

Transilvania University of Braşov, Romania

Study program: Welding Engineering

Faculty: Materials Science and Engineering

Study period: 4 years

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mathematical Analysis	SMAMA1	4	2	2		

Course description (Syllabus): Field theory. Scalar and vector fields; Differential operation. Formulas whole; Theory of complex variable functions; Cauchy integrals. Taylor and Laurent series; Partial differential equations of first order. Raw integrated; Trigonometric series. Strings orthogonal Fourier series. Bessel functions; Mathematical Equation. Order partial differential equations II. string equations; Vibrant, heat equation, Laplace equation.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Computer Basics	SMBUC1	5	3		1	

Course description (Syllabus): Description and use of personal computer operating systems; How to use Visual Basic and Visual C programs; Description and use of Microsoft Office package; Numerical methods of approximation; Document compression utilities.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Descriptive Geometry	SMGDE1	4	2		1	

Course description (Syllabus): Importance of standards in technical drawing. Classification of technical drawings; Representations used in industrial design; Sections; Representation and dimensioning of machine elements; Condition scoring areas; Registration linear and angular tolerances size. Registration form and position deviations; Overall design and installation.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Materials science and engineering I	SMINM1	4	2		1	

Course description (Syllabus): Structure and properties of metallic materials; Definitions of metal, alloy, crystal structure, types of networks; Influence on the properties of the network type. Allotropic metallic materials; Defects cross linking. Influences; Crystallization of metallic materials; Homogeneous and inhomogeneous crystallization; Defects. Methods of prevention; Plastic deformation and recrystallization. Plastic deformation of crystals. Plastic deformation of polycrystalline aggregates; Influences on properties; Influence of heating; Hot plastic deformation.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
General chemistry	SMCGB1	4	2		1	

Course description (Syllabus): General notions of chemistry (Atom, molecule, mol equivalent gram); The relationship between structure and properties of substances. Chemical bonds; Water. Water hardness. Water softening and demineralization; Metals. Preparation. Properties. Corrosion. Corrosion protection methods and techniques; Getting thermo chemistry. Fuels. Economic importance and practice materials (lubricants, abrasives, glass); Electrochemical energy conversion. Cells; Macromolecular compounds. Composites; Getting pollution and environmental.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Materials Technology I	SMTHM1	3	1		2	

Course description (Syllabus): Materials properties; Extractive metallurgy; Casting blanks and parts; Casting properties of metals and alloys, design patterns and core boxes, foundry mixtures, making manual and mechanized forms and core networks, hardware, castings debate, modern methods of temporary molding, molding processes permanent (casting molds, die casting, centrifugal casting).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Physics	SMFIZ1	4	2		1	

Course description (Syllabus): Mechanic and acoustic; Thermodynamics and Statistical Physics; Electromagnetism; Maxwell's equations; Potential field; Transition equations for the electromagnetic field components; Field energy in inductors and capacitors electromagnetic; Electrostatics.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Materials Technology II	SMTHM2	5	2		1	

Course description (Syllabus): Technological basics of plastic deformation. General phenomena occurring in plastic deformation. Processing by plastic deformation: rolling, drawing, extruding, forging, stamping, machining equipment by plastic deformation. sheet metal processing. Manufacture of pipes by plastic deformation. Welding and metal bonding. Theoretical welding of metallic materials. Oxy-fuel welding and flame cutting. Arc welding discovered. Special procedures for arc welding. Pressure welding. Welding allied processes: cutting and metal bonding. Powder metallurgy. Nonmetallic materials used in technics.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Materials science and engineering II	SMINM2	5	2		1	

Course description (Syllabus): Alloy systems; Constituents; Binary equilibrium diagrams; Ternary equilibrium diagrams; Fe-C alloys; Fe-C diagram; Steels (classification, symbolization, microstructure properties); Iron (classification, symbolization, microstructures, properties); Alloy steels (classification, microstructure, symbolization, properties, uses).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Linear Algebra, Analytical Geometry and Differential Equation	SMALG1	4	2	1		

