СИЛАБУС ДИСЦИПЛІНИ

«Mechanics of materials and constructions»



Ступінь вищої освіти - <u>Bachelor</u> Спеціальність - <u>133 "Sectoral mechanical engineering"</u> Освітня програма - «<u>Bachelor</u>» Рік навчання – 2, семестр – 3, <u>4</u> Форма навчання – <u>daily learning</u> Кількість кредитів ЄКТС – 7 Мова викладання – <u>English</u>

A. Kutsenko

Лектор курсу Контактна інформація лектора (e-mail) Сторінка курсу в eLearn

<u>kutsenko@nubip.edu.ua</u> https://elearn.nubip.edu.ua/course/view.php?id=2068

опис дисципліни

(до 1000 друкованих знаків)

Mechanics of materials and construction is a basic engineering subject that must be understood by anyone concerned with the strength and physical performance of structures, whether those structures are man-made or natural. The subject matter includes such fundamental concepts as stresses and strains, deformations and displacements, elasticity and inelasticity, strain energy, and load-carrying capacity. These concepts underlie the design and analysis of a huge variety of mechanical and structural systems.

The teacher main aims to help students taking courses taught in English at National University of life and environmental sciences of Ukraine, Faculty of Design and Engineering, in their studies of one of the most important and most difficult engineering topic.

	IHE SIE	RUCTURE OF DISCIPLIN	NE	
Title of thematic modules and themes	Hours (Lectures / Laboratory lessons/ Independent study)	Training facts	Tasks	Estimation, units
		3 semester		
The themati	c module 1. T	ENSION AND COMPRESS	SION	20
Theme 1. Purpose and objectivesobjectivesobjectivesofcourse.Thebasichypothesesanddefinitionsofmechanicsofmaterialsandconstructions	2/0/0	Student should be know: the basic hypotheses and the definitions of the mechanics of materials and constructions	Delivery of practicaly and laboratory	
Theme 2. The relation among internal forces and tensions in case of tension or compression of the bar.	2/2/2	Student should be able to: built the diagrams of internal forces and tensions in case of tension or compression of the bar.	works. Execution of independent works.	4
Theme 3. The method of calculating the bar on strength	2/2/2			4

