SYLLABUS

Course description

Course code	Course	Mechanika konstrukcji
ME/O/I/NST/B14		**Mechanics of structures**
Language of instruction		English
Academic year		2025/2026
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)		4
Affiliation with a group of classes		B. Group of obligaroty course core subject
Course status		Obligatory

Types of classes, instruction hours, ECTS credits	Types of classes	Number of instruction hours	Number of ECTS credits
	Lecture	16 [h]	6 ECTS
	Classes	16 [h]	
	Lab	8 [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	ECTS
	with qualifications	It is used to acquire engineering competences by the student	6 ECTS
	with science discipline	Mechanical engineering	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	dr inż. Roman Król
The website of the basic organizational unit	http://wm.uniwersytetradom.pl
E-mail address, phone number of the coordinator	r.krol@uthrad.pl, +48 361 71 12

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

Learning Objective:	C1 – Ability to perform strength analysis of the constructions which consists of rods under complex loading state including statically indeterminate constructions

	C2 – to familiarize Students with the basics of the plate, pipe and thin walled vessels analysis C3 – to develop skills in performing the fatigue life computations and analysis of the structures in the scope of elasto-plastic deformations
Curriculum Content:	Lecture: Solving beam diagrams of the statically determinate structures under tension or under bending. Analysis of statically determinate frames. Solving displacements in the statically determinate frames. The Reciprocal Theorem. The superposition method. Energy methods in solving reaction forces and displacements in statically indeterminate beam and frames. Castigliano's Theorem and Menabrea's Theorem. Using Maxwell-Mohr equations and Vereshchagin's Method in solving statically indeterminate reaction forces and reaction moments. Beam diagrams for the statically indeterminate structures. Analysis of the beam deflection line using Clebsch's Method. Analysis of thin-walled vessels. Exercises: Solving complex strength of materials problems concerning statically determinate supporting structures. Solving beam diagrams with internal moments and internal forces of the statically determinate frames. Solving axial stress distribution in the rod structures. Analysis of the statically indeterminate beams using Maxwell-Mohr equations. Solving statically indeterminate reaction forces and reaction moments using Menabrea's Theorem. Solving problems with energy methods. Determining the beam deflection line using Clebsch's Method. Application of the symbolic calculations in the MATLAB environment in the solution of the exercises with the energy methods. Laboratory exercises: Verification of the Strength of Materials' theorems and methods: the Reciprocal Theorem, Vereshchagin's Method. Verification of the statically indeterminate reaction forces and reaction moments solved by the Finite Element Method using Autodesk Nastran In-CAD software and by the theoretical calculations according to Menabrea's Theorem. Verification of the FEM analysis of structures using energy methods. Solving displacements of the statically indeterminate frames on the basis of the beam diagrams obtained as a result of the FEM analysis.
Didactic (educational) methods:	traditional
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 in the area of strength analysis of basic mechanical structures;	K_WG06	Lecture/ Class/ Lab	Reports, tests, problems, examination	
W2	has knowledge of numerical methods used in simulation and analysis of mechanical	K_WG17	Lecture/ Lab	Reports, problems	

	systems, as well as in the process of their design, manufacturing and operation;				
U1	is able to use computer methods in solving engineering tasks in the field of design, manufacturing and operation of machinery and equipment;	K_UW05	Lab		
U2	can use measurement apparatus and methods of estimating measurement errors;	K_UW06	Lab		
K1	is ready to complete and critically evaluate specialized knowledge and is able to select sources of knowledge and methods of learning appropriate for himself/herself and others;	K-KK01	Lecture/ Class/ Lab		Verbal assessment
K2	is willing to comprehensively analyze and effectively carry out assigned tasks, and in the event of difficulties in solving them, use expert opinion;	K-KK02	Lecture/ Class/ Lab		Verbal assessment

Literature and teaching aids
Primary literature: 1. Brzoska Z., Wytrzymałość materiałów, PWN, Warszawa, 1983. 2. Niezgodziński M. E., Niezgodziński T., Zadania z wytrzymałości materiałów, Wydawnictwo Naukowe PWN SA, Warszawa 2016 (reprinted e-book) 3. Niezgodziński M. E., Niezgodziński T., Wytrzymałość materiałów, PWN, Warszawa, 2002. 4. Niezgodziński M. E., Niezgodziński T., Wzory wykresy i tablice wytrzymałościowe, WNT, Warszawa, 1996. 5. Den Hartog J. P., Strength of materials, McGraw-Hill Book Company Inc., USA 1949 (reprinted ebook) 6. Den Hartog J. P., Advanced strength of materials, McGraw-Hill, New York 1952 (reprinted ebook) Additional literature: 1. Timoschenko S., Goodier J. N., Theory of elasticity, McGraw-Hill Book Company Inc., New York, 1951 Study aids: Lecture notes in Microsoft Power Point

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits		
Attendance, participation	Student workload [h].	
	Student's self-study hours Classes without a teacher (ZBN**)**	Classes
Participation in lectures/classes/lab	X	40 [h]
Preparation for lectures/classes/lab , Preparation for ... credit / exam	110 [h]	X
Total student workload Preparation for ... credit / exam	110 [h]/4.4 ECTS	40 [h]/1.6 ECTS
ECTS points per subject	6 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).