MEĐIMURJE POLYTECHNIC IN ČAKOVAC

POLYTECHNIC OF MEĐIMURJE AND ČAKOVEC

SYLLABUS COURSE

ACADEMIC YEAR: 2020/2021

1. GENERAL INFORMATION ABOUT THE COURSE

1.1. Course title	**Mechanics and resistance of structures**			
1.2. Study program (s)	Undergraduate professional study Sustainable Development			
1.3. Course status (O, I)	Mandatory	**1.6. Teaching methods (number of hours)**	**Lectures**	30
1.4. Course code			**Exercises**	30
1.5. Course abbreviation	MiOK		**Seminar**	
1.6. Semester	III		**E-learning**	
1.7. Credit value (ECTS)	5	**1.7. Place and time of classes**	Premises of the Polytechnic of Međimurje in Čakovec, according to the schedule published on the website	

2. TEACHING STAFF

2.1. Carrier	mr. sc. Vladimir Križaić, Dražen Hranj	**2.4. Assistant (s)**	Dražen Hranj
2.2. Calling	s. lecturer, lecturer	**2.5. Title (s)**	lecturer
2.3. Contact	vkrizaic @ mev.hr, dhranj@mev.hr	**2.9. Contact / s**	dhranj@mev.hr

3. COURSE DESCRIPTION

3.1. Course objectives	The acquisition of basic skills and of technical mechanics with a focus on the needs of the construction as a basis to monitor the teaching of vocational subjects.
3.2. Requirements for enrollment and taking the course	Passed the course PHYSICS
3.3. Learning outcomes	**After successfully completing the course, students will be able to:** 1. Analyze the basic physical laws of conservation in nature 2. Determine the equilibrium state of a material point and a body . Determine equilibrium forces and moments for a loaded material point and body by setting equilibrium conditions by analytical methods 3. Determine the equilibrium state of a material point and body and the equilibrium forces and moments for a loaded material point and body by setting the equilibrium conditions by graphical methods 4. Calculate the geometric characteristics of the cross section of the rod - simple / typical engineering cross sections

	5. Understand the concepts of stress, displacement and deformation 6. Analyze the stress state and deformation field required for mechanical safety and stability of a flat rod 7. Determine the internal shear forces of a flat rod and draw diagrams of the internal forces of a flat rod 8. Analyze the stress state and deformation field required for mechanical safety and stability of the foundation
3.4. Course content	The course presents contents related to classical and modern technology of construction projects

3.5. Types of teaching

x	Lectures	x	Exercises		Blended e-learning	x	Independent tasks		Laboratory
	Seminars and workshops		Distance education		Field work	x	Multimedia and network		Mentoring work
	Other:								

3.6. Performance language	Croatian

3.7. Monitoring student work (enter the number of ECTS credits for each activity so that the total number of ECTS credits corresponds to the credit value of the course, 1 ECTS = 30 hours)

2,0	Class attendance	0,5	Seminar paper		Essay
0,5	Teaching activity		Project		Report
1 ,0 0	Colloquia		Practical work		Continuous assessment
1.00	Written exam		Experimental work		
1.00	Oral exam		Research		

Seminar paper = colloquium 1

3.8. Assessment and evaluation of student work during classes and at the final exam

Activity specification	**Percentage%**	**points**
Evaluation during classes		
Class attendance	8%	8
Teaching activity	2%	2
Practical work	18%	18
Colloquium 1	36 %	36
Colloquium 2	36 %	36
Evaluation of exam work for students who did not take the colloquium		
Written exam	*90 %*	*9 0*
In total:	**100%**	***100***

3.9. Evaluation criteria - elaboration by outcomes

	Method of passing the outcome					
	Class attendance	**Teaching activity**	**Colloquium 1**	**Colloquium 2**	**Practical work**	**In total**
Outcome 1			10	2. 5		12.5
Outcome 2			10	2.5		12.5
Outcome 3			10	2.5		12.5
Outcome 4			10	2.5		12.5
Outcome 5				10		10
Outcome 6				10		10
Outcome 7				10		10
Outcome 8				10		10
Outside the outcome	8	2				10

