# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Strength of materials [S1Trans1>WM]

## Course

Field of study
Transport

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

## Number of credit points

3,00

## Coordinators

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## Lecturers

## Prerequisites

The knowledge ir range of phisics, mechanics, the basics of mathematical analysis and planimetry.

## Course objective

A student who knows the basics of classical mechanics develops his knowledge and skills in modeling and analyzing typical simple engineering problems. Understands the convention of correctly creating a model of the structure, boundary conditions, material properties and loads adequate to the problem being solved. Distinguishes the specifics of internal forces in structural elements and the effects they induce. Is able, using the fundamentals of strength of materials, to analyze the state of stress and strain for plane load systems. Moreover: 1. Present the basic knowledge in range of mathematical methods of description the material strength and simple construction elemnts like shafts and beams. 2.Developing students" skills in modeling simple physical phenomena arising as a result of loading the structure or their elements and their mathematical description. 3. Developing the skill of practical interpretation of the obtained results, important from a practical point of view. 4. Developing teamwork skills in students.

## Course-related learning outcomes

Knowledge:

The student has an extended and deepened knowledge of mathematics useful for formulating and solving complex technical tasks concerning various means of transport
The student has extended and in-depth knowledge of physics useful for formulating and solving selected technical tasks, in particular for correct modeling of real problems
The student has a basic knowledge of the life cycle of means of transport, both equipment and software, and in particular about the key processes occuring in the product life cycle

Skills:
Student is able, when formulating and solving tasks in the field of transport, to apply appropriately selected methods, including analytical, simulation or experimental methods

Social competences:
The student is aware of the importance of knowledge in solving engineering problems, knows examples and understands the causes of malfunctioning transport systems that have led to serious financial and social losses or to serious loss of health and even life

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The lecture exam is in written form and is divided into two stages:
Step I (Solution of 3 problem tasks by analytical methods)
Time duration: 45 minutes
Step II (Solving a multiple-choice test).
Time duration: 25 minutes
Number of questions: 30
Punctuation: 2 points/correct answer to a question (possible partial points)
Evaluation:
For Step I (max. number of points 12)
grade 3,0 - points spread 6,0-7,3
grade 3,5 - points spread 7,4-8,5
grade 4,0 - points spread 8,6-9,5
grade 4,5 - points spread 9,6-10,7
grade 5,0 - points spread 10,8-12,0
For Step II (max. number of points 60)
61%-64,99% (36-38 pts.) grade: 3,0
65%-71.99% (39-42 pts.) grade: 3,5
72%-79,99% (43-47 pts.) grade: 4,0
80%-89,99% (48-53 pts.) grade: 4,5
90%-100% (54-60 pts.) grade: 5,0
A passing grade (i.e., a minimum of 3.0) must be obtained from both stages of the exam to receive a passing final grade. The final exam grade is an average of the grades from the test and the task and problem part. When taking a make-up exam, you can correct only those written forms of the exam from which you received a failing grade.
Passing of the auditory exercises (colloquium) has a written form and consists in solving 3-4 tasks. The scoring is analogous to that of stage I of the exam.

## Programme content

1. Types and definitions of structural elements, boundary conditions and loads.
2. Definition of stress, description of stress state, Hooke's law, equilibrium differential equations for material continuum.
3. Flat state of stress, determination of directions and principal stresses.
4. The effect of normal force. Static tensile test of low carbon steel.
5. The state of pure shear, design of shear connectors.
6. Moments of inertia of plane figures.
7. The effect of bending moment.
8. Elementary theory of free torsion.
9. Strength hypotheses - evaluation of material and structure strain under complex loading condition.

## Course topics

none

## Teaching methods

Lecture and exercises

## Bibliography

Basic:
1. Jerzy Zielnica, Wytrzymałość materiałów, WPP, wyd. 3, Poznań 2001
2. Marian Ostwald, Podstawy wytrzymałości materiałów, WPP, wyd. 4, Poznań 2011
3. Marian Ostwald, Wytrzymałość materiałów i konstrukcji (zbiór zadań), WPP, wyd. 3, Poznań 2018
Additional:
1. Andrzej Gawęcki, Mechanika materiałów i konstrukcji prętowych (tom 1 i 2), WPP, wyd. 3, Poznań 1998
2. Józef Kubik, Janusz Mielniczuk, Mechanika techniczna dla inżynierów, Wyd. Uniwersytetu Kazimierza Wielkiego, wyd. 3, Bydgoszcz 2017
3. Michał E. Niezgodziński, Tadeusz Niezgodziński, Zadania z wytrzymałości materiałów, PWN-WNT, wyd. 4, Warszawa 2012
4. Przemysław Jastrzębski, Jerzy Mutermilch, Wiktor Orłowski, Wytrzymałość materiałów, Arkady, Warszawa 1974

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 70 | 3,00 |
| Classes requiring direct contact with the teacher | 45 | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 35 | 1,00 |