Course description (Syllabus): Vector spaces; Euclidean spaces; Space; Plan and right in space; Linear transformations. Values and eigenvectors. Bilinear and quadratic forms; Conic; Sphere; Quadra on reduced equations; Surfaces generated.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Technical Drawing	SMDEST	3	1		2	

Course description (Syllabus): General (presentation software, interfaces, configuration, screen, menus, opening, closing, maneuvers, etc.). Fundamentals for drawing (initiation, ordering, managing screen graphics, design prototype, coordinates and units). Basic 2D drawing techniques. Layer concept. Graphic aids (basic object creation, types of lines, properties). Editing commands and extract information from drawings. Selecting entities (set of selection, editing techniques, attachment points, grips, delete, move, zoom, scale, copy, etc.). Advanced editing techniques (changing

object characteristics, bevelling, connections, extensions, and so on). The concept of block. Symbols and attributes. External references.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Numerical methods	SMMEN1	4	2		2	

Course description (Syllabus): Numerical errors; Numerical solution of algebraic equations; Solving systems of equations; Numerical methods for calculating eigenvectors; Approximation of functions; Numerical derivation; Numerical integration; Numerical solution of first order differential equations.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mechanics	SMMEC1	3	2	1		

Course description (Syllabus): Systems of forces; Center of mass; Rigid solid balance; Balance material systems; Mechanical inertia; Kinematics point; Kinematics of rigid; Getting Started dynamics; Fundamental theorems of dynamics; Dynamic stiffness.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Data Processing and Informatic Systems	SMPDS1	4	2		2	

Course description (Syllabus): Microsoft Access; Overview of application. General concepts; Tables and their use; Relationships between entities. Creating relationships between tables; Sorting, filtering and indexing data; Operations with applications, forms, reports and labels; LabVIEW; LabVIEW program overview; LabVIEW virtual instruments; Creating a SubVI; Loops and diagrams; Numbers, matrices and graphs; Establishing of formulas and working conditions; Data acquisition and instrument control; Designing an application.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
English language	SMLE01/ SMLE02	2/2	1/1	1/1		

Course description (Syllabus): The Verb. Indicative Mood. Present (simple & continuous, perfect simple & continuous) Practice; The Verb. Indicative Mood. Past (simple & continuous, perfect simple & continuous); Practice; The Verb. Indicative Mood. Future (simple & continuous, perfect simple & continuous). Future-in-the-Past (simple & continuous, perfect simple & continuous). Other ways of expressing the future (Present simple & continuous, be going to, be to, be about to), Practice. The Verb. Subjunctive Mood. Synthetic (Present/Past/Past perfect) & Analytic (modal + inf.), Practice. The Noun. Classification, gender, number, case, Practice. The Adjective. Classification, comparison, special constructions, position, Practice. The Adverb. Classification, types, comparison, position.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Physic education	SMEDF01 SMEDF02	1/1			1/1	

Course description (Syllabus): Sports, athletics, basketball, football; School walking, running and sports march; School-jumping; School-throwing; Passing strengthening the place of displacement; Strengthening the place and throw away; Repeating structures and finishing the game with 2-3 players; Long jump with 1 ½ steps in flight; Throwing small.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Special mathematics	SMMS01	4	2	1		

Course description (Syllabus): Systems of differential equations; Elements of field theory; Complex functions; Fourier series; Partial differential equations of second order; Laplace transform.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Strength of Materials I	SMRM01	5	2	1	1	

Course description (Syllabus): Strength of materials problems; And static moments of inertia; Sectional efforts to straight beams, curved, flat and spatial structures; Elements of the Theory of Elasticity; Extent-compression; Shear relatively small sections, calculating joints; Torsion bars straight; Bending of straight beams.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Ecology and environmental protection	SMECOL	5	2		2	

