STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Plates and Shells		**1010102111010113718**
Field of study	Profile of study (general academic, practical)	Year /Semester
Civil Engineering Second-cycle Studies	**(brak)**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**English**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
Second-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **30** Classes: **15** Laboratory: **-** Project/seminars: **-**		**3**
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		**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basis of strengths of materials, mechanics of building, theory of elasticity, numerical methods and mathematics.
2	**Skills**	Student can determine stresses and strains in any structural members.
3	**Social competencies**	The student is aware of the responsibility that lies with the person conducting the structural calculations.

Assumptions and objectives of the course:

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.

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

Knowledge:

1. Student knows the basis of the theory of plates and shells. - [K_W01]
2. Student knows the most important analytical methods of calculating plates and shells in the elastic range. - [K_W03]
3. Student knows basic numerical methods used in plates and shells static calculations. - [K_W04]

Skills:

1. Student can calculate internal forces in plate and shell members for a given loading and boundary conditions. - [K_U01, K_U04]
2. Student can describe stress and strain state and deflection of an analysed plate or shell element. - [K_U04]
3. Student can create discrete model appropriate for the chosen numerical method of solving plates and shells. - [K_U06, K_U07]

Social competencies:

1. Student is aware of the responsibility that lies on the person conducting the structural calculations. - [K_K02, k_K05]
2. Student uses different computational methods to eliminate any errors. - [K_K02]

Assessment methods of study outcomes

Two tests and two projects.

Course description

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. Continuous Rectangular Plates and Plates Resting on Elastic Foundation
8. Bending of Plates under the Combined Action of Lateral Loads and Forces in the Middle Plane of the Plate And Large Deflections of Plates
9. Plates of Various Shapes
10. Numerical Analysis of Strength of a Rectangular Plate
11. Deformation of Shells without Bending
12. General Theory of Cylindrical Shells
13. Shells Having the Form of a Surface of Revolution
14. Application of Numerical Methods in Shells
15. General Remarks on the Multilayered Plates and Shells

Example classes

1. Repetition of Mathematical and Mechanical bases
2. Solving Examples of Plates
3. Discussion on Individual Projects
4. First Test
5. Solving Example of Shells
6. Discussion on Individual Projects
7. Second Test

Basic bibliography:

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 bibliography:

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.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Example classes	15
3. Preparation for classes	10
4. Preparation of homework assignments	10
5. Literature studies	15
6. Consultation	5

Student's workload

Source of workload	hours	ECTS
Total workload	85	3
Contact hours	45	2
Practical activities	0	0