POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION

1.1 Course name	Mechanics of Materials			
1.2 Study program/s				
1.3 Course status (O,E)	O	**1.6 Mode of instruction (number of hours)**	**Lectures**	30
1.4 Course code	4100		**Exercises**	30
1.5 Course abbreviation	MoM		**Seminars**	
1.6 Semester	III		**E-learning**	
1.7 ECTS	5	**1.7 Place and time of instruction**	Facilities of Polytechnic of Medjimurje in čakovec	

2. TEACHING STAFF

2.1 Course leader/s-title	Doc.dr.sc. Tanja Tomic	**contact**	tanja.tomic@mev.hr
		contact	00385 91 601 6541
2.2 Assistant/s- title		**contact**	
		contact	
2.3 Instruction held by- title		**contact**	

3. COURSE DESCRIPTION

3.1 Course goals	Introducing the general concept and terms used in this research field of Mechanics of materials, stress load and deformation, according to the basic calculations in problems regarding the material strength on loaded beams.
3.2 Prerequisites	Prerequisites are successfully passed the course in Mechanics
3.3 Course outcomes	The students will be able to: I1 – define the basic terms in the field of Mechanic of Materials: stress loading, types of loading, deformation, material strength, static determinateness and main deformation. I2 – describe the differential equations that are regarded to the loaded beams, beam constructions, and axial and bending stress I3 – differentiate the principles on that the calculations are made in conditions of static determinated and static undeterminated beams with more support I4 – calculate the components of stress loading and movement in on axial, bending, shear and torsion stress I5 – differentiate the main stress loading for the plain stress load and main deformation in the plain deformation state. Calculating the thermal and assembling beam constructions. I6 – Dimensioning the simple construction elements that are simple loades with admissible loading forces for the given material.
3.4 Course content	The course is divided into two parts. The first part is given the theoretical approach to the lecture where the main principles of the course is given and the second part is audio exercise part in which the numerical solution for the given problems will be studied.

3.5 Types of coursework		Lectures	x	Exercises	x	Blended e-learning	x	Individual activities	x	Laboratory

		Seminars and workshops		Distant learning		Field classes		Multimedia and network		Mentorship
		Other								

3.6 Language of instruction

3.7 Monitoring students' work (enter the number of ECTS credits for each activity so that the total number of ECTS credits is equal to the total ECTS value of the course, 1 ECTS = 30 hours)

2,0	Class attendance	0,5	Seminars		Essay
	Class activity		Project		Report/paper
1,5	Midterm exams		Practical task		Continuous knowledge check
(1,5)	Written exam		Experimental work		
1,0	Oral exam		Research		

3.8 Assessment and evaluation of students' work during classes and at the final exam

Activity specification	Percent %	Points
Assessment during instruction		
Attendance	5%	5
Class activity	5%	5
Seminar/ project/ essay	20%	20
Midterm exam 1	35%	35
Midterm exam 2	35%	35
Exam assessment for the students who failed to fullfil all the obligatory requirements during the semester		
Written exam	*70%*	*70*
Total:	**100%**	**100**

3.9 Assessment criteria – analysis per learning outcomes

Ways of evaluating learning outcomes						
	Attendance	**Activity**	**Mid-term exam 1**	**Mid-term exam 2**	**Practical work**	**Total**
Outcome 1			5		5	10
Outcome 2			5	10		15
Outcome 3			10		5	15
Outcome 4			15			15
Outcome 5				10	5	15
Outcome 6				15	5	20
Outcome not-related						
Total	**5**	**5**	**35**	**35**	**20**	**100**

Grading of outcomes (in order to pass the mid-term exam/exam the student must achieve at least 50% points for each learning outcome)

Points	Grade
89 – 100	excellent (5)
76 – 88	very good (4)
63 – 75	good (3)
50 – 62	pass (2)
0 – 49	fail (1)

3.10 Specific features related with taking the course

In case the student accumulates more than 50% of the points, he/she is can directly approach the oral exam. In case the student does not accomplish the proper amount of points on the first midterm (1st Midterm), he/she cannot take a part on the following midterm (2nd Midterm).