Course description (Syllabus): Introduction. History on the time evolution of ecology and environment and their classification in the context of sustainable development concepts and overall quality. Basic principles of ecology. Formation of environmental awareness. Branches of ecology: population ecology, ecotoxicology, urban ecology, behavioral ecology, human ecology, applied ecology, information ecology, industrial ecology. Environment. Environment and economic development. Environmental pollution. Categories of pollutants. Pollution events.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Probability theory and statistics	SMTPSM	4	1		3	

Course description (Syllabus): Field-probability events; Classical probability distributions; Random variable systems; Law of large numbers; Selection and estimation theory; Confidence intervals; Hypothesis testing.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Technical devices	SMDIST	5	2		2	

Course description (Syllabus): General technological, classification; Blanks in device orientation; Devices with levers and screw tightening; Clamping devices up.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Dimensional control	SMCODI	5	3		2	

Course description (Syllabus): Getting on measurement techniques. Basic principles of measurement. Units. Metrology. Meters. Methods and means for measuring lengths. Interpol used to measure lengths. Mechanical means for measuring length. Plane-parallel way, calipers, micrometers, parameter. Pneumatic tools for measuring length. Pressure measurement. General, units and types of pressure. Non-electric means of measuring pressure. Flow measurement. Definitions and units. Measuring masses. No electric means to measure mass. Methods and means for measuring the velocity and speed. Non-electrical methods for measuring velocities and speeds. Transducers used. Measurement of linear velocity.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Electrotechnics	SMETH1	4	2		1	

Course description (Syllabus): Electrostatic. Primitive and derived sizes. Units. Electrification phenomena. Electric charge, electric charge density. Electric field in the vacuum electrical current, Coulomb's formula, induction electric vacuum voltage vacuum. Laws of electrostatics. Applications. Electro kinetic. Electro kinetic status, power and electric current density. Electric fields printed. Cells and batteries. Classification point of view of electrical conductivity material. Solving linear DC network. Applications. Electrodynamics

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Quality Control and Assurance	SMASCA	5	2		2	

Course description (Syllabus): Consideration about the quality; Control methods and procedures; Evolution of quality; Quality assurance by international standards ISO 9000; Internal quality assurance; External quality assurance; The quality system documentation; Quality records.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Strength of Materials II	SMRM02	4	2	1	1	

Course description (Syllabus): Bending flat curved bars requests composed; Calculating bending deformations; Statically indeterminate systems; Buckling of straight beams; Thin-walled vessels revolution; Requests fatigue; Requests shock; Basics of experimental methods for evaluation of stresses and strains.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Machine components	SMOM01	4	2		1	1

Course description (Syllabus): Introduction. Objective and importance of the subject. History. Course contents. Bolted joints and screw-nut transmissions. Assemblies with pins and bolts. Longitudinal assemblies feathers. Grooved assembly. Polygonal wheels on. Tightening assemblies own. Assembly by clamping onto the cone. Assemblies with tapered rings. Couplings. Gears.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Thermodynamics	SMTERM	4	2		1	

Course description (Syllabus): Introduction. General terms of thermotechnics; The first principle of thermodynamics; Perfect gas; The second principle of heat transfer; Heat conduction; Internal combustion engine with reciprocating piston; Compressors; Gas turbine.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Bases of Technical Computer Assisted Design	SMBPTA	5	3		2	

Course description (Syllabus): Program interface presentation; 2D design; Dimensioning of 2D elements; 3D modeling; Surfaces generating; Cavities generating with 3D model; Assemblies modeling; Utilization of Weld met module.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Practical Activity	SMPR11	2			30	

Course description (Syllabus): Will gather technical data on semi-finished products was made in the company. Their production flow in sections: ferrous and nonferrous materials, development of systems and equipment arc melting, induction furnaces, ovens resistive heating, flame. Casting continuous flow systems and equipment (conveyors), in temporary form, chill, pressure forging mold-free and specific equipment, heating furnaces, hammers mold hydraulic presses, eccentric presses. Heat-treatments, thermochemical treatments. Welding and welding equipment, thermal cutting, and metallization. Mechanical cutting, turning, milling, grinding, mortising, cutting. Surface coatings, galvanizing. Destructive and non-destructive testing of tensile, compression, bending, shearing, hardness, impact bending, ultrasonic, magnetic particle, radiation testing

