

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Steel Structures		Code 1010102111010110073
Field of study Civil Engineering second-cycle studies	Profile of study (general academic, practical) general academic	Year /Semester 1 / 1
Elective path/specialty Costruction Engineering and Management	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: 30 Classes: - Laboratory: - Project/seminars: 30		No. of credits 4
Status of the course in the study program (Basic, major, other) major		(university-wide, from another field) from field
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 inż. Marcin Chybiński email: marcin.chybinski@put.poznan.pl tel. 61 665 24 77 Wydział Budownictwa i Inżynierii Środowiska ul. Piotrowo 5 60-965 Poznań		Responsible for subject / lecturer: dr inż. Zdzisław Kurzawa email: zdzislaw.kurzawa@put.poznan.pl tel. 61 665 20 91 Wydział Budownictwa i Inżynierii Środowiska ul. Piotrowo 5 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Knowledge in the field of strength of materials and metal structures. Knowledge of structural mechanics in the field of plane bar structures. Knowledge in the field of steel structures from first-cycle studies.
2	Skills	Ability to calculate internal forces and stresses in statically determinate and indeterminate bar structures. Ability to design basic metal structures using limit state conditions and welded and bolted joints.
3	Social competencies	Consciousness of the need to raise professional and personal competences. Understanding the needs of dissemination the knowledge of the technical processes and technology in the structural engineering in commonly understood way.
Assumptions and objectives of the course: The aim of the course is to introduce the basic methods of designing crane beams, frame buildings, trestles and space deck roofs.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student knows the principles of analysis, construction and designing of the elements of any buildings (metal structures). - [K_W02]		
2. Student has knowledge of solid mechanics, knows the rules of the analysis of issues of statics, stability and dynamics of the (metal) bar structures, and surface (plate, shield and shell) and solid. - [K_W03]		
3. Student has knowledge of the analysis and optimization of metal structures and parts of complex building systems, methods for solving nonlinear and perform engineering calculations. - [K_W09]		
4. Student knows the standards and guidelines for the design of buildings (metal construction) and their elements. - [K_W14]		
5. Student knows the principles of building and designing of objects of general construction, industrial, and communications (metal structures). - [K_W16]		
Skills:		

1. Student is able to assess and statement of any loads acting on buildings (metal structures). - [K_U01]
2. Student is able to classify buildings (metal structures). - [K_U02]
3. Student knows how to design elements and connections in complex metal structures. - [K_U03]
4. Student is able to critically assess the results of the numerical analysis of engineering structures (metal structures). - [K_U07]
5. Student knows how to design complex construction details (metal structures) in buildings of general construction, industrial, and communications. - [K_U09]
6. Student can choose the tool (analytical or numerical) to solve engineering problems in metal structures. - [K_U13]
7. Student is able to perform design and technical documentation in the field of metal structures using CAD programs. - [K_U16]

Social competencies:

1. Student can - executing certain tasks - work independently, to work in a team and manage a team. - [K_K01]
2. Student is responsible for the accuracy of the results of their work and the evaluation of the work of subordinate team. - [K_K02]
3. Student independently complements and extends knowledge of modern techniques, processes and technology. - [K_K03]
4. Student is aware of the need to raise his professional and personal competences. - [K_K06]

Assessment methods of study outcomes

The lecture is illustrated with multimedia presentations and films. Design exercises - project of the industrial hall with or without the overhead travelling crane. The lecture - examination, design exercises - defence of the project.

Grades scale:

- 5,0 - the student got above 90 % points from the exam or project defense,
- 4,5 - the student got 80 % to 90 % points from the exam or project defense,
- 4,0 - the student got 70 % to 80 % points from the exam or project defense,
- 3,5 - the student got 60 % to 70 % points from the exam or project defense,
- 3,0 - the student got 50 % to 60 % points from the exam or project defense,
- 2,0 - the student got below 50 % points from the exam or project defense.

Course description

- housing elements halls,
- design of beams for overhead travelling cranes and suspended cranes,
- concentrated force of cranes,
- computational models of transverse systems halls,
- spatial effect of the elements hall,
- welded portal joints and foundation joints in the transverse systems of halls,
- node design rules due to their stiffness,
- design of columns with axial force and bending with constant cross-section, with gradually variable geometry and tapered geometry,
- spatial stability halls (bracing systems),
- design of steel trestles,
- spatial structures roofs of halls.

