COURSE DESCRIPTION CARD - SYLLABUS

Course name
Plates and shells

Course

Field of study
Civil Engineering Second-cycle Studies

Year/Semester
1/1

Area of study (specialization)
-

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	0	0
Tutorials	**Projects/seminars**	
15	0	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Knowledge: basis of strengths of materials, mechanics of building, theory of elasticity, numerical methods and mathematics.

Skills: student can determine stresses and strains in any structural members.

Social competences:student is aware of the responsibility that lies with the person conducting the structural calculations.

Course objective

The main aim of this course is to provide students with basic analytical and numerical methods of plates and shells computation. Also focusing on design and practical problems of these types of constructions is the scope. Systematising of ideas and individual realization of exercises will help in making easy and proper design decisions in the students' future engineering practice.

Course-related learning outcomes

Knowledge

Student knows the basis of the theory of plates and shells (obtained on lectures). Student knows the most important analytical methods of calculating plates and shells in the elastic range (obtained on lectures). Student knows basic numerical methods used in plates and shells static calculations (obtained on lectures)

Skills

Student can calculate internal forces in plate and shell members for a given loading and boundary conditions (obtained on classes). Student can describe stress and strain state and deflection of an analysed plate or shell element (obtained on classes). Student can create discrete model appropriate for the chosen numerical method of solving plates and shells (obtained on classes).

Social competences

The student is responsible for the reliability of the results of his work and the work of his team. The student is aware of the need to improve professional and personal competences, is ready to critically assess their knowledge and received content.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - test at the end of the semester
Grades: very good (5.0), good plus (4.5), good (4.0), satisfactory plus (3.5), satisfactory (3.0), insufficient (2.0)

Classes - assessment of independent work on a project task
Grades: very good (5.0), good plus (4.5), good (4.0), satisfactory plus (3.5), satisfactory (3.0), insufficient (2.0)

Programme content

Lectures
1. Preliminary Information, Assumptions and Problems Appearing in Plates and Shells
2. Bending of Long Rectangular Plates to a Cylindrical Surface
3. Pure Bending of Plates
4. Different Tapes of Load of Simply Supported Rectangular Plates
5. Symmetrical Bending of Circular Plates
6. Small Deflections of Laterally Loaded Plates
7. Plates Resting on Elastic Foundation
8. Plates of Various Shapes
9. Numerical Analysis of Strength of a Rectangular Plate
10. Deformation of Shells without Bending
11. General Theory of Cylindrical Shells
12. Shells Having the Form of a Surface of Revolution
13. Application of Numerical Methods in Shells

14. General Remarks on the Multilayered Plates and Shells
15. Test

Classes
1. Repetition of Mathematical and Mechanical bases
2. Solving Examples of Plates - part 1
3. Solving Examples of Plates - part 2
4. Discussion on Individual Projects
5. Solving Example of Shells
6. Discussion on Individual Projects
7. Defense of the project task

Teaching methods

Informative lecture

Exercice method - solving tasks

Bibliography

Basic

1. Theory of Plates and Shells, S. Timoshenko, S. Woinowsky-Krieger, McGraw- Hill, Singapore, 1959.

2. Stresses in Shells, W. Flugge, Springer-Verlag, Berlin, 1960.

3. Płyty - obliczenia statyczne, Z. Kączkowski Wyd. Arkady, W-wa, 1980.

Additional

1. Theory of Elastic Stability, S.P. Timoshenko, J.M. Gere, Dover Publications, 2009

2. Theory and Analysis of Elastic Plates, J.N. Reddy, CRC Press, 1999.

3. The Finite Element Method: A Practical Course, G.R. Liu, S.S. Quek, Elsevier Science Ltd., Oxford, 2003.

4. Mechanika Budowli - ujęcie komputerowe, Z. Waszczyszyn, i M. Radwańska, Rozdz. 9.

5. Podstawowe równania i metody obliczania sprężystych dźwigarów powierzchniowych, Z. Waszczyszyn, i M. Radwańska,T3, Wyd. Arkady, W-wa, 1995.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	15	0,5

[1] delete or add other activities as appropriate