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
English language	SMLE03/ SMLE04	4	1/1	1/1		

Course description (Syllabus): The Verb. Indicative Mood. Present (simple & continuous, perfect simple & continuous); Practice; The Verb. Indicative Mood. Past (simple & continuous, perfect simple & continuous); Practice; The Verb. Indicative Mood. Future (simple & continuous, perfect simple & continuous). Future-in-the-Past (simple & continuous, perfect simple & continuous). Other ways of expressing the future (Present simple & continuous, be going to, be to, be about to), Practice; The Verb. Subjunctive Mood. Synthetic (Present/Past/Past perfect) & Analytic (modal + inf.), Practice; The Noun. Classification, gender, number, case, Practice; The Adjective. Classification, comparison, special constructions, position, Practice; The Adverb. Classification, types, comparison, position.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Physic education	SMEDF03 SMEDF04	1/1			1/1	

Course description (Syllabus): Sports, athletics, basketball, football; School walking, running and sports march; School-jumping; School-throwing; Passing strengthening the place of displacement; Strengthening the place and throw away; Repeating structures and finishing the game with 2-3 players; Long jump with 1 ½ steps in flight; Throwing small.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Elements of Electronics in Industrial Engineering	SMEEII	5	2		2	

Course description (Syllabus): Passive electronic components; Semiconductor electronic components; Rectifiers, converters, inverters; Amplifiers; Electronic devices with discrete components; Analog integrated circuits; Binary logic integrated circuits; Electronic circuits for industrial machinery and equipment.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Theory of Welding Processes	SMTSP1	6	3		3	

Course description (Syllabus): Getting on base metal, steel, weld ability; Processes metal in welded joints to stitch formation; Thermal processes in metal welding, heat transfer during welding processes; Physic-chemical phenomena in welding, electric arc; Dissociation specific chemicals and chemical reactions arc space; Formation and solidification of metal bath her fusion welding processes; Welding stresses and strains; Phenomena of base metal welding under; Welding metallurgy alloy steels; Heterogeneous welded joints.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Control joints and welded products	SMCIPS	5	2		2	

Course description (Syllabus): Quality and quality control; Defects of welded joints; Magnetic control methods welded; Control methods of X-ray and γ; Ultrasonic flaw welds; Mechanical tests and welded construction; Troubleshooting and weld defects reshuffle; Organizing technical check of welds.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Heat treatments	SMTRTE	4	2		2	

Course description (Syllabus): Alloys for heat treatment; Heat treatment types; Transformation on solid state; Transformation on hardening; Transformation on cooling; Surface heat treatment.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Thermal cutting	SMTATE	5	2		2	

Course description (Syllabus): Mechanical cutting; Gas flame cutting; Oxy-arc cutting; Oxy-arc underwater cutting; Thermal lance cutting; Plasma cutting; Laser cutting; Special cutting; Water jet cutting; Electro-erosion cutting.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Ergonomics in welding	SMERGS	5	2		1	1

Course description (Syllabus): Ergonomics and ergonomics laws; Physiology of the human body and work requests; The ergonomic value dimensions; Physical strength, work capacity, energy body; Fatigue and body movements ergonomics principles; Ergonomic workplace organization; Factors ergonomic work environment and organization; Elements of psychology and human adaptation to work; Industrial aesthetic and ergonomic organization jobs; Labor protection organization ergonomic job; Economic efficiency ergonomic studies.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Welding Equipment (I)	SMESU1	4	2		1	1

