



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Structural stability

Course

Field of study

Mechanical Engineering

Area of study (specialization)

Machine Construction

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

4/7

Profile of study

general academic

Course offered in

polish

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

Other (e.g. online)

Tutorials

15

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

Piotr Kędzia, PhD

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Faculty of Mechanical Engineering

ul. Jana Pawła II 24, 61-131 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of mathematics and other areas of education in the field of study. Knowledge of the strength of materials. Ability to solve problems in statics. Ability to solve tasks in mathematics: algebra, mathematical analysis, geometry. The ability to search for necessary information in literature,



databases, on the Internet and in indicated sources. Ability to self-study and self-education. Using information and communication techniques appropriate to the implementation of engineering tasks.

Course objective

Presentation in a concise and understandable form of the basics of stability necessary in the design of safe and reliable structures. Overview of basic models and calculation methods, paying attention to the importance of formulating stability conditions. Indication of the possibilities of solving stability problems by various methods. Drawing attention to the threats to the safe operation of machines resulting from the loss of stability of their parts or their assemblies. Realizing the complexity of the problems, distinguishing various forms of loss of stability.

Course-related learning outcomes

Knowledge

1. Knowledge and understanding of the phenomenon of loss of stability of systems, including structures. [P6S_WG] (K_W03, K_W04)
2. Understanding the basic models and calculation methods necessary in the study of structural stability. [P6S_WG] (K_W03, K_W04)
3. Awareness of the importance of stability in the design of safe and reliable structures. [P6S_WG] (K_W03, K_W04)
4. Knowledge of the basic concepts of structural stability. [P6S_WG] (K_W03, K_W04)
5. Understanding the importance of theories and experiments in the study of structural stability. [P6S_WG] (K_W03, K_W04)
6. Knowledge of current issues in world research. [P6S_WG] (K_W03, K_W04)

Skills

1. Formulating and solving simple problems of structure stability under static loads. [P6S_UW] (K_U12)
2. Formulation of stability conditions for simple structures. [P6S_UW] (K_U12)
3. Determination of critical loads for selected structures. [P6S_UW] (K_U12, K_U23)
4. Identification of the technical problem - indication of the stability problem. [P6S_UW] (K_U12)

Social competences

1. Understanding the need for self-education related to the development of technology. [P6S_KK] (K_K01)
2. Awareness of the importance of engineering activities. [P6S_KK] (K_K02)
3. The ability to make the right decisions and make the right decisions for the problem. [P6S_KR] (K_K05)
4. Understand the importance of teamwork. [P6S_KO] (K_K03)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Passing the lecture: test during the last class in the semester:

rating 3.0 50.1% -60%

rating 3.5 60.1% -70%

rating 4.0 70.1% -80%



rating 4.5 80.1% -90%

rating 5.0 90.1% -100%

Passing the exercises: current verification of the learning results and the final test at the last class in the semester:

rating 3.0 50.1% -60%

rating 3.5 60.1% -70%

rating 4.0 70.1% -80%

rating 4.5 80.1% -90%

rating 5.0 90.1% -100%

Assessment of activity during lectures and involvement in classes included in the final grades.

Programme content

Discussion of the importance of stability in the design of safe, reliable and economical engineering structures.

Presentation of the basic concepts of structure stability as the mechanics of deformable bodies.

Stability of compressed members or member systems: buckling of a rigid rod system pinned and supported on springs, loss of stability of a rigid column supported by a bar, buckling of compressed beams with different edge support methods, buckling of multi-span beams, buckling of beams on elastic ground, buckling of a flat frame.

Stability of rectangular plates: differential equilibrium equation, buckling of compression plate, critical load.

Stability of circular plates: differential equilibrium equation, buckling of the compression plate, critical load.

Stability of cylindrical shells: differential equilibrium equation, buckling of compression shell, critical load.

Ending: the critical state, examples of equilibrium paths.

Teaching methods

Lecture with multimedia presentation.

Exercises conducted at the blackboard.

Bibliography

Basic

1. Magnucki K., Stawecki W. Stateczność wybranych części konstrukcji, Instytut Pojazdów Szynowych TABOR, Poznań 2016.
2. Magnucki K., Szyk W. Wytrzymałość materiałów w zadaniach. Pręty, płyty i powłoki obrotowe. Wyd. naukowe PWN, Warszawa, 2000.
3. Weiss S., Giżejowski M. Stateczność konstrukcji metalowych. Arkady, Warszawa, 1991.
4. Życzkowski M. Stateczność prętów i ustrojów prętowych, s.242-380. M. Życzkowski (red.) Mechanika techniczna. Wytrzymałość elementów konstrukcyjnych. T.IX, PWN, Warszawa, 1988.



Additional

1. Bařant Z.P., Cedolin L. Stability of structures. Oxford University Press, New York, Oxford,1991.
2. Doyle J.F. Nonlinear analysis of thin-walled structures. Springer Verlag, New York, 2001.
3. Demidowicz B.P. Matematyczna teoria stabilnořci. Wyd. Naukowo-Techniczne, Warszawa 1972.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,2
Student's own work (literature studies, preparation for tutorials, preparation for tests) ¹	20	0,8

¹ delete or add other activities as appropriate