In total	**8**	**2**	**40**	**50**	0	**100**

Scoring outcomes (in order to pass the colloquium / exam the student must achieve at least 50% points for each learning outcome)

Rating Points

89 - 100 Excellent (5)

76 - 88 Very good (4)

63 - 75 Good (3)

5 1 - 62 Sufficient (2)

0 - 49 Insufficient (1)

3.10. Specifics related to taking the course	If a student collects 50% of the points of each outcome, he / she directly takes the exam . If a student does not achieve a sufficient number of points on the midterm exam, he / she cannot take the next midterm exam. Once achieved points in intermediate exams for each learning outcome are no longer deleted unless the student decides to correct the result for a particular learning outcome, whereby the points won until then are deleted and newly achieved points for that learning outcome are entered. The final grade is obtained on the exam period and is the sum of points earned during classes. Students who did not take the colloquium access the written part of the exam where all learning outcomes are checked .	
3.11. Student obligations	Full-time students are required to attend at least 70% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. Part-time students are required to attend at least 30% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. If the student has not fulfilled all the obligations provided by the course, he is obliged to attend the lectures again and meet the conditions for taking the exam. Attendance can be offset by online consultations, organized webinars, and added assignments given by teachers. One lesson lasts 45 minutes, and several hours form a teaching unit. Absence from one teaching unit is counted as one absence. Delays and apologies are recorded separately. In that case, if the student missed more than 50% of classes, and has a justifiable reason / apology, a request should be submitted to the Department Council, which then decides on the justification of student absences with the obligatory opinion of the course leader.	
3.12. Written works		
3.13. Required reading	1.	H. Werner: Technical Mechanics, script, Zagreb, 1986.
	2.	V. Šimić Resistance of materials I, Školska knjiga, Zagreb, 1992.
	3.	V. Šimić: Otpornost materijala II, Školska knjiga, Zagreb, 1995
3.14. Supplementary literature	1.	M. Anđelić: Statics of indeterminate rod structures, DHGK, Zagreb, 1993; FEAT and TOWER user manual
	2.	IA Birger, RR Mavlyutov, Co-operation of Materials, Moscow - Science, 1986
	3.	JE Bowles, Foundation Engineering Handbook, Van Nostrand Reinhold Co., 1982
4. ADDITIONAL INFORMATION ABOUT THE COURSE		
4.1. Quality control	The quality of the program, teaching process, teaching skills and level of mastery of the material will be established by conducting a written evaluation based on	

	questionnaires, and in other standardized ways and in accordance with the acts of the Polytechnic of Međimurje in Čakovec.
4.2. Contacting the teacher	Students can contact the teacher during the consultation period and during classes, while for short questions and explanations they can contact any day during working hours by coming in person or by landline. It is also possible to ask questions by e-mail, which will be answered in 48 hours at the latest. It is desirable that students come to the consultation as often as possible for any ambiguities.
4.3. Informing about the course	It is the obligation of each student to be regularly informed about the course. All notifications about the holding or possible postponement of classes will be posted on the bulletin board and on the website of the Polytechnic at least 24 hours in advance.
4.4. The contribution the course to the study program	Apply the basics of static building through creating and designing projects construction

5. DEVELOPMENT OF THEMATIC UNITS (the number of elaborated hours is identical to the number of lectures and exercises of the course)

LECTURES

Hours	**Topic and description of the lecture**	**Method of work** • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning • case study • field teaching…	**Lecture learning outcomes**	**Course learning outcome**
1.	Basic physical laws and principles of conservation in nature. Work, strength and energy. Units of measure and friction.	Presentation, pp presentation	Distinguish the laws of the nature of force	I1
2.	Material point dynamics. Definitions and representations of forces and moments. Equivalence of the force system. Equilibrium conditions analytically .	Presentation, pp presentation	Distinguish equilibrium conditions	I 2
3.	Material point dynamics. Definitions and representations of forces and moments. Equivalence of the force system. Equilibrium conditions graphically .	Presentation, pp presentation	Distinguish equilibrium conditions	I 3
4.	Geometrical characteristics of rod cross section. Core cross section. Neutral axis	Presentation, pp presentation	Use the resistance of the body section	I 4

