



Theory of elasticity and plasticity  
Educational subject description sheet

**Basic information**

<b>Field of study</b> Civil engineering		<b>Education cycle</b> 2022/23	
<b>Speciality</b> -		<b>Subject code</b> ID000000IBU(P)S.MI1.2586.22	
<b>Organizational unit</b> The Faculty of Environmental Engineering and Geodesy		<b>Lecture languages</b> english	
<b>Study level</b> Second-cycle (engineer) programme		<b>Mandatory</b> optional	
<b>Study form</b> Full-time		<b>Block</b> major subjects (conducted) in foreign languages	
<b>Education profile</b> Practical		<b>Disciplines</b> Civil engineering and transport	
		<b>Subject related to scientific research</b> Yes	
		<b>Subject shaping practical skills</b> Nie	
<b>Teacher responsible for the subject</b>	Małgorzata Meissner		
<b>Other teachers conducting classes</b>	Małgorzata Meissner		
<b>Period</b> Semester 1	<b>Examination</b> exam	<b>Number of ECTS points</b> 3.0	
	<b>Activities and hours</b> lecture: 15 laboratory classes: 15		

## Goals

C1	The aim of education is to learn about the spatial issues of the theory of elasticity, description of the state displacements, deformations and stresses, basic equations of the theory of elasticity. In particular, it has get to know flat issues of the theory of elasticity, thin plate theory and methods of solving rectangular plates. Is to familiarize with the basics of plasticity theory.
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## Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
<b>Knowledge - Student knows and understands:</b>			
W1	The student knows and understands the equations of the theory of elasticity, relationships between displacements and deformations and stresses. Knows Hooke's generalized law. Know thin plate theory and plate solving methods rectangular. Understands the basics of plasticity theory. Knows methods of solving rod systems in border states.	BU_P7S_WG03, BU_P7S_WG04	written exam, oral exam
<b>Skills - Student can:</b>			
U1	The student is able to formulate equations and relationships in theory elasticity. He can determine the state of displacement and strain in thin rectangular plates. Can solve bar systems in the elastoplastic range. He can determine the limit loads in bar systems	BU_P7S_UW03, BU_P7S_UW04	project
<b>Social competences - Student is ready to:</b>			
K1	The student is ready for rational design complex constructions in the elastic range and using the plastic reserve.	BU_P7S_KR06	observation of student's work

## Balance of ECTS points

Activity form	Activity hours*	
lecture	15	
laboratory classes	15	
lesson preparation	15	
presentation/report preparation	15	
exam participation	6	
consultations	10	
<b>Student workload</b>	<b>Hours</b> 76	<b>ECTS</b> 3.0
<b>Workload involving teacher</b>	<b>Hours</b> 36	<b>ECTS</b> 1.3

<b>Practical workload</b>	<b>Hours</b> 15	<b>ECTS</b> 0.6
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\* hour means 45 minutes

## Study content

No.	Course content	Activities
1.	<a href="#">1. Spatial issues of the theory of elasticity</a> <a href="#">2. Description of displacement, deformation and stress.</a> <a href="#">3. Basic equations of the theory of elasticity.</a> <a href="#">4. Flat issues in the theory of elasticity.</a> <a href="#">5. Airygo stress function.</a> <a href="#">6. Thin plate theory.</a> <a href="#">7. Stress and deformation of a rectangular plate.</a> <a href="#">8 Methods for solving rectangular plates. Application of series.</a> <a href="#">9. Methods for solving rectangular plates. Application of the difference method Finite.</a> <a href="#">10 Basics of plasticity theory.</a> <a href="#">11. Elasto-plastic bending of statically determinate beams.</a> <a href="#">12. Elasto-plastic bending of statically indeterminate beams.</a> <a href="#">13. Elasto-plastic bending of frame beams.</a> <a href="#">14. Determination of limit loads in statically member systems indeterminate.</a> <a href="#">15. Repetition.</a>	lecture
2.	<a href="#">1. Solution of multi-span beams using the finite difference method.</a> <a href="#">2. Solution of a rectangular plate with point support by means of series and by the finite difference method.</a>	laboratory classes

## Course advanced

### Teaching methods:

lecture, classes

Activities	Examination methods	Percentage in subject assessment
lecture	written exam, oral exam	60%
laboratory classes	project, observation of student's work	40%

## Entry requirements

[Knowledge of the strength of materials and structural analysis.](#)

## Literature

### Obligatory

1. Y.C. Fung, Foundations of Solid Mechanics, Prentice-Hall, 1965
2. L. E. Malvern, Introduction to the Mechanics of a Continuous Medium, Prentice-Hall

### Optional

1. W. D. Pilkey, W. Wunderlich, Mechanics of Structures , Variational and Computational Methods, CRC Press, 1994

## Kierunkowe efekty uczenia się

Kod	Treść
BU_P7S_KR06	Absolwent jest gotów do rozwijania dorobku oraz podtrzymywania etosu zawodu;
BU_P7S_UW03	Absolwent potrafi krytycznie ocenić wyniki analizy numerycznej konstrukcji inżynierskich.
BU_P7S_UW04	Absolwent potrafi wykonać klasyczną analizę statyczną, dynamiczną i stateczności ustrojów prętowych (kratownic, ram i cięgien) statycznie wyznaczalnych i niewyznaczalnych oraz konstrukcji powierzchniowych (tarcz, płyt, membran i powłok).
BU_P7S_WG03	Absolwent zna i rozumie w pogłębionym stopniu zagadnienia Mechaniki Ośrodków Ciągłych. Zna zasady analizy zagadnień statyki, stateczności i dynamiki złożonych konstrukcji prętowych, powierzchniowych oraz bryłowych;
BU_P7S_WG04	Absolwent zna i rozumie w pogłębionym stopniu zagadnienia wytrzymałości materiałów, modelowania materiałów i konstrukcji, teoretycznych Metody Elementów Skończonych oraz ogólnych zasad prowadzenia nieliniowych obliczeń konstrukcji inżynierskich;