Course description (Syllabus): Machinery and equipment for welding; Machinery and equipment for welding; Machinery and equipment for welding pressure; Machinery and equipment for fusion welding and pressure; Machinery and equipment for thermal cutting; Machinery and equipment for metallization and charging; Machinery and equipment for thermal bonding.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Fusion welding technology (I)	SMTST1	4	3		1	

Course description (Syllabus): General technological problems of fusion welding; Welding processes, classification, general aspects; 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
Pressure welding technology (I)	SMTSP1	4	2		1	

Course description (Syllabus): Welding technology in points; Welding technology in line; Welding technology in relief; Butt welding technology; Technology welding high frequency.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mechanical Processing	SMPRM1	4	2		2	

Course description (Syllabus): Turning metal. Lathe and turning tools, technology operations that can be performed on the lathe, classification of lathes, tools and devices used for lathes. Drilling materials. Technology operations that can be performed on drill. Milling. Basic operations that execute milling, milling machine. Grinding. Grinding machines, tools and devices used in rectification. Reaming, broaching and planning. Boring, stitching machines, planning machines.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Design of welded structures (I)	SMPSS1	4	2		1	1

Course description (Syllabus): Introduction to the design of machines and machine welded construction; Welded construction materials; Design of welded joints subjected to static; Calculation of welded joints fatigue; Uniform distribution in welded efforts; Corrosion protection.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Computerization and optimization of welding processes	SMIOPS	4	2	2		

Course description (Syllabus): Experimental data processing and programming experience. Central and centrifugal sizes of populations. Confidence interval. Statistical assumptions used in scheduling experiments Types of relations used in the analysis of welding processes. Linear regression. Checking law coefficients obtained. By nonlinear regression parameter. Checking the correlation coefficient Using factorial experiments to modeling welding processes. Choice of programs order levels and ranges of parameters. Matrix programming and programs. Order Programs II. General methods of optimizing the relations resulting from the planning process experiences. Gradient optimization algorithms used to optimize welding processes. Newton-Raphson algorithm. Description of the program developed for this algorithm. Numerical methods for optimizing processes

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Pneumatic drives	SMAPN1	4	2	1		

Course description (Syllabus): Production and distribution of air; Air preparation; Pneumatic; Distributors; Pneumatic applications in welding engineering.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Practical Activity	SMPR12	2			30	

Course description (Syllabus): Base and filler materials for welded structures, chemical composition determination, welding compatibility, choice of filler material. Mechanization of thermal cutting processes, automation, robotic, sources like gas flame, air-plasma laser. Equipment for different welding methods. Adjust welding parameters on equipment, optimization. Destructive and non-destructive control of welded joints, tensile, bending, shear, bending with shock strength, dye penetrant inspection, magnetic particle, ultrasonic penetrating radiation. Safety in welding

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Welding Equipment (II)	SMESU2	5	2		2	

Course description (Syllabus): Methods of measurement of the machinery and equipment for welding; Current transformers for welding; Rectifiers and inverters; Generator with separate excitation and series antagonist; Machinery welding flux; Equipment for MIG / MAG; Radiant energy welding equipment; Stored energy welding equipment; Cutting and welding equipment, air plasma; Equipment for gas welding flame; Diffusion welding equipment; Friction welding equipment; Used for welding pressure points; Pressure welding equipment in line; Butt Welding Machine; Cold welding equipment; Explosion welding machinery; Equipment for coating; Arc welding equipment rotating; Welding equipment for plastics.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Fusion welding technology (II)	SMTST2	6	2		1	2

Course description (Syllabus): Welding behavior of materials; Weldability; Carbon steel welding; Welding of low alloy steels; Welding alloy steels; Welding of clad steel; Welding of dissimilar joints between steel; Welding of cast iron; Welding of aluminum; Welding of copper.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Pressure welding technology (II)	SMTSP2	5	2		1	1

Course description (Syllabus): Turn technology ARC; Cold Welding Technology; Friction welding technology; GAS Welding Technology; Welding Technology Term (aluminothermic); Technology welding stored energy; UV Welding Technology; Explosion welding technology; Plastic Welding Technology.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mechanization and automation of welding processes (I)	SMMAP1	4	2		2	

