Transilvania University of Braşov, Romania
Study program: Welding Engineering Advanced Materials

Faculty: Materials Science and Engineering
Study period: 2 years (master)

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Advanced Materials Science	SMSMAV	Romanian	3	1		1	

Course description (Syllabus): Introduction to the materials welded joints. Steels. Cast irons. Alloys. Ceramic materials. Composites. Polymers. Alloys. Ti and its alloys. Ni and its alloys. Cr and its alloys. Ceramic materials. Classification. Properties. Applications. Composites. Definition. Hardening elements. Organic matrix composites. Metal matrix composites. Ceramic matrix composites. Carbon composite materials. Applications. Polymers. Classification. Symbolization. Properties. Applications. Hybrid joints. Adhesives. Types of joints: metal-ceramic, metal-composite plastic-plastic, metal to metal. Applications.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Advanced Materials Engineering	SMIMAV	Romanian	3	1		1	

Course description (Syllabus): Processing of composite materials; Advanced composite materials; Amorphous metal materials processing; Processing of metallic materials and nanocrystalline multilayer.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Behavior of advanced materials for welding	SMCMAS	Romanian	5	2		1	

Course description (Syllabus): Behavior welding high alloyed steels; Welding behavior of superalloys, high temperature precipitation hardening; Behavior welding dissimilar materials; Welding behavior of Ti, Mg, Ta, Day, Be, W, Nb; Welding of clad steels behavior; Behavior of welding plastics; Welding behavior of composite materials.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Welding processes	SMPRSU	Romanian	5	2		2	

Course description (Syllabus): General introduction to welding engineering; Welding with coated electrodes; Submerged arc welding; MIG – MAG; TIG; Gas welding; Plasma Welding; Electron beam welding; Laser welding.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Standardization and terminology in welding engineering - English	SMTISE	Romanian	4	1	1		

Course description (Syllabus): General technical terminology; Technical terminology - fusion welding; Technical terminology - pressure welding; Technical terminology – cutting;Technical terminology - brazing, soldering; Technical terminology - reconditioning, welding load; Technical terminology - conventional welding processes.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Methods and computer software for welding processes and technologies	SMMPCS	Romanian	5	2		1	

Course description (Syllabus): Tables; Queries; Forms; Reports; Data processing; Related tables; Finite difference method; The finite element method .

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Welding related processes	SMPCOS	Romanian	5	1		2	

Course description (Syllabus): Soldering (brazing); Spray coating technology; Welding and brazing plastics; Adhesives.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Modern welding sources	SMSMOS	Romanian	5	2		1	

Course description (Syllabus): Modern welding sources; Modern welding sources; Modern sources for MIG / MAG welding; Welding equipment in narrow sense; Sources for welding equipment, cutting and laser drilling; Sources for welding equipment, cutting and drilling electron beam; Welding equipment for composites; Modern sources for pressure welding.

Course title	Code	Language of instruction	No. of credits	Number of hours per wee			
				course	seminar	laboratory	project
Testing and examination methods in welding	SMIMES	Romanian	5	1		2	

Course description (Syllabus): Mechanical tests of filler material made by manual welding with coated electrodes; Testing of welded joints butt fusion and pressure; Testing of welded joints in corner seams; Tests for resistance to fatigue; Testing of welded joints by dots; Testing of welded joints cracking technology: technological; Technology of hot cracking test; Mechanical tests of filler material made by manual welding with coated electrodes.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Construction and design of welded structures	SMCDSS	Romanian	5	2		2	

Course description (Syllabus): Introduction to design of structures; Stress and strain; Geometry of welded joints; Stress in welded joints; Behavior of welded joints under static action; Design under static loads; Behavior of welded joints under the action of dynamic applications; Design under dynamically loads; Design of pressurized structures; Design of aluminum structures; Hardening of structures.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Elements of reliability in welding	SMEFBS	Romanian	5	2		1	

Course description (Syllabus): Purpose and importance of reliability study; Notions of probability calculation; Elements of mathematical statistics; Reliability indicators; Reliability testing; Methods used to determine reliability indicators; Study on testing significant differences between two groups of equipment.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Ethics and academic integrity	SMETIA	Romanian	2	2		1	

Course description (Syllabus): involves an in-depth exploration of the fundamental ethical principles guiding academic activities and scientific research. Through this course, students are encouraged to internalize values such as honesty, responsibility, and respect for moral norms, thereby contributing to the development of ethical conduct within the academic environment. Promoting academic integrity is essential for maintaining the credibility and value of the educational process and for shaping responsible and ethical professionals.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Ecological materials for welding	SMPEPS	Romanian	4	1		1	

Course description (Syllabus): Influence of electrode system and its components on the quantity and quality welding fumes; Tools for determining the concentrations of pollutants in the workplace; Knowledge systems that generate health and safety hazards operator welding processes and means for their removal and minimizing; Technical ventilation and air conditioning to welding; Calculation methods for estimating air flow circulated in natural ventilation; Case studies: light steel structures, boilers, pressure vessels, pipelines, chemical containers, to for choosing MB, MA welding, assembly, design, welding procedure.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Clean technologies for welding	SMTCUS	Romanian	5	2		1	

Course description (Syllabus): Environmental standards in the industry; Measurement of systems noises; Determination of harm to the welding; Harm reduction methods in welding metals; Ecological aspects of alloying elements commonly used in metal alloys; Emissions from thermal spraying; Design of exhaust systems in welding workshops.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Elements of applied engineering in welding	SMEIAS	Romanian	5	2		1	

Course description (Syllabus): General elements of the composition of welded structures; The machining technology of welded steel structures; Welding processes used in the implementation of welded structures; Mounting technology - welding applied trusses, beams with full heart; Technologies Installation - applied welding steel bridges; Mounting technology - welding applied to vessels; Related technologies execution welded structures; General elements of the composition of welded structures.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Systemic manufacturing of welded structures	SMFSSS	Romanian	5	1		1	

Course description (Syllabus): Complex systems for MIG MAG welding; Complex systems of modern TIG welding processes; Complex systems of modern laser welding processes; Modern Hybrid Laser Welding; Modern brazing; Welding complex systems of optical fibers; Modern systems of automatic welding; Robotic welding systems; Systems testing and inspection of welded structures; Modern ships welded.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Modelling in welding engineering	SMMISU	Romanian	5	1		1	

Course description (Syllabus): Introduction to Inventor modeling; Drawing commands; Settings used in drawing; Arranging modeling; Exploded; Symbols and drawings; Structures and welds in Inventor.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practical activity no. 1, 2 and 3	SMADCS	Romanian	5				168

Course description (Syllabus): Experimental development in scientific research projects conducted in the Department; MA students will work in mixed teams with PhD and coordinators research grants; The topics considered are: Designing innovative welding technology; Development of innovative materials for welding; Welding technology manufacturing design of welded structures innovative materials.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Practical activity no. 4	SMADCS	Romanian	15				182

Course description (Syllabus): Experimental development in scientific research projects conducted in the Department; MA students will work in mixed teams with PhD and coordinators research grants; The topics considered are: Designing innovative welding technology; Development of innovative materials for welding; Welding technology manufacturing design of welded structures innovative materials.

Course title	Code	Language of instruction	No. of credits	Number of hours per week			
				course	seminar	laboratory	project
Dissertation examination	SMEXDI	Romanian	15				182