STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Advanced structural mechanics		**1010102111010106020**
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)
Structural Engineering	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
Second-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **15** Classes: **15** Laboratory: **-** Project/seminars: **15**		**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 %)

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knows analytical methods of calculation of internal forces and displacements in statically determinate and indeterminate bar structures. Has basic knowledge concerning buckling and stability loss of plane bar structures. Has knowledge concerning stress and strain states in beam cross-sections.
2	**Skills**	Can calculate internal forces and displacements in statically determinate and indeterminate bar structures. Can calculate stress and strain states in beam cross-sections.
3	**Social competencies**	Is responsible for the results of carried out computations.

Assumptions and objectives of the course:

Presentation of matrix methods of static and stability analysis of bar structures.

Introduction of foundations of plane girders analysis by analytical methods, finite strip method and boundary element method.

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

Knowledge:

1. Student knows analytical and numerical methods of calculation of internal forces and displacements in bar structures, also with the influence of large axial forces. - [K_W03]
2. Student knows methods of analysis of initial stability of bar structures. - [K_W03]
3. Student knows foundations of forming and non-linear behaviour of cable structures. - [K_W03, K_W09]
4. Student knows foundations of forming and bahaviour of shells in membrane and bending state. - [K_W03]

Skills:

1. Student can use analytical and numerical methods of calculation of internal forces and displacements in bar structures, also with the influence of large axial forces - [K_U04, K_U06, K_U13]
2. Student can compute the critical load and mode of the stability loss for bar structures. - [K_U04, K_U06]
3. Student can apply the Newton method to geometrically non-linear static analysis of cable structures. - [K_U04, K_U06]
4. Student can compute internal forces in axially symetric shells using the engineering approach. - [K_U04]
5. Student can critically assess the results of carried out calculations and draw appropriate conclusions. - [K_U07]

Social competencies:

1. Student is responsible for the results of carried out calculations - [K_K02]
2. Student can desrcibe the carried out analyses and draw the general conclusions from the results. - [K_K10]

Assessment methods of study outcomes

Lecture ? written examination with 5 questions checking the study outcomes. Satisfactory mark - for 3 correct answers, good mark - for 4 correct answers, very good mark - for 5 correct answers.

Example classes ? the final mark is the mean value from three marks for three tests checking the knowledge from three individual exercises

1 ? Matrix version of stiffness method - 33%

2 ? Matrix method of analysis of frame stability and statics with large axial forces ? 33%

3 ? Internal forces in axisymmetric shells ? 33%

The tests take place on the deadline of particular exercises.

Exercise classes ? the final mark is the mean value from three marks for each individual exercise. The particular mark for the exercise results from the mark for the particular test which may be:

a) decreased if the exercise deadline is not met (by 1 for each week of delay),

b) increased in the case of special activity of the student during classes.

Course description

Matrix version of stiffness method.

Matrix analysis of bending of plane frames with large axial forces.

Matrix approach to the initial stability analysis of frames.

Internal forces and displacements in cable structures.

Engineering approach to computation of internal forces in axially-symmetric shells.

Foundations of finite strip method and boundary element method.

Teaching methods: lecture - informative, monographic, exercises - exercise and project methods.

Basic bibliography:

1. Wybrane zagadnienia zaawansowanej mechaniki budowli, P. Litewka, R. Sygulski, Wydawnictwo Politechniki Poznańskiej, Poznań, 2012

Additional bibliography:

1. Mechanika budowli - ujęcie komputerowe, t. 1, 2 i 3, Z. Waszczyszyn i in., Arkady, Warszawa, 1995

2. Computer Analysis of Structural Systems, J. F. Fleming, Mc Graw - Hill, 1989

3. Metoda przemieszczeń i podstawy MES, T. Chmielewski, H. Nowak, L. Sadecka, PWN, Warszawa, 2016

Result of average student's workload

Activity	Time (working hours)
1. Exercise No 1	15
2. Preparation for Test No 1	15
3. Exercise No 2	15
4. Preparation for Test No2	15
5. Exercise No 3	15
6. Preparation for Test No3	15
7. Preparation for the examination	15

Student's workload

Source of workload	hours	ECTS
Total workload	100	4
Contact hours	50	2
Practical activities	45	2