Nume of the module/subject Code IOIOI15111010116019 Theory of elasticity, plasticity and rheology Profile of study (general academic, practical) Year /Semester Civil Engineering Extramural Second-cycle Profile of study (general academic, practical) Year /Semester Cycle of study: Structural Engineering Polish Course (compulsory, elective) obligatory Cycle of study: Second-cycle studies part-time No. of hours Ecture: 18 Classes: 18 Laboratory: - Project/Seminars: - 3 Status of the course in the study program (Basic, major, other) (university-wide, from another field) No. of credits Education areas and fields of sciences 3 100% 3 100% Technical sciences 3 100% 3 100% Responsible for subject / lecturer: dr inz. Maciej Przychodzki @put, poznan, pl tei. 656-287 3 100% Prerequisites in terms of knowledge, skills and social competencies: I Knowledge Has basic knowledge of mathematics, theoretical mechanics, strength of materials, and similar types of studies that finished with a Bachelor of Solinea digreb. I			STUDY MODULE D	ESCRIPTION FORM		
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1. Is capable of examining the differential equilibrium equations of a material continuum - [K_U04]

2. Is capable of calculating the components of strain and stress tensors, and the principle values and directions of the tensor - [K_U04]

3. Is capable of calculating the components of strain and stress tensors by the generalized Hooke'a law - [K_U04]

4. Is capable of solving the plane stress or plain strain problems - [K_U04]

5. Is capable of calculating the internal forces and displacements in elastic plates - [K_U04]

6. Is capable of predicting ultimate load-bearing capacity of beams and simple frame structures - [K_U04]

Social competencies:

1. Is aware of the responsibility for the correctness of conducted analyses and of the need of verifying adopted assumptions and obtained results - $[K_K02]$

2. Sees the necessity of systematic expanding und updating his/her knowledge and skills - [K_K06]

3. Understands the need of teamwork in solving theoretical and practical problems - [K_K01]

Assessment methods of study outcomes

Lectures

A 90-minute final written test which encompasses two parts; its date is given at the beginning of the semester. The aim of Part 1 is to check knowledge; it consists in answering 4 questions. The aim of Part 2 is to check skills; it consists in solving 2 computation problems.

Classes

A 90-minute final written test in the last week of the semester. The test consists in solving 3 computation problems. Evaluation of students` activity during classes.

Grading scale:

>=90% - 5,0 (very good) >=85% - 4,5 (good plus) >=75% - 4,0 (good) >=65% - 3,5 (sufficient plus) >=55% - 3,0 (sufficient, pass) <54% - 2,0 (failure).

Course description

1. Elements of vector and tensor calculus.

2. State of stress - tensor of stress. Principle values and principle directions of tensor.

- 3. State of strain tensor of strain. Strain compatibility equations.
- 4. Hooke's law constitutive equations of elasticity.
- 5. Theorem of minimum potential energy. Virtual work equation. Lame's equations. Beltrami-Michell equations.
- 6. Analysis of plane state problems (plane stress, plane strain, disks).
- 7. Fundamentals of thin plates.
- 8. Calculation of internal forces and displacements in plates.

9. Constitutive relations of plasticity. Yield criteria of Tresca and of Huber-Mises-Hencky.

10. Fundamentals of ultimate load-bearing capacity analysis of structures.

Teaching methods: lecture - informative, monographic, exercises - exercise and project methods.

Basic bibliography:

1. Gawęcki A., Mechanika materiałów i konstrukcji prętowych, (tom I+II), Wyd. PP, Poznań 1998 [wersja elektroniczna dostępna na http://etacar.put.poznan.pl/mieczyslaw.kuczma/spis_tresci.pdf]

- 2. Brunarski L., Kwiecinski M.: Wstęp do teorii sprężystości i plastyczności, Wyd. PW, Warszawa 1976.
- 3. Brunarski L., Górecki B., Runkiewicz L.: Zbiór zadań z teorii sprężystości i plastyczności, Wyd. PW, Warszawa 1976.
- 4. Stanisławski S., Podstawy teorii sprężystości, Wyd. PP, Poznań 1963
- 5. Fung Y. C.: Podstawy mechaniki ciała stałego, PWN, Warszawa 1969.
- 6. Krzyś W., Życzkowski M.: Sprężystość i plastyczność, PWN, Warszawa 1962.
- 7. Nowacki W.: Teoria sprężystości, PWN, Warszawa 1970.
- 8. Ostrowska-Maciejewska J., Podstawy mechaniki ośrodków ciągłych, PWN, Warszawa 1982
- 9. Skrzypek J.: Plastyczność i pełzanie, PWN, Warszawa 1986.

Additional bibliography:

- 1. Mase G.E., Theory and problems of continuum mechanics, Mc-Graw Hill , New York 1970
- 2. Mase G. E.: Continuum Mechanics, McGraw-Hill Book Comp., 1970.
- 3. Ragab A.-R., Bayoumi S.E.: Engineering Solid Mechanics. Fundamentals and Applications, CRC, Boca Raton 1999.
- 4. Stein E., Barthold F.-J.: Elastizitätstheorie, Skript, Hannover 2004.

Result of average student's workload

Activity		Time (working hours)
1. Participation in lectures		18
2. Participation in classes		18
3. Participation in consultations, i.e. chosen after class discussions	5	
4. Study for the final test (classes)		12
5. Study for the final test (lectures)		12
Student's wo	rkload	
Source of workload	hours	ECTS
Total workload	65	3
Contact hours	41	2
Practical activities	18	1