THE STRUCTURE OF DISCIPLINE

Theme 4. The method					
	2/0/2			4	
of calculating the bar	2/0/2			4	
on rigidity Theme 5. The		-			
calculation of bar on	2/2/0			4	
strength with in terms	2/2/0			4	
of weight and					
temperature.		_			
Theme 6. The					
calculation of	2/2/2			4	
statically				•	
indeterminate bars.					
	he thematic	module 2. TORSION		30	
Theme 1. The		Student should be			
geometric					
characterizations of	5/4/4			10	
the plane cross		geometric			
sections.		characterizations of the	Delivery of		
Theme 2. Analysis of	1/0/0	plane cross sections;	practicaly and	2	
Stress and Strain	4/2/2	the relation among	laboratory	2	
Theme 3. The direct		- internal forces and	works.	_	
shear stresses.	2/2/2	tensions in cases of	Execution of	5	
Theme 4. The		- direct shear and torsion.	independent		
definition of torsion.	2/0/2	Student should be	works.	5	
Theme 5. The method		able to: built the	W OTHER		
of calculating the bar		diagrams of internal			
on strength and	2/2/0	forces and tensions in		8	
rigidity by torsion		case of torsion of the bar.			
	hematic mo	dule 3. BEAM BENDING		20	
Theme 1. The				20	
equation of Shearing					
force for the cantilever	2/2/2			2	
and simple beams					
-					
Theme 2 The					
Theme 2. The equation of Bending					
equation of Bending	2/2/0			2	
equation of Bending moment for the	2/2/0	Student should be		2	
equation of Bending moment for the cantilever and simple	2/2/0	Student should be		2	
equation of Bending moment for the cantilever and simple beams.	2/2/0	know: the equations of	Delivery	2	
equationofBendingmomentforthecantileverandsimplebeams.Theme3.The	2/2/0	know: the equations of bending moment and	Delivery of	2	
equationofBendingmomentforthecantileverandsimplebeams.Theme3.Thecalculationmethod		know: the equations of bending moment and shearing force for the	practicaly and		
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the	2/2/0	know: the equations of bending moment and shearing force for the cantilever and simple	practicaly and laboratory	2 6	
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal		know: the equations of bending moment and shearing force for the cantilever and simple beams.	practicaly and laboratory works.		
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses		 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be 	practicaly and laboratory works. Execution of		
equationofBendingmomentforthecantileverandsimplebeamsTheme3.Thecalculationmethodcantileverbeam on thestrengthbythe normalstressesTheme4.The		 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the 	practicaly and laboratory works. Execution of independent		
equationofBendingmomentforthecantileverandsimplebeams.JThecalculationmethodcantileverbeams.Theme3.Thestrength <td cols<="" td=""><td>2/0/2</td><td> know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal </td><td>practicaly and laboratory works. Execution of</td><td>6</td></td>	<td>2/0/2</td> <td> know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal </td> <td>practicaly and laboratory works. Execution of</td> <td>6</td>	2/0/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal 	practicaly and laboratory works. Execution of	6
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the		 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in 	practicaly and laboratory works. Execution of independent		
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the strength by the normal	2/0/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in case of bending of the 	practicaly and laboratory works. Execution of independent	6	
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the strength by the normal stresses.	2/0/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in 	practicaly and laboratory works. Execution of independent	6	
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the strength by the normal stresses. Theme 5.	2/0/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in case of bending of the 	practicaly and laboratory works. Execution of independent	6	
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the strength by the normal stresses. Theme 5. The calculation of a	2/0/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in case of bending of the 	practicaly and laboratory works. Execution of independent	6	
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the strength by the normal stresses. Theme 5. The calculation of a curveted beam	2/0/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in case of bending of the 	practicaly and laboratory works. Execution of independent	6	
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the strength by the normal stresses. Theme 5. The calculation of a	2/0/2 2/2/2 5/2/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in case of bending of the 	practicaly and laboratory works. Execution of independent	6 4 2	
equation of Bending moment for the cantilever and simple beams. Theme 3. The calculation method cantilever beam on the strength by the normal stresses Theme 4. The calculation method simple beam on the strength by the normal stresses. Theme 5. The calculation of a curveted beam	2/0/2	 know: the equations of bending moment and shearing force for the cantilever and simple beams. Student should be able to: built the diagrams of internal forces and tensions in case of bending of the 	practicaly and laboratory works. Execution of independent	6	