The accomplished points on the midterms cannot be deleted unless the student makes the decision to improve his/her grade.

	The points for homework assignments are calculated regarding the quality of the written assignment. The points gained on the assignments and class activity are valid through the whole academic year unless the student decides to better their grades. The student cannot approach the written exam unless the signed homework assignment is done and graded. The homework assignment must be held in 3 days before the written exam. The final grade is given on the oral exam.	
3.11 Students 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 set 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 tuition, organised 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, the 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 assignments	The homework assignment must be typed out on a PC and must have maximum 12 text cards (Times New Roman, font 12) including the introduction and the pictured, attachments and tables, etc. The homework assignments must have an according front page, content with page numeration, introduction. The homework assignment must be divided in chapters, and include the literature references, and list of picture and list of table content. The chapter with the conclusion must have 250 words. The student guaranties the authentic work as its own.	
3.13 Required reading	1.	Alfirevic, I.: Nauka o čvsrtoći I, Tehnička knjiga, Zagreb,1995.
	2.	Plazibat, B.; Matokovic, A.; Vetma, V.: Nauka o čvrstoći, Sveučilište u Splitu, Sveučilišni odjel za stručne studije, Skripta, 2019
3.14 Additional reading	1.	Matejiček, F.; Semenski, Z.; Vnučec, Z.: Uvod u statistiku sa zbirkom zadataka, Slavonski Brod, Fakultet strojarstva i brodogradnje, 2012.
	2.	Kraut, B.: Strojarski priručnik
4 ADDITIONAL COURSE INFORMATION		
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 standardised ways and in accordance with the by-laws of the Polytechnic of Međimurje in Čakovec.	
4.2 Contact the teacher	Students can contact the teacher during the office hours and during classes, while for short questions and explanations they can contact him/her 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 for students to come as often as possible for any possible questions during the teacher's office hours.
4.3 Information about the course	It is the obligation of each student to be regularly informed about the course. All notifications about the classes 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 Course contribution to the study program	Personal knowledge and skills: - Introducing information, ideas, problems and solution to the competent and general public and communities - Adaptability to new technologies, techniques and recent systems as a part of the whole life education. General knowledge and skills: - The capacity to apply the gained knowledge in the field of technical expertise on concrete engineering assignments, - The capacity to identify, algorithm and finding solution for engineering problems in the field of material strength Special expert knowledge and skills gained in completing the courses in Faculty department Sustainable development: - Taking part in research and development business fields and institutions - Working in the project, consulting and executing development and business sectors within the field of Sustainable development.

5. ANALYSIS OF COURSE TOPICS (the number of hours is equal to the number of lectures and exercises of the course)

LECTURES

Hours	Topic and description	Method • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	Learning outcomes	Course outcome
1.	Introduction: general terms of strength, stiffness, stability of construction. Methods on solving the problems regarding the Mechanics of Materials	• Direct teaching (lecture, instruction, pp presentation)	Defining the main terms and principles	I1
2.	Deformation tensor. The correlation between the stress loading and deformation. Transformation of components of the stress tensor in the rotation of the coordinate system.	• Direct teaching (lecture, instruction, pp presentation)	Defining the main terms and principles	I1
3.	Main stress. Moohrs' circle.	• Direct teaching (lecture, instruction, pp presentation)	Defining the main terms and	I1

