STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Welded steel structures**		Code **1010101171010115398**
Field of study **Civil Engineering First-cycle Studies**	Profile of study (general academic, practical) **(brak)**	Year /Semester **4 / 7**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **elective**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **30** Classes: **-** Laboratory: **-** Project/seminars: **-**		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		ECTS distribution (number and %)

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge in the field of strength of materials and metal structures. Knowledge of structural mechanics in the field of plane bar structures.
2	**Skills**	Ability to calculate internal forces and stresses in statically determinate and indeterminate bar structures. Ability to design 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 making the students acquainted with the methods and principles of manufacturing, construction and assembly of metal structures. Presentation common and modern technical and technological processes in the field of manufacturing of metal structures.

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

Knowledge:

1. Student knows the basic welding processes and selected aspects of welding technology. - [K_W12]
2. Student knows basic metallurgy: steels, non-ferrous metals. - [K_W14]
3. Student knows the principles of the design of welded structures. - [K_W07]

Skills:

1. Student is able to correctly design welded structures. - [K_U07]
2. Student is able to match the correct technology of welding to the designed structure. - [K_U20]
3. Student is able to match the correct material to the designed structure. - [K_U20]

Social competencies:

1. Student independently complements and extends knowledge of modern techniques, processes and technology. - [K_K03]
2. Student is aware of the need to raise his professional and personal competences. - [K_K06]
3. Student is able to formulate opinions on technical processes and technology in construction. - [K_K07]

Assessment methods of study outcomes

Final test consisting of 30 questions, the total number of points: 60, the duration of the test - 45 minutes. Grading scale: 55 - 60 very good (A), 49 - 54 good plus (B), 43 - 48 good (C), 37 - 42 plus sufficient (D), 31 - 36 is sufficient (E) - less than 31 inadequate (F).

For each attendance one can get one extra point. A total number is 25 points.

Final grade is obtained on the basis of the total number of points earned by the student. Students can earn a total of 85 points.

Grading scale: 78 - 85 very good (A), 70 - 77 good plus (B), 61 - 69 good (C), 52 - 60 plus sufficient (D), 43 - 51 is sufficient (E) - less than 43 inadequate (F).

Course description

General introduction to the manufacturing, construction and assembly of metal structures.

Welding technologies: gas welding and related technologies, gas-shielded metal arc welding, TIG welding, MIG / MAG welding and with tubular cored filler material, manual metal arc welding with covered electrode (MMA), submerged arc welding (SAW), other types of welding processes, resistance welding, brazing, soldering and braze welding, mechanized and robotic processes, cutting and joint preparation, surfacing by welding and spraying.

Metallurgy: production of steel and intended use, structure and properties of pure metals, alloys and phase diagrams; diagram of iron-carbon, heat treatment, construction of welded joints; non-alloy steels general-purpose and carbon-manganese steels, fine grain steels, thermo-mechanically treated steels, low-alloy steels used to work at very low temperatures and at elevated temperatures, high-alloy steels, heat resisting steels, high strength steels, cast iron and cast steel, non-ferrous metals: copper, nickel, aluminum.

Discussion of phenomena: cracks in steels, corrosion and abrasion. Overview of protective layers.

Design of welded structures: the base of strength of materials, stress and strain welding, testing of materials and welded joints, design of welded joints. Design and behavior of welded structures for different static and dynamic loads.

The quality and inspection of welded structures: quality control, non-destructive testing.

Aspects of economic analysis in welding.

Health and safety issues during the welding process.

Presentation of welding processes (demonstration of real or in multimedia forms).

Execution and control of bolted connections. Standardized rules for execution of welded joints and bolted connections.

Basic bibliography:

1. Ferenc K., Ferenc J., (2006), Konstrukcje spawane. Połączenia., WNT, Warszawa.
2. Ferenc K., (2007), Spawalnictwo., WNT, Warszawa.
3. Klimpel A., (1997), Technologia spawania i cięcia metali., Wyd. Politechniki Śląskiej, Gliwice.
4. Klimpel A., (1999), Spawanie, zgrzewanie i ciecie metali - technologie., WNT, Warszawa.
5. Pilarczyk J. i inni, (2003), Poradnik inżyniera. Spawalnictwo. Tom 1, WNT, Warszawa.
6. Pilarczyk J. I inni, (2005), Poradnik inżyniera. Spawalnictwo. Tom 2, WNT, Warszawa.
7. Przybyłowicz K., (1999), Podstawy teoretyczne metaloznawstwa., WNT, Warszawa.
8. Przybyłowicz K., (1999), Metaloznawstwo., WNT, Warszawa.

Additional bibliography:

1. Blicharski M., (2004), Inżynieria materiałowa. Stal., WNT, Warszawa.
2. Czuchryj J., Papkala H., Winiowski A., (2005), Niezgodności w złączach spajanych., Instytut Spawalnictwa, Gliwice.
3. Czuchryj J., Stachurski M., (2005), Badania nieniszczące w spawalnictwie., Instytut Spawalnictwa, Gliwice.
4. Dobrzański L.A. (2002), Podstawy nauki o materiałach i metaloznawstwo. Materiały inżynierskie z podstawami projektowania materiałowego., WNT, Warszawa.
5. Dobrzański L.A. (2007), Podstawy kształtowania struktury i własności materiałów metalowych., Wydawnictwo Politechniki Śląskiej, Gliwice.
6. Rykaluk K., (2000), Pęknięcia w konstrukcjach stalowych., DWE, Wrocław.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Current preparation for lectures (repeat material)	30
3. Preparation for the final exam and the attendance at the exam	40

Student's workload

Source of workload	hours	ECTS
Total workload	100	4
Contact hours	30	1
Practical activities	0	0