STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Fundamentals of mechanics		**1010101111010114898**
Field of study	Profile of study (general academic, practical)	Year /Semester
Sustainable Building Engineering First-cycle	**(brak)**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **2** Classes: **2** Laboratory: **-** Project/seminars: **2**		**5**
Status of the course in the study program (Basic, major, other)	(university-wide, from another field)	
(brak)	**(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)
technical sciences		**5 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	- knows the basics of vector calculus and mathematical analysis
2	**Skills**	- can use vector calculus - can calculate derivatives and integrals of simple functions
3	**Social competencies**	- is aware of the need to upgrade the knowledge and skills

Assumptions and objectives of the course:

Preparing student to solve two- and three-dimensional static problems and simple problems of dynamics of particles system and rigid bodies.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. student knows the equilibrium conditions of coplanar and spatial forces system (lecture, classes, project) - [KSB_W04]
2. student knows the methods of determining internal forces in two-dimensional bar systems statically determinate (lecture, classes, project) - [KSB_W04, KSB_W06]
3. student knows the principle of virtual work (lecture, classes) - [KSB_W04]
4. student knows the basic concepts related to kinematics and dynamics of a particle and a rigid body (lecture) - [KSB_W04]

Skills:

1. student is capable to determine the suport reactions in two- and three-dimensional systems (lecture, classes, project) - [KSB_U06]
2. student is capable to determine internal forces in two-dimensional bar systems statically determinate (lecture, classes, project) - [KSB_U06]
3. student is capable to apply the principal of virtual work to determine suport reactions and internal forces (lecture, classes) - [KSB_U06]
4. student is capable to apply the concepts of kinematics and dynamics to describe the motion of a point and a rigid body (lecture) - [KSB_U06]

Social competencies:

1. student is responsible for the reliability of the obtained results and their interpretation (classes, project) - [KSB_K02]
2. student can formulate conclusions and describe the results of her/his own work (classes, project) - [KSB_K08]

Assessment methods of study outcomes

Lecture: Written examination checking knowledge from lectures.

Student gets a positive grade after obtaining at least 50% of the maximum amount of points from the examination:

0%-49% - unsatisfactory

50%-59% - satisfactory

60%-69% - satisfactory plus

70%-79% - good

80%-89% - good plus

90%-100% - very good

Classes: Two tests checking knowledge from classes.

Student gets a positive grade after obtaining at least 50% of the maximum amount of points from two tests:

0%-49% - unsatisfactory

50%-59% - satisfactory

60%-69% - satisfactory plus

70%-79% - good

80%-89% - good plus

90%-100% - very good

Project: Five unique exercises for solving and tests checking the knowledge from projects.

Student gets a positive grade after completing unique exercises and obtaining at least 50% of the maximum amount of points from five tests:

0%-49% - unsatisfactory

50%-59% - satisfactory

60%-69% - satisfactory plus

70%-79% - good

80%-89% - good plus

90%-100% - very good

Course description

Lecture 1 - Fundamental concepts and principles. Basics of vector calculus. Moment of a vector about a point.

Lecture 2 - Moment of a vector about a given axis. Principles of mechanics. Force system and its properties. Moment of a couple and its properties. Reduction of coplanar forces system. Equilibrium conditions of coplanar concurrent and non-concurrent forces system.

Lecture 3 - Degrees of freedom, constraints. Necessary and sufficient conditions of kinematically stable.

Lecture 4 - Static analysis of rigid bodies in two dimensions. Internal forces in beams.

Lecture 5 - Differential equations for bending. Gerber beam.

Lecture 6 - Internal forces in frames.

Lecture 7 - Planar trusses. Methods for determining internal forces in truss members.

Lecture 8 - Reduction of spatial forces system. Equilibrium conditions of spatial concurrent and non-cncurrent forces system.

Lecture 9 - Three dimensional forces systems. Friction and laws of dry frictions. Rolling resistance.

Lecture 10 - Principle of virtual work.

Lecture 11 - Application of the principle of virtual work to determine the supports reactions and internal forces in beams.

Lecture 12 - Kinematics of a particle.

Lecture 13 - Kinematics of a rigid body.

Lecture 14 - Mass moment of inertia. Kinetic energy.

Lecture 15 - Conservative forces and their properties. Dynamics of a particle.

Classes 1 - Basics of vector calculus. Moment of a vector about a point. Resultant of concurrent forces system.

Classes 2 - Resultant of non-concurrent forces system. Equilibrium conditions of coplanar concurrent and non-concurrent forces system.

Classes 3 - Necessary and sufficient conditions for equilibrium of a rigid body.

Classes 4-5 - Static analysis of rigid bodies in two-dimensions.

Classes 6-7 - Internal forces in beams.

Classes 8 - Test 1

Classes 9-10 - Internal forces in frames.

Classes 11-12 - Internal forces in truss members.

Classes 13-14 - Application of the principle of virtual work to determine the supports reactions and internal forces in beams.
Classes 15 - Test 2

Project 1-2 - Exercise 1: Resultant of non-concurrent forces system.
Project 3 - Test 1
Project 4-5 - Exercise 2: Analysis of rigid bodies in two dimensions.
Project 6 - Test 2
Project 7-8 - Exercise 3: Internal forces in beams.
Project 9 - Test 3
Project 10-11 - Exercise 4: Internal forces in frames.
Project 12 - Test 4
Project 13-14 - Exercise 5: Internal forces in truss members.
Project 15 - Test 5

Teaching methods: lecture - informative, monographic, Classes - exercise and project method, Project - exercise and project method

Basic bibliography:

1. F. P. Beer, E. R. Johnston et al., Vector Mechanics for Engineers: Statics and Dynamics, McGraw-Hill Education, New York, USA, 2015
2. R.C. Hibbeler, Engineering Mechanics: Statics, Pearson Education Limited, Harlow, United Kingdom 2016
3. R.C. Hibbeler, Engineering Mechanics: Dynamics, Pearson Education Limited, Harlow, United Kingdom 2016

Additional bibliography:

1. J. Leyko, Mechanika ogólna. T. 1, Statyka i kinematyka, T. 2, Dynamika, PWN,Warszawa 2006
2. J. Misiak, Mechanika ogólna. T. 1, Statyka i kinematyka, T. 2, Dynamika, WNT Warszawa 1998
3. Z. Cywiński, Mechanika budowli w zadaniach. Układy statycznie wyznaczalne, PWN Warszawa 1999

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures (contact hours)	30
2. Participation in classes (contact hours)	30
3. Participation in projects (contact hours and practical hours)	30
4. Participations in consultations (contact hours)	7
5. Participation in the examination (contact hours)	3
6. Solving exercises (independent work and practical hours)	15
7. Preparation for the examination (independent work)	15
8. Preparation for tests (independent work)	10

Student’s workload

Source of workload	hours	ECTS
Total workload	140	5
Contact hours	100	4
Practical activities	45	0