratory: **-** Project/seminars: **2**		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:

dr hab. inż. Adam Glema, prof. nadzw.
email: adam.glema@put.poznan.pl
tel. +48 61 665 2104
Wydział Budownictwa i Inżynierii Środowiska
ul. Piotrowo 5 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	has knowledge of mathematics and physics (engineering mechanics and strength of materials) that is useful for the formulation, modeling materials and solving problems related to the construction and development of the overall design; knows the theory of design and analysis of rod systems in statics, dynamics and stability; knows the most commonly used building materials and their properties.
2	**Skills**	able to perform static analysis, linear stability and bearing capacity of the evaluation of critical states and limit load design for simple bar systems statically determinate and indeterminate; uses information technology, Internet and other sources to search for information, communication and software acquisition to support the work of the designer.
3	**Social competencies**	draws conclusions and describes the results of its own and is responsible for the accuracy of the results of their work and their interpretation and is communicative media presentations.

Assumptions and objectives of the course:

Knowledge of the characteristics and behavior of the structural material according to the time [t (s)], the temperature [T (C)], the pressure [P (Pa)], the strain rate [/ dot [/ epsilon] (1 / s)] frequency [/ omega (1 / s)].

During the exercises, students will acquire skills of design calculation, analysis and design of components and structures, taking into account the phenomena and processes in finite dimensions of space and time, realizing individual and team design exercise.

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

Knowledge:

1. has advanced knowledge of the theory of materials, modeling materials - [K_W01]
2. advanced topics in strength of materials, construction and building - [K_W04]

Skills:

1. able to conduct a hazard analysis in the implementation and operation of buildings and implement appropriate measures and safety - [K_U11]
2. able to plan and carry out laboratory experiments leading to the evaluation of the quality of materials used and the strength of the elements of buildings - [K_U12]
3. is able, according to scientific principles using scientific workshop to formulate and carry out preliminary work on a research to resolve the structural problems - [K_U17]

Social competencies:

1. independently complements and extends knowledge in modern processes and technologies in the construction industry - [K_K01]
2. can - in performing specific tasks - work independently, to work in a team and manage a team - [K_K03]

Assessment methods of study outcomes

The starting date of the course, the 26 February 2013

Credit terms of design exercises:

19 MARCH 2013: project 1

09 APRIL 2013: project 2

23 APRIL 2013: project 3

21 MAY 2013 on: project 4

04 JUNE 2013: project 5

CREDIT LECTURES written part: max. test: 15 questions x 7 points = 105 points the oral part:

Deadline for receiving credit - Tuesday, 4 June 2013, at. 12:00, room 18

Deadline for completion of the correction - Friday, 20 September 2013, h. 9:30, room 18

The extraterm III - Friday, 27 September 2013, h. 9:30, room 18

Course description

1. Introduction. Name and scope of the course. The scope and timing of this exercise. The method of evaluation. Literature.
2. Harmonic motion of discrete systems. The transition from discrete mechanics to the continuum mechanics. Derivation of the wave equation as an example strings.
3. Waves. Wave propagation speed. Group velocity. Dispersion. Modulation. Wave phenomena. Types of waves.
4. Rheological and viscous properties of building materials. Calculation of shrinkage in the concrete beam.
5. Strength of the material at elevated temperatures. Dimensioning of steel structure elements in fire.
6. Material defects. Defects detection.
7. Summary of the course. The scope and form of credit course.

Project tasks:

1 Task 0 Moodle preliminary tasks 0-3 points.

2 Task 0.1 Setting up a personal profile Moodle 0-3 points.

3 Task 1.1 Consultation Project 0-4 points.

4 Task 1.2 Definition of the wave. Wave equation. Types and characteristics of the waves. [the project team] 0-11 points.

5 Task 2.1 Consultation Project 0-4 points.

7 Task 2.2 speed and the propagation time of the wave front, stress, thermal, acoustic and pressure of the air, water, soil, steel, concrete and wood. [personal project] 0-11 points.

8 Task 3.1 Consultation Project 0-4 points.

9 Task 3.2 Rheological and viscous properties of building materials. [personal project] 0-11 points.

10 Task 4.1 Consultation Project 0-4 points.

13 Task 4.2 Tensile strength of the material at elevated temperatures. Dimensioning of steel beams in fire. [personal project] 0-15 points.

14 Task 5.1 Consultation Project 0-4 points.

15 Task 5.2 Material defects. Defects detection [team project] 0-11 points.

15 Task 6 Activity 0-15 points.

R A Z E M max 100 points

Basic bibliography:

1. F.C. Crawford, Waves, Berceley Physics Course vol. III, McGraw-Hill Education, New York, 1986

2. H. Kolsky, Stress Waves in Solids, Oxford University Press, London, 1953

3. A. Bodnar, M. Chrzanowski, P. Latus, Reologia konstrukcji prętowych, Wydawnictwo Politechniki Krakowskiej, 2006

4. M. Maślak, Trwałość pożarowa stalowych konstrukcji prętowych. ISBN: 0860-097X-370, Wydawnictwo Politechniki Krakowskiej, Kraków 2008

5. Eurocode EN-1991-1-1

6. Eurocode EN-1991-1-2

Additional bibliography:

1. . L. Drobiec, R. Jasiński, A. Piekarczyk, Diagnostyka konstrukcji żelbetowych, Tom 1: Metodologia, badania polowe, badania laboratoryjne betonu i stali, Wydawnictwo Naukowe PWN, 2010

2. . M. Rucka, Guided wave propagation in structures, Modelling, experimantal studies and application to damage detection, Monografie, nr 106, Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2011

Result of average student's workload

Activity	Time (working hours)
1. Participation in activities	45
2. Consultation tasks	15
3. Literature study	20
4. Projects elaboration	35
5. Final study and preparation for test	5
6. Final preparation for exam	20

Student's workload

Source of workload	hours	ECTS
Total workload	110	5
Contact hours	55	2
Practical activities	55	2