

Transilvania University of Braşov, Romania

Study program: Welding Engineering of Advanced Materials

Faculty:	Materials Science and Engineering
Study period:	2 years (master)
Academic year structure:	2 semesters (14 weeks per semester)
Examination sessions (two):	winter session (January/February) summer session (June/July)

1st Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Advanced Materials Science	SMSMAV	4	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 plasticplastic, metal to metal. Applications.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Advanced Materials Engineering	SMIMAV	4	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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Behavior of advanced materials for welding	SMCMAS	6	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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Welding processes	SMPRSU	6	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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Welding engineering terminology - English	SMTISE	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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Methods and computer software for welding processes and technologies	SMMPCS	6	1		2	

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

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Welding related processes	SMPCOS	6	2		2	

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

Course title	Cod	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Modern welding sources	SMSMOS	6	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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Testing and examination methods in welding	SMIMES	6	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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Construction and design of welded structures	SMCDSS	6	2		1	

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.

2nd Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Elements of reliability in welding	SMEFBS	6	1		2	

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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Elements of applied engineering in welding	SMEIAS	6	1		2	

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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Systemic manufacturing of welded structures	SMFSSS	6	2		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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Modelling in welding engineering	SMMISU	6	1		1	

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

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Ecological materials for welding	SMPEPS	4	1		2	

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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Project Management in Welding Engineering	SMMP CS	4	1		1	

Course description (Syllabus): Research programs with national and international funding; Priority research directions; Forms for application; Research organization; Quality of research; Getting inventions; Documentation for filing patents.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Clean technologies for welding	SMTCUS	4	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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Practical Activity and Scientific Research for Development of the Dissertation Thesis	SMADCS	15				16

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	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Dissertation examination	SMEXDI	15				