

Transilvania University of Braşov, Romania

Study program: Economic Engineering in Mechanics

Faculty: Materials Science and Engineering

Study period: 4 years

1st Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mathematical analysis	SMAMA1	6	3	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
Intellectual property and industrial legislation	SMLECO	3	2	1		

Course description (Syllabus): General aspects on intellectual property rights, author rights, rights on drawings and models, geographic indications, confidentiality agreements in industry. Theoretical and practical aspects on creativity and inventions. The main organizations from Romania and European Union that regulates this field (OSIM, WIPO, etc.). Brainstorming and Delphi techniques. Notable discoveries and inventions. Romanian and foreign famous inventors. Industrial intellectual creations. Distinctive signs. Copyright and rights related to copyright. Patenting inventions in Romania and abroad. The economic value of the patent.

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

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; Hot plastic deformation.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Software and computer programming	SMPRG1	6	3		2	

Course description (Syllabus): HTML programming language; PHP programming language; JavaScript programming language; Java programming language.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Chemistry	SMCGB1	5	2	1	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
Mechanics	SMMEC1	4	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
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
Linear algebra, analytical geometry and differential equations	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
European economic politics	SMPEE1	4	2	1		

Course description (Syllabus): The main issues of the course are the European economic history and policies, focusing on selected topics: the Golden Age, the Common Market, the productivity slowdown, the EMS and the EMU.

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, beveling, 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		1	

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
Economy; fundamentals	BE	3	2	1		

Course description (Syllabus): Demand, offer, market, concurrency; Labor market, employment, unemployment, wages; Monetary market, inflation, loan and interest; Capital market; Macroeconomics; international economic relations.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Bases of management	SMASE1	3	1	2		

Course description (Syllabus): General aspects on economic systems. Company structure. SWOT analysis applied in economic systems. General aspects on company's financial management (outgoings cost, resources, accountability, values, financial situations). Expenses analysis of economic systems. General aspects on marketing operations inside of economic systems. General aspects on project management inside of economic systems. General aspects on Quality management inside of economic systems.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Communication and academic writing	SMTCP1	3	2	1		

Course description (Syllabus): Science communication and communication principles; classification of communication. Written communication: letter, essay, report, request, official and personal letters, E-mail, web pages, CV and cover letter. Mood control in communication. The conflict in the managerial team, communication types during conflicts, dialogue theory. Academic writing.

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
Physical training 1/2	SMEF01/ SMEF02	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.

2nd Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Special mathematics	SMMSP1	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	SMRM01	4	2	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
General management	SMMANG	3	2	1		

Course description (Syllabus): The Course General Management aims acquiring the management concepts, principles, methods and techniques; development and formation of a critical thinking in adopting economic decisions; stimulating the interest for preparing future managers. Introduction. Management concept. Historical perspective on management. Organizational culture. International management and global economy. Management principles. Management functions: Planning function, organizing function, Directing function, Control function.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Applied informatics	SMINFA	5	2	2		

Course description (Syllabus): Database;MySQL language; Interaction between PHP and MySQL; Economic and engineering applications;Creating a virtual store; Server-side ASP.NET language, C# language; Applications in Visual Web Developer express 2008.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Electronics; fundamentals	SMETH1	3	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
Materials selection and properties	SMTSPM	5	2	1	2	

Course description (Syllabus): Crystalline structure – perfection. Crystal defects and noncrystalline structure-imperfection (the solid solution-chemical imperfection, point defects, linear defects, planar defects, three dimensional imperfections). Mechanical behavior - the theoretical aspects, influences, determination methods, choosing materials based on these characteristics. Thermal behavior (heat capacity, thermal expansion, thermal conductivity, thermal shock) - the theoretical aspects, influences, determination methods, choosing materials based on these characteristics. Electrical behavior - the theoretical aspects, influences, determination methods, choosing materials based on these characteristics. Magnetic characteristics - the theoretical aspects, influences, determination methods, choosing materials based on these characteristics (magnetism, ferromagnetism, ferrimagnetism, metallic magnets, ceramic magnets). Technological properties of materials - the theoretical aspects, influences, determination methods, choosing materials based on these characteristics. Materials in engineering design (environmental degradation, materials selection).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Entrepreneurship	SMANTR	4	2		2	

Course description (Syllabus): Entrepreneurs and entrepreneurship – characteristics, stages, business life cycle, organization of a business, objectives, profits, ethics, market and marketing strategies, business management, horizontal aspects, social innovation. Elaboration of a financial request proposal based on an existing call (example: start-up).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Probability and statistics	SMTPSM	4	1	2		

Course description (Syllabus): Field-probability events; Classical probability distributions; Random variable systems; Law of large numbers; Selection and estimation theory; Confidence intervals; Hypothesis testing. www, url, html;search engines, file sharing and file transfer; network security in Internet.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Thermotechnics	SMTERM	3	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
Machine parts	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
Value analysis	SMAVAL	4	2	1		1

Course description (Syllabus): Basic concepts about Management and Value Analysis elements. General and particular elements about design of Value Analysis Method. Function Analysis System technique (FAST). Functional Analysis. Concepts and Approaches of Value Analysis and Engineering. Case study: equipment, technologies.Practical applications: technology and Value Analysis products.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Commercial trade	SMSMTC	4	2	2		

Course description (Syllabus): Commercial transaction (subject, payment, participants). Trade policies (tariff protection tools, non-tariff protection tools, incentives and export promotion). The General Agreement on Tariffs and Trade (GATT) and World Trade Organization (WTO).European Union trade policy. International commercial negotiation and contracting. Combined commercial transactions (re-exporting, Lohn, switch). Complex commercial transactions (licensing, franchising, know-how, consulting-engineering).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Manufacturing systems engineering	SMISP1	5	2	1		2

Course description (Syllabus): Fundamentals of manufacturing systems; Identify the components and characteristics of manufacturing systems; Identify appropriate performance metrics of different manufacturing systems; Develop mathematical models to describe manufacturing systems; Analyze performance of manufacturing systems; System performance and influencing factors analysis.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Practical activity II (90h)	SMPR41	2				

Course description (Syllabus): Organizational and functional aspects of commercial companies. Primary technologies in materials processing. Machining of materials. Heat treatment technologies. Finishing and super finishing technologies. Industrial equipment working efficiency estimation. Company's primary accounting. Quality management in a manufacturing company. Logistics activities in a manufacturing company.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
English language 3/4	SMLE03/SMLE04	2	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
Physical training 3/4	SMEF