Course description (Syllabus): The technology of welding and Indicators of mechanization mechanization index; Mechanization basic operations preparatory; Complex mechanization preparatory operations; Classification of mechanical equipment for the manufacture of welded structures; Fasteners and fastening; Fitting welded construction; seating and clamping elements; Mechanical drive systems for positioning and clamping elements; Staging movable and mechanization equipment produced in the country.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Design of welded structures (II)	SMPSS2	4	2		2	

Course description (Syllabus): Welded beams; Welded tanks; Welded pipes; Welded studs; Machine welded; Approval and verification of welded steel structures.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Materials and heat treatments for welding	SMMTTS	6	3		2	

Course description (Syllabus): Weldability of materials; Development of steels for welded structure; Steels for general; Steels appliances and containers, choosing quality class; Medium and high alloyed steels; Cast iron and non-ferrous metals; Fillers: selection criteria, electrodes, wires, gas flows; Heat treatment: definitions, parameters, changes in heating and cooling; Heat treatments applied before, during and after welding; Regulations on materials and heat treatments.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mechanization and automation of welding processes (II)	SMMAP2	3	2		1	1

Course description (Syllabus): Automation of welding processes; Automation elements; Transducers, principles for analog and complex energy; Frequency transducers, pulse and digital; Sizes transducers mechanical forces deform; Displacement transducers and sizes; Level transducers, speed, vibration and acceleration; Pressure and flow transducers; Temperature gauges, pyrometers and radiation; Transducers for gases; Automatic controllers; Actuators Drives; Automation systems automatic welding plant

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Welding Related Processes	SMPCS1	3	3		2	

Course description (Syllabus): Spray coating technology; Gas flame spraying, arc spraying, spraying using CIF, plasma spraying, laser spray, phenomena, occurring in interface between sprayed layer and substrate; Metallization technique; Environmental problems in thermal spraying; Welding and brazing plastic; Adhesives.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Damage analysis of welded structures	SMAASS	3	2		2	

Course description (Syllabus): Metallographic aspects of resistance crystalline structures; Physical mechanisms of breaking; Thermodynamic aspects of deformable environments with cracks; Linear-elastic fracture mechanics of materials; Elastic-plastic fracture mechanics material; Determinants of toughness characteristics; Breaking material under the action of variable requests; Engineering Applications of Fracture Mechanics.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Bases of experimental research	SMBCEX	3	3		2	

Course description (Syllabus): Mechanical testing of materials; Technological tests; Methods to investigate behavior welding of steels for welded structure; Determination of mechanical metallurgy of welded joints; Behavior characteristics of the base metal welding, metallurgical behavior, technological and constructive Tested for their reaction to welding technology. Determination of resistance to cold cracking in the heat affected; Methodology for determining the resistance of the weld metal hot cracking in welding; Methodology for determining some aspects of technological behavior welding, bending test specimens loaded with longitudinal welding, bending impact test, hardness and material compatibility in seam welding heterogeneous melting.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Verification of welding procedures	SMVPRS	3	2		2	

Course description (Syllabus): Management and quality assurance; Quality systems in firms producing welded structures; Quality of welded joints; Approval of welding technologies; Checking arc welding procedures; Certification of welding procedures according CR7 – 96; Certification of welding procedures according to EN 288/3; Checking and approval of welding procedures according to EN 287; Checking and approval of welding sources

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Finite element method in welding	SMMEFS	3	2		2	

Course description (Syllabus): Theoretical considerations on the physical phenomena that govern the welding process; Using finite element method for stationary scalar; Using finite element method for stationary vector; Form finite element method for non-stationary fields; Methods for solving the system of equations obtained by finite element method; Solving non-stationary; Welding process modeling.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Practical Activity	SMPR13	2			30	

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Research for the Diploma Project	SMPPD1	10				26