			principles, Mohr's circle	
4.	Linear and angular deformation. Deformation tensor and transformation of deformation tensor components. Major deformations and Mohr's circle deformations.	• Direct teaching (lecture, instruction, pp presentation)	Defining the general terms of linear and angular transformation, describing the principle of Mohr's circle.	I1
5.	Mechanical properties of materials. Hook's law. Shear stress.	• Direct teaching (lecture, instruction, pp presentation)	Defining the terms on mechanical properties, showing the Hooks law diagram	I1, I2, I3
6.	The correlation to the stress loading and deformation. Plain state of deformation	• Direct teaching (lecture, instruction, pp presentation)	Defining the terms regarding the tensors.	I1, I2, I3
7.	Deformation and movement in the axial loaded beams. Axial stiffness	• Direct teaching (lecture, instruction, pp presentation)	Calculating the compoments of tensor stress and deformation in the arbitrarily rotated coordinate system	I3, I4
8.	Tensor transformation of plain stress loading and deformation. Main stress and deformation.	• Direct teaching (lecture, instruction, pp presentation)	Calculating the components of the stress and movement in the loaded beams	I4
9.	Assembling and thermal stress loading of the beam 1st Midterm test	• Direct teaching (lecture, instruction, pp presentation)	Calculating the thermal and assembling stress loading in the beam constructions	`I5
10.	Torsion of plain round beams. Stress and deformation components.	• Direct teaching (lecture, instruction, pp presentation)	Calculating the components and the movement in the torsion loaded beams	I4, I5
11.	Static undeterminated examples on bending. Dimensioning the beams at bending forces.	• Direct teaching (lecture, instruction, pp presentation)	Dimensioning the simple construction elements on loaded constructions	I6
12.	Presuming and limitations on the analysis of bending of plain prism beams.	• Direct teaching (lecture, instruction, pp presentation)	Calculating the components of stress and deformations	I4
13.	Stress at bending the beams, moments and forces.	• Direct teaching (lecture, instruction, pp presentation)	Calculating the components of the stress and movement, analyse the main stress fir the plain state of	I4, I5

			stress loading and main deformations	
14.	Shear force on the beam. Components of stress and deformation at shear stress. Dimensioning the beams loaded on bending.	• Direct teaching (lecture, instruction, pp presentation)	Calculating the components of the stress and movement	
15.	2nd Midterm test	• Direct teaching (lecture, instruction, pp presentation)		
EXERCISES/ SEMINARS				
Hours	**Topic and description**	**Method** • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	**Learning outcomes**	**Course outcome**
1.	Review of the basic and main terms of static. Calculating the components of the stress vector and tensor.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Defining the basic terms of the mechanics of materials; stress loading; types of stress; deformation of materials, static un-determination of the structure and main deformation	I1
2.	Calculating the components of the stress and deformations	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Calculating the components of the stress and deformation on the given examples	I1
3.	Connecting the components of deformation with the components of stress loading.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Calculating the components of stress loading and components on deformation on given examples	I1
4.	Analyse of deformation and Mohrs circle.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Determination of components on linear and angular deformations in the directions of the coordinate system, main directions and	I2, I3, I4

			main deformations including the angular deformation of the Mohrs' circle.	
5.	Calculating the elastic constant material	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Calculating the elastic constant E, and the Poisson's' ratio	I1, I2, I3
6.	The connection between the stress loading and deformation. Calculating the components of stress loading on plain state of stress loading.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Determination the main deformation and the directions of main deformations	I1, I2, I3
7.	Movement. Dimensioning the beams.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Based on the force value calculating the stress load in the beams and determinate the point movement in the plan.	I3, I4
8.	Calculating the main stress loading and deformation	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Determinate the main stress directions on given components of stress tensor	I5
9.	Static un-determinated beam structures. Bending. 1st Midterm test	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Calculating the relations, plain beam, drawing the transversally diagram	I4 I5
10.	Calculating the stress in the plain round beam loaded on bending.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Calculating the strength and stiffness	I5, I6
11.	Calculating the stress loading in the static un-determinated beam loaded on bending.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Calculating the approved loading	I4, I5

12.	Calculating the bending moment in the beam	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Calculating the value of the approved loading.	
13.	Calculating the normal stress in the beam loaded on bending force.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Dimensioning the cross section	I4, I5
14.	Calculating the shear stress in the loaded beam. Dimensioning the beam.	• Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion)	Dimensioning the cross section, drawing the diagram, moment of bending and elastic line	I4, I5, I6
15.	2nd Midterm test			