Basic bibliography:

1. Biegus A., (2008), Stalowe budynki halowe, Wydawnictwo Arkady, Warszawa, s. 342 (in Polish)
2. Bogucki W., (1982) Poradnik projektanta konstrukcji metalowych. Tom 1, Wydawnictwo Arkady, Warszawa, s. 560 (in Polish)
3. Bogucki W., (1980) Poradnik projektanta konstrukcji metalowych. Tom 2, Wydawnictwo Arkady, Warszawa, s. 788 (in Polish)
4. Bródka J., Broniewicz M., (2010), Projektowanie konstrukcji stalowych wg Eurokodów, Polskie Wydawnictwo Techniczne, Warszawa, s. 739 (in Polish)
5. Bródka J., Kozłowski A., (2009), Projektowanie i obliczanie połączeń i węzłów konstrukcji stalowych. Część 1. Polskie Wydawnictwo Techniczne, s. 600 (in Polish)
6. Bródka J., Kozłowski A., (2009), Projektowanie i obliczanie połączeń i węzłów konstrukcji stalowych. Część 2. Polskie Wydawnictwo Techniczne, s. 843 (in Polish)
7. Giżejowski, Ziółko J., (2010), Budownictwo ogólne. Tom 5. stalowe konstrukcje budynków projektowane wg eurokodów z przykładami obliczeń, Wydawnictwo Arkady, Warszawa, s. 1085 (in Polish)
8. Jankowiak W., (1992), Wybrane konstrukcje stalowe. Część 1. Wydawnictwo Politechniki Poznańskiej, Poznań, s. 301 (in Polish)
9. Jankowiak W., (1994), Wybrane konstrukcje stalowe. Część 2. Zbiorniki. Zasobniki. Konstrukcje wiszące, Wydawnictwo Politechniki Poznańskiej, Poznań, s. 165 (in Polish)
10. Kozłowski A., (2012), Konstrukcje stalowe. Przykłady obliczeń wg PN-EN 1993-1. Część 1. Wybrane elementy i połączenia, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów, s. 396 (in Polish)
11. Kozłowski A., (2012), Konstrukcje stalowe. Przykłady obliczeń wg PN-EN 1993-1. Część 2. Stropy i pomosty, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów, s. 498 (in Polish)
12. Kurzawa Z., (2011), Stalowe konstrukcje prętowe. Część 1. Hale przemysłowe oraz obiekty użyteczności publicznej, Wydawnictwo Politechniki Poznańskiej, Poznań, s. 368 (in Polish)
13. Kurzawa Z., (2011) Stalowe konstrukcje prętowe. Część 2. Struktury przestrzenne, przekrycia cięgnowe, maszty i wieże, Wydawnictwo Politechniki Poznańskiej, Poznań, s. 235 (in Polish)
14. Pałkowski Sz., (1994), Konstrukcje cięgnowe, Wydawnictwo Naukowo-Techniczne, Warszawa, s. 200 (in Polish)
15. Pałkowski Sz., (2010), Konstrukcje stalowe. Wybrane zagadnienia obliczania i projektowania, Państwowe Wydawnictwo Naukowe, Warszawa, s. 215 (in Polish)
16. PN-EN 1990 Eurocode: Basis of structural design
17. PN-EN 1991 Eurocode 1: Actions on structures
18. PN-EN 1993 Eurocode 3: Design of steel structures
19. PN-90/B-03200 Konstrukcje stalowe. Obliczenia statyczne i projektowanie (in Polish)

Additional bibliography:

1. Biegus A., (1997), Nośność graniczna stalowych konstrukcji prętowych, Państwowe Wydawnictwo Naukowe, Warszawa-Wrocław, s. 183 (in Polish)
2. Bogucki W., (1976), Budownictwo stalowe. Część 1, Wydawnictwo Akady, Warszawa, s.451 (in Polish)
3. Bogucki W., (1977), Budownictwo stalowe. Część 2, Wydawnictwo Akady, Warszawa, s.444 (in Polish)
4. Bogucki W., Żyburtowicz M., (2008), Tablice do projektowania konstrukcji metalowych, Wydawnictwo Arkady, Warszawa, s.399 (in Polish)
5. Jankowiak W., (1983), Konstrukcje metalowe, Państwowe Wydawnictwo Naukowe, Warszawa-Poznań, s. 916 (in Polish)
6. Kurzawa Z., Chybiński M., (2008), Projektowanie konstrukcji stalowych, Wydawnictwo Politechniki Poznańskiej, Poznań, s. 322 (in Polish)
7. Łubiński M., Filipowicz A., Żółtowski W., (2008), Konstrukcje metalowe. Część 1. Podstawy projektowania, Wydawnictwo Arkady, Warszawa, s. 646 (in Polish)
8. Łubiński M., Żółtowski W., (2007), Konstrukcje metalowe. Część 2. Obiekty budowlane, Wydawnictwo Arkady, Warszawa, s. 566 (in Polish)
9. Rykaluk K., (2006), Konstrukcje stalowe. Podstawy i elementy, Dolnośląskie Wydawnictwo Edukacyjne, Wrocław, s. 431 (in Polish)

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Current preparation for lectures (repeat material)	3
3. Preparation for the final exam and the attendance at the exam	17
4. Participation in projects	30
5. Work on a project at home	17
6. Preparation for a defence of the project and its defend	3

Student's workload

Source of workload	hours	ECTS
Total workload	100	4
Contact hours	60	2
Practical activities	50	2