STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Strength of Materials**		Code **1010115121010110028**
Field of study **Civil Engineering Extramural Second-cycle**	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) **part-time**	
No. of hours Lecture: **10** Classes: **18** Laboratory: **8** Project/seminars: **-**		No. of credits **4**
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 %) **4 100%** **4 100%**

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 is aware of the necessity to advance professional and personal competencies.

Assumptions and objectives of the course:

Knowledge on properties and behavior of the structural material according to shorter and longterm time effects, the temperature elevation and other physical influences.

Skills of design calculation and dimensioning, analysis and design of structures and its components, taking into account the phenomena and processes in finite dimensions of space and time, preparation of individual and team design exercise.

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

Knowledge:

1. has 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 recognize 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 February 2018

Credit terms of design exercises:

APRIL 2018: project 2

MAY 2018: project 3

JUNE 2018: project 4

Deadline for receiving credit - June 2018, at. 8:00, room 18

Deadline for completion of the correction - September 2018

The extraterm III - September 2018

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

Project tasks:

Task 0 Moodle preliminary tasks Setting up a personal profile Moodle 0-10 points.

Task 1 Rheological and viscous properties of building materials. [personal project]

or Definition of the wave. Wave equation. Types and characteristics of the waves. 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] 0-20 points.

TEST 0-10 points.

Task 2 Project 3 Tensile strength of the material at elevated temperatures. Dimensioning of steel beams in fire. [personal project] 0-30 points.

Task 3 Project 4 Tensile strength of the material at elevated temperatures. Dimensioning of composite column in fire. [personal project] 0-30 points.

TOTAL max 100 points PASS >= 51 Points

Course description

Introduction. Content and scope of the course. The scope and timing of exercise projects. The method of evaluation. Literature. Behavior of the structural material according to the time, the temperature, the pressure, the strain rate, frequency. Space scales and dimension ranges for structural behavior description. Time scales and ranges for structural behavior description.

Long term phenomena and properties of structural material. Rheological and viscous properties of building materials. Historical view on formation and development of rheology. Results of experimental investigation in rheology. Creep test. Relaxation test. Mathematical models of rheological materials. Calculation of creep and shrinkage in the concrete beam.

Short term phenomena in structural materials. Waves and wave effects. Harmonic motion of discrete systems. Derivation of the wave equation as an example strings. Wave propagation speed in structural materials. Dispersion. Constitutive viscosity in dynamic and impact deformations.

Material defects. Defects detection. Wave effects in detection of defects. Defectoscope, measurement set, initiation and performance of defect test. Testing of steel elements and welds. Detection of defects and verification of properties in concrete specimen or element.

Strength of the material at elevated temperatures. Phenomenon of fire in building. Methods of analysis of fire development. Fire modeling for structural analysis. Mechanical and thermal properties of metals in elevated temperatures. Strength and deformation of steel structure in fire. Design and dimensioning of steel structural elements. Fire resistance of steel structural element in fire. Mechanical and thermal properties of concrete in elevated temperatures. Behavior of concrete or composite element in fire. Design and dimensioning of concrete and composite structural elements in fire. Computer simulation of fire phenomenon and computer aided design of structure in fire. Summary of the course an final evaluation test.

Basic bibliography:

1. http://www.moodle.bis.put.poznan.pl/mod/resource/view.php?id=875

Additional bibliography:

1. http://www.moodle.bis.put.poznan.pl/mod/resource/view.php?id=875

Result of average student's workload

Activity	Time (working hours)
1. Participation in activities	36
2. Consultation tasks	20
3. Literature study	10
4. Projects elaboration	20
5. Final study and preparation for test	14

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	100	4
Contact hours	36	2
Practical activities	50	2