Test 1 Total for 3 semester 1 4 semester 1 The thematic module 4 METHODS OF DEFINITION OF BEAM SYSTEMS	
Total for 3 semester14 semesterThe thematic module 4. METHODS OF DEFINITION OF BEAM SYSTEMS DEFORMATIONSTheme 1. Castigliano's theorem.2/4/22/4/2Student should be know: the basis methods for definition the deformations of beam and frame. The definitions of the statically indeterminate construction method beding-moment for the simple frame.Theme 5.The definitions of the statically2/2/22/2/2Theme 5.The deformations of beam and frame. The deformations of beam and frame by different methods; applicate methods of definitions of the diagram of shear-force and bending-moment for the simple frame.Theme 5.The 2/4/22/4/22/4/22/4/22/4/22/2/2Belivery of practically indeterminate constructions; the order statically indeterminate constructions.Theme 6.The application of the Castigliano's theorem to the statically indeterminate constructions.2/2/22/2/22/2/22/2/22/2/22/2/22/2/22/2/22/2/22/2/22/2/22/2/22/2/23/23/23/23/23/23/23/23/23/23/23/23/23/23/23/23/23/23/	70
4 semester The thematic module 4. METHODS OF DEFINITION OF BEAM SYSTEMS DEFORMATIONS Theme 1. 2/4/2 Theme 2. The More's integral. 2/2/2 Theme 3. The construction method of the diagram of shear-force and bending-moment for the cantilever frame 2/4/2 Theme 4. The construction method of the diagram of shear-force and bending-moment for the simple frame. 2/2/2 Student should be know: the basis methods for definition the deformations of beam and frame. The definitions of the statically indeterminate constructions; the three moment's theorem Delivery of practical y and laboratory works. Theme 5. The definitions of the statically indeterminate constructions. 2/4/2 Leformations of beam and frame by different methods; applicate methods; applicate methods of definitions of the deformations for statically indeterminate constructions. Delivery of statically indeterminate beam and frame. Theme 6. The application of the Castigliano's theorem to the statically indeterminate constructions. 2/2/2 2/2/2 Delivery of statically indeterminate beam and frame. Theme 7. The three moment's theorem. 2/4/2 2/2/2 Delivery of statically indeterminate beam and frame.	30
Student should be know: the basis methods for definition the deformations of beam and frame. Delivery of practicaly and haben dispendent works. Theme 5. The definitions of the diagram of shear-force and bending-moment for the cantilever frame 2/4/2 Student should be know: the basis methods for definitions of the statically indeterminate constructions; the three moment's theorem Delivery of practicaly and haben dispendent works. Theme 5. The definitions of the statically indeterminate constructions. 2/4/2 Levent definitions of beam and frame by different methods of definitions of beam and frame by different methods of definitions of beam and frame by different methods of definitions of beam and frame by different methods of definitions of the deformations of beam and frame by different methods of definitions of the deformations of beam and frame by different methods of definitions of the deformations of beam and frame by different methods of definitions of the deformations of beam and frame by different methods of definitions of the deformations of beam and frame by different methods of definitions of the deformations of beam and frame by different methods of definitions of the deformations of beam and frame by different methods of definitions of the deformations for statically indeterminate beam and frame. Evecution of independent works. Theme 6. The application of the castigliano's theorem to the statically indeterminate constructions. 2/2/2 Theme 7. The three moment's theorem. 2/2/2	100
DEFORMATIONS Image: Name of Castigliano's theorem. 2/4/2 Theme 1. Castigliano's theorem. 2/4/2 Student should be know: the basis methods for definition the deformations of beam and frame. The definitions of the statically indeterminate constructions. Image: Name of Castigliano's theorem. 2/4/2 Theme 4. The construction method of the diagram of shear-force and bending-moment for the cantilever frame 2/2/2 Student should be definitions of the statically indeterminate constructions; the three moment's theorem Delivery of practicaly and laboratory works. Theme 5. The definitions of the simple frame. 2/4/2 Alternations of beam and frame by different methods; applicate methods of definitions of the deformations of beam and frame by different methods; applicate methods of definitions for the deformations for statically indeterminate beam and frame. Delivery of practicaly and laboratory works. Theme 6. The application of the Castigliano's theorem to the statically indeterminate constructions. 2/2/2 2/2/2 Delivery of statically indeterminate beam and frame. Delivery of statically indeter	
Castigliano's theorem.2/4/2Theme 2. The More's integral.2/2/2Theme 3. The construction method of the diagram of shear-force and bending-moment for the cantilever frame2/4/2Theme 4. The construction method of the diagram of shear-force and bending-moment for the simple frame.2/2/2Z/2/2Student should be know: the basis methods for definition the deformations of beam and frame. The definitions of the statically indeterminate constructions.Delivery of practicaly and laboratoryTheme 5. The definitions of the statically indeterminate constructions.2/4/2Student should be able to: define the deformations of beam and frame by different methods; applicatio the deformations of the deformations	40
Castigliano's theorem.2/2/2Theme 2. The More's integral.2/2/2Theme 3. The construction method of the diagram of shear-force and bending-moment for the cantilever frame2/4/2Student should be know: the basis methods for definition the deformations of beam and frame. The definitions of the statically indeterminate constructions.Delivery of practically and laboratory works.Theme 5. The definitions of the statically2/4/2Student should be definitions of beam and frame. The definitions of the statically indeterminate constructions.Delivery of practically and laboratory works.Theme 6. The application of the statically indeterminate constructions.2/2/22/4/2Delivery of practically indeterminate beam and frame by different methods of definitions of the deformations of the deformations for statically indeterminate beam and frame.Delivery of practically and laboratory works.Theme 6. The application of the castigliano's theorem to the statically indeterminate constructions.2/2/22/2/2Delivery of practically indeterminate beam and frame.2/2/22/2/22/2/21000000000000000000000000000000000000	5
integral.2/2/2Theme 3. The construction method of the diagram of shear-force and bending-moment for the cantilever frameStudent should be know: the basis methods for definition the deformations of beam and frame. The definitions of the statically indeterminate constructions.Delivery of practically and laboratoryTheme 4. The construction method of the diagram of shear-force and bending-moment for the simple frame.2/2/2Student should be statically indeterminate constructions; the three moment's theoremDelivery of practicaly and laboratory works.Theme 5. The definitions of the statically indeterminate constructions.2/4/22/4/2Delivery of practicaly and laboratory works.Theme 6. The application of the castigliano's theorem to the statically indeterminate constructions.2/2/22/2/22/2/22/2/22/2/2	3
construction method of the diagram of shear-force and bending-moment for the cantilever frame2/4/2Student should be know: the basis methods for definition the deformations of beam and frame. The definitions of the statically indeterminate constructions; the three moment's theoremDelivery of practicaly and laboratory works.Theme 5. The definitions of the statically2/4/22/2/2Delivery of practicaly and laboratory works.Theme 5. The definitions of the statically2/4/22/2/2Delivery of practicaly and laboratory works.Theme 6. The application of the castigliano's theorem2/2/22/2/2Delivery of practicaly and laboratory works.Theme 7. The three moment's theorem.2/4/22/2/2Image: construction sizeDelivery of practicaly and laboratory works.Theme 7. The three moment's theorem.2/4/22/2/2Image: construction sizeDelivery of practicaly and laboratory works.Theme 7. The three moment's theorem.2/4/22/2/2Image: construction sizeImage: construction sizeTheme 7. The three moment's theorem.2/4/22/2/2Image: construction sizeImage: construction size	5
Theme4. The construction method of the diagram of shear-force and bending-moment for the simple frame.statically indeterminate constructions; the three moment's theoremDelivery of practicaly and laboratory works.Theme5. The definitions of the statically2/4/22/4/2Delivery of practicaly and laboratory works.Theme6. The application of the Castigliano's theorem to the statically2/2/22/2/2Delivery of practicaly and laboratory works.2/2/22/2/22/2/2Delivery of practicaly and laboratory works.Theme6. The application of the Castigliano's theorem to the statically indeterminate constructions.2/2/2Delivery of practicaly and laboratory works.2/2/22/2/22/2/2Delivery of practicaly and laboratory works.Theme7. The three moment's theorem.2/2/2	5
Theme5. The definitions of the statically2/4/2ableto:definelaboratory works.indeterminate constructions.2/4/22/4/2add frame by different methods; applicate methods of definitions of the deformations for statically indeterminate beam and frame.laboratory works.Execution of independent works.Theme6. The application of the Castigliano's theorem to the statically indeterminate constructions.2/2/2z/2/2laboratory works.Execution of independent works.Theme 7. The three moment's theorem.2/4/22/4/2independent works.independent works.	5
Theme6.The application of the Castigliano's theorem to the statically indeterminate constructions.statically indeterminate beam and frame.2/2/22/2/2Theme 7. The three moment's theorem.2/4/2	5
moment's theorem.	5
Theme 8. The	5
application of the Verescagin's rule to the statically indeterminate constructions.	5
	30
Theme 1. Analysis of Stress and Strain in the case of combined or compressionStudent should be know: Stress and Strain in the case of the action of complex deformationsDelivery of practicaly and laboratory	4
Theme 2. Analysis of Stress and Strain in the case of a complex2/2/2of construction.works.2/2/2Student should be able to: calculate beam and works.independent works.	4
Theme 3. Analysis of Stress and Strain in2/4/2frame by acting of complex Stress and	4

