SYLLABUS

Course description

Course code	Course	**WYTRZYMAŁOŚC MATERIAŁÓW**	
MB/O/I/NST/A.5		**STRENGTH OF MATERIALS**	
Language of instruction	English		
Academic year	2023/2024		
field of study:	Mechanical Engineering		
field of specialisation:	All		
Educational level	first-cycle studies		
Education profile	General academic		
Mode of study	Part-time studies		
Semester(s)	3		
Affiliation with a group of classes	Basic classes		
Course status	Obligatory		
Types of classes, instruction hours, ECTS credits	Types of classes	Number of instruction hours	Number of ECTS credits
	Lecture	16 [h]	7 ECTS
	Classes	20 [h]	
	Lab	20 [h]	
Linkage of the course	with the education profile	Related to the conducted scientific activity in the discipline to which the field of study is assigned	7 ECTS
	with qualifications	It is used to acquire engineering competences by the student	7 ECTS
	with science discipline	Mechanical engineering	7 ECTS
Form of teaching	Traditional – classes organized at the University /classes conducted using distance learning methods and techniques		
Prerequisites	knowledge of mechanics (statics) and mathematics		
Department	Faculty of Mechanical Engineering		
Coordinator	Ph.D. K. Olejarczyk		
The website of the basic organizational unit	http://wm.uniwersytetradom.pl		
E-mail address, phone number of the coordinator	k.olejarczyk@uthrad.pl (48) 361-71-16		

LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

Learning Objective:	C1 – Knowing the strength of materials in simple cases such as the load rod tension, compression, shear, torsion and bending C2 – Ability to perform strength calculations In bar structures in simple load cases.
Curriculum Content:	The content of classes is related to the conducted scientific research. Lecture content: Basic concepts of strength of materials. Definition of stresses and state of tension. Load classification. Simple load cases. Stretching and compression. Hooke's law. Allowable stresses. Security factor. The principle of superposition. Thermal stresses. Energy of elastic deformation in a rod in tension. Stress and strain analysis. Mohr's Circle. Stress analysis in a plane tension state. Changing the transverse dimensions of a stretched bar. Poisson's number. Torsion of circular cross-section bars. Free torsion of bars of any cross-sectional shape. Moments of inertia of plane figures. Bending. Diagrams of shear forces and bending moments. Stress analysis in a bending bar. Analytical method for determining the deflection of the beam. Application of packages supporting engineering calculations in strength analysis. The use of a graphical programming environment for measurements, simulations and data acquisition. Content of exercises Simplified model of a solid. System of units in strength calculations. Tasks for tension or compression of statically determinate systems. Problems for statically indeterminate systems. Stress analysis problems. Strain analysis problems. Statically determinable cases of torsion of shafts. Maximum stresses and bar twist angle. Free torsion of thin-walled bars with a closed cross-section and with an open cross-section. Determination of moments of inertia of plane figures. Strength calculations of beams. Determination of beam deflection. Content of laboratory exercises Static tensile test of metals. Determination of Young's modulus based on a strict tensile test. Impact test. Study of deformation of the coil spring system and determination of the shear stiffness coefficient G of the spring material. Determination of Young's modulus E of the material based on the measurement of the radius of curvature of the beam being bent. Determination of the Kirchhoff shear modulus for torsion of a thin-walled pipe. Determination of stresses in a strongly curved rod by means of resistance strain gauges. Buckling test of a compressed member. Circular ring deformation test. Determination of the location of the center of transverse forces.
Didactic (educational) methods:	feeding methods (informative lecture combined with exposition and demonstration of basic cases of bar work); programmed methods (using a computer to present the state of stresses and strains), practical methods (demonstration, laboratory exercises, calculation exercises, numerical simulation of structure effort)
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	The condition for passing the course is to achieve all the required learning out comes specified for the course.

Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes				Methods of verifying learning outcomes	
Learning outcome number	Description of the learning outcomes for the course (PEU) A student who has passed the course (**W**) knows and understands / (**U**) can / (**K**) is ready to:	Field of study learning outcome (KEU)	Types of classes	Form of verification (credits)	Methods of testing and assessment
W1	Has knowledge of the task and methods of strength of materials and the analysis of statically determinate bars and bar structure in simple load case (tension, compression, shear, torsion and bending)	K_WG02	Lecture, Auditorium exercises, Laboratory exercises	Test	Test / egam
W2	knows the basic formulas, describes simple cases of rod work and understands the concept of structural safety	K_WG06	Lecture, Auditorium exercises, Laboratory exercises	Test	Test / egam
U1	is able to perform strength calculations for statically determinate bars and bar structures in simple load cases.	K_UW08	Lecture, Auditorium exercises, Laboratory exercises	Test	Test / egam
U2	Is able to determine the effort components of the bar cross-section and perform control and dimensioning strength calculations in simple load cases	K_UW02	Lecture, Auditorium exercises, Laboratory exercises	Test	Test / egam
K1	is aware of the responsibility related to decisions made as part of engineering activities, especially in terms of own and other people's safety	K_KO04	Lecture, Auditorium exercises, Laboratory exercises	Test	Test / egam

Literature and teaching aids
1. R.Bąk, T.Burczyński: Wytrzymałość materiałów z elementami ujęcia komputerowego. WNT, Warszawa 2001. 2. E. Cegielski: Wytrzymałość materiałów. Teoria, przykłady, zadania. IMiPKM, Politechnika Krakowska 2000. 3. Brzoska Z., Wytrzymałość materiałów, PWN, Warszawa 1979. 4. Timoshenko S. Strength of Materials, 3rd edition. Krieger Publishing Company, 1976 5.Hibbeler, R.C. Statics and Mechanics of Materials, SI Edition. Prentice-Hall, 2004 6.Mott, Robert L. Applied Strength of Materials, 4th edition. Prentice-Hall, 2002 7.Dziewiecki K., Misiak J., Ćwiczenia laboratoryjne z wytrzymałości materiałów, Wyd. WSI Radom, 1992.

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits			
Attendance, participation	Student workload [h].		
	Other contact hours (IGK)	Student's self-study hours Classes without a teacher (ZBN)	Classes
Participation in lectures/classes/lab	X	X	16 [h] /20[h]/20[h]
Meeting with teachers during their duty hours	10 [h]	X	X
Preparation for lectures/classes/lab , Preparation for ... credit / exam	X	24[h]/30[h]/30[h] 15[h]/10[h]	X
Total student workload	10 [h]/ 0,4 ECTS	109 [h]/ 4,4 ECTS	56 [h]/ 2,2 ECTS
ECTS credits for the course	175 [h] / 7 ECTS		

Additional information, comments
In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate. Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekle chorych).