5.	Body center of gravity, static moment, moment of inertia and body resistance. Mechanical behavior of solids.	Presentation, pp presentation	Use body cross-sectional resistance	I 4
6.	The notion of internal forces. The concept of stress, displacement and deformation. In-plane stress analysis. Direction and magnitude of major stresses. Mohr's circle.	Presentation, pp presentation	Distinguish between internal and external actions	I 5
7.	Introduction to the mechanics of continuous forces. Mechanics of elastic bodies. Hooke's law for an isotropically homogeneous body. Poisson's ratio.	Presentation, pp presentation	Distinguish between internal and external actions	I5
8.	Main stresses and stress trajectories. Clean pressure and eccentric. Pure bending. Bending with transverse force. S bending with longitudinal force.	Presentation, pp presentation	Distinguish body stresses	I6
9.	Stress superposition principle.	Presentation, pp presentation	Apply superposition	I6
10.	Main bending stresses and stress trajectories. Pure bending. Bending with transverse force.	Presentation, pp presentation	Apply body bending	I6
11.	Main bending stresses and stress trajectories. Pure bending. Bending with longitudinal force	Presentation, pp presentation	Distinguish between bending and twisting	I6
12.	Oblique bending.	Presentation, pp presentation	Distinguish hair bending	I6
13.	Body flexion.	Presentation, pp presentation	Explain the buckling method	I6
14.	Stress concentration. Shift. DIRECTION of shear and elasticity. Cut.	Presentation, pp presentation	Explain the offset and cut	I7
15.	Major stresses and stress stresses of foundations.	Presentation, pp presentation	Explain the basic actions	I8
EXERCISES / SEMINARS				
Hours	**Topic and description of the lecture**	**Method of work** • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning • case study	**Lecture learning outcomes**	**Course learning outcome**

		• field teaching…		
1.	Material point dynamics. Definitions and representations of forces and moments. Equivalence of the force system. Equilibrium conditions analytically.	Presentation, presentation of seminar paper	Distinguish equilibrium conditions	I1, I2
2.	Material point dynamics. Definitions and representations of forces and moments. Equivalence of the force system. Equilibrium conditions graphically.	Guided assignment - seminar paper, examples of resistance	Distinguish equilibrium conditions	I3
3.	Geometrical characteristics of rod cross section. Core cross section. Neutral axis	Guided assignment - seminar paper, modulus of elasticity	Use body cross-sectional resistance	I4
4.	Body center of gravity, static moment, moment of inertia and body resistance. Mechanical behavior of solids.	Guided assignment - seminar paper, bends and sags	Use body cross-sectional resistance	I4
5.	The notion of internal forces. The concept of stress, displacement and deformation. In-plane stress analysis. Direction and magnitude of major stresses. Mohr's circle.	Guided assignment - seminar paper, Beam	Distinguish between internal and external actions	I5
6.	Introduction to the mechanics of continuous forces. Mechanics of elastic bodies. Hooke's law for an isotropically homogeneous body. Poisson's ratio.	Guided assignment - seminar paper, Gerber	Distinguish between internal and external actions	I5
7.	Main stresses and stress trajectories. Clean pressure and eccentric. Pure bending. Bending with transverse force. Bending with longitudinal force.	Guided assignment - seminar paper, sizing	Distinguish body stresses	I6
8.	Stress superposition principle.	Guided task - example	Apply superposition	I6
9.	Main bending stresses and stress trajectories. Pure bending. Bending with transverse force.	Guided task - example	Apply body bending	I6
10.	Main bending stresses and stress trajectories. Pure bending. Bending with longitudinal force	Guided task - example	Distinguish between bending and twisting	I6
11.	Oblique bending.	Guided task - example	Distinguish hair bending	I6
12.	Body flexion.	Guided task - example	Explain the buckling method	I6

13.	Stress concentration. Shift. DIRECTION of shear and elasticity. Cut.	Guided task - example	Explain the offset and cut	I7
14.	Major stresses and stress stresses of foundations.	Guided task - example	Explain the basic actions	I8
15.	Colloquium	Independent production	To rate	