the case of the off-		Strain.		
centre acting of force				
of tension or				
compression				
Theme 4. Analysis of				
Stress and Strain in				
the case of combined	2/2/2			10
bending and torsion at				
once				
Theme 5. The				
calculation method of	2/4/2			4
column.				
Theme 6. Analysis of				
Stress and Strain in				
the cases of acting	4/5/4			4
difference types of				
dynamic loads				
Total for 4 semester	30/45/30	-	-	70
Exam			30	
Total for course			100	

EVALUATION POLICY

	The student must submit the work within the time specified by the teacher.
Deadline and	Works that are submitted in violation of deadlines without good reason are
retake policy:	evaluated at a lower grade. Rearrangement of modules takes place with the
	permission of the lecturer if there are good reasons (for example, hospital).
Academic	Write-offs during tests and exams are prohibited (including the use of mobile
Integrity	devices). Course papers, abstracts must have correct text references to the
Policy:	literature used
Visiting	The student is obliged to attend classes of all kinds every day in accordance with the established schedule, not to be late, to have the appropriate
policy:	appearance. For objective reasons (for example, illness, international
r ·····	internship) training can take place individually (in online form in consultation
	with the dean of the faculty)

STUDENT EVALUATION SCALE

Student rating,	Evaluation results on n	ational exam tests
points	Exams	Tests
90-100	Excellent	Accepted
74-89	Great	
60-73	Satisfactory	
0-59	Unsatisfactorily	Not accepted