

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Advanced structural mechanics		Code 1010102111010106020
Field of study Civil Engineering Second-cycle Studies	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 1
Elective path/specialty Railways	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: 15 Laboratory: - Project/seminars: 15		No. of credits 4
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 4 100% 4 100%
Responsible for subject / lecturer: dr hab. inż. Przemysław Litewka, prof. nadzw. email: przemyslaw.litewka@gmail.com tel. 061-6652468 Wydział Budownictwa i Inżynierii Środowiska ul. Piotrowo 5, 60-965 Poznań		Responsible for subject / lecturer: dr hab. inż. Przemysław Litewka email: przemyslaw.litewka@gmail.com tel. 061-6652468 Wydział Budownictwa i Inżynierii Środowiska ul. Piotrowo 5, 60-965 Poznań
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 behaviour 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 symmetric 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 describe the carried out analyses and draw the general conclusions from the results. - [K_K10]

Assessment methods of study outcomes		
Written examination. 3 written tests during the semester. 3 individual exercises: 1. Matrix version of stiffness method 2. Stability and statics with large axial forces. 3. Axially symmetric shell structure.		
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.		
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		
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