SYLLABUS OF A MODULE

Polish name of a module	Mechanika materiałów i analiza wytrzymałościowa elementów konstrukcji
English name of a module	Mechanics of materials and strength analysis of construction elements
ISCED classification - Code	0715
ISCED classification - Field of study	Mechanics and metal trades
Languages of instruction	English
Level of qualification:	1 – BSc (EQF 6)
Number of ECTS credit points	5
Examination:	EW – exam written
Available in semester:	

Number of hours per semester:

Lecture	Tutorials	Laboratory	Seminar	E-learning	Project
15 E	15	30	0	0	0

MODULE DESCRIPTION

MODULE OBJECTIVES

- O1. Provide theory of complex strength of materials.
- O2. Provide theory of mechanics of materials.
- O3. To acquire capabilities to perform strength analysis of construction elements and to perform laboratory test of thermomechanical properties of materials as well as numerical modelling of chosen issues of mechanics of materials using selected computer software.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

- 1. Fundamentals of mechanics and strength of materials.
- 2. Safety rules during the use of laboratory equipment.
- 3. Capability of individual work and collaboration in a group.
- 4. Data analysis and presentation of results.

LEARNING OUTCOMES

LO 1 – Knowledge on complex strength of materials analysis.

LO 2 – Knowledge on basics of mechanics of materials.

LO 3 – Ability to predict stress in loaded construction elements and to test material properties.

MODULE CONTENT

	Number
Type of classes – lecture	of
	hours
Lec 1-2 - Internal forces, stress and strain tensor, constitutive relations	2
Lec 3-4 – Tension, bending, shear and torsion	2
Lec 5-6 - Strength of materials in compound stress. Strength hypotheses	2
Lec 7 - Combined stresses	1
Lec 8 - Deformation of beams due to bending	1
Lec 9 - Mechanical properties of materials, material isotropy and	
anisotropy	
Lec 10 The structure of materials, material polycrystalline	1
Lec 11-12 - Thermomechanical properties, methods of determination of	2
stress and strain	L
Lec 13 - Linear and non-linear materials in elastic and plastic range	1
Lec 14 – Creep - the theory of viscoelastic	1
Lec 15 – Fatigue - models of the formation of micro-cracks fatigue	1
Sum	15

	Number
Type of classes- tutorials	
	hours
T 1-2 - Internal forces in prismatic bars	2
T 3-4 – Properties of a plane area	2
T 5-6 – Tension, compression and bending	2
T 7 – Eccentric tension and compression	1
T 8 - Shear and torsion	1
T 9-10 - Combined stresses – strength hypotheses	2
T 11-12 - Deformation of beams. Statically indeterminate systems – 1D and 2D problem	2
T 13-14 - Castigliano-Menabrei energetic methods	2
T 15 – Buckling of beams	1
Sum	15
	Number
Type of classes– laboratory	of
	hours
Lab 1-4 - Hardness testing, (Brinell, Poldi, Rockwell, Vickers)	4
Lab 5-8 - Tension test	4
Lab 9-10 - Compression test	2
Lab 11-12 – Bending test	2
Lab 13 – Impact test - Charpy	1
Lab 14-17 – Deflection test on beam	4
Lab 14-17 – Deflection test on beam Lab 18-19 – Dilatometric test	4 2
Lab 14-17 – Deflection test on beamLab 18-19 – Dilatometric testLab 20-23 - Measurement of stresses with bond wire strain gauges	4 2 4
Lab 14-17 – Deflection test on beamLab 18-19 – Dilatometric testLab 20-23 - Measurement of stresses with bond wire strain gaugesLab 24-25 - Photoelastic method for stress state analysis	4 2 4 2
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TEACHING TOOLS

1 - lecture with the use of multimedia presentations

2 - experimental stands equipped with measuring instrumentation

3 - computer laboratory, software for FEM simulation of construction

4 - instructions to laboratory exercises

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for laboratory exercises

F2. - assessment of the ability to apply the acquired knowledge while doing the exercises

exercises

F3. - evaluation of reports on the implementation of exercises covered by the curriculum

F4. - assessment of activity during classes

S1. - assessment of the ability to solve the problems posed and the manner of

presentation obtained results - pass mark *

S2. - assessment of mastery of the teaching material being the subject of the lecture - exam

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
1. Contact nours with teacher		
1.1	Lectures	15
1.2	Tutorials	15
1.3	Laboratory	30
1.4	Seminar	0

1.5	Project	0		
1.6	Consulting teacher during their duty hours	5		
1.7	Examination	5		
	Total number of contact hours with teacher:	70		
2.	2. Student's individual work			
2.1	Preparation for tutorials and tests	15		
2.2	Preparation for laboratory exercises, writing	15		
	reports on laboratories			
2.3	Preparation of project	0		
2.4	Preparation for final lecture assessment	10		
2.5	Preparation for examination	5		
2.6	Individual study of literature	10		
Total number of hours of student's individual work:		55		
Overall student's workload:		125		
Overall number of ECTS credits for the module		5 ECTS		
Number of ECTS points that student receives in classes requiring teacher's supervision:		2,60 ECTS		
Num class	ber of ECTS credits acquired during practical ses including laboratory exercises and projects:	2,40 ECTS		

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Blake A.: Handbook of Mechanics, Materials, and Structures, 1985

2. Silva V. D.: Mechanics and Strength of Materials, 2006

3. Ross Carl T.F., Case J., Chilver A., Strength of materials and Structures,

Elsevier, 1999

4. Patnaik S., Hopkins D., Strength of Materials, A New Unified Theory for the 21 Century, Elsevier, 2004

5. Timoshenko S.: Strength of materials, part I, part II, Van Nostrand Company, Inc. 1956 6. Shigley J.: Applied Mechanics of Materials, 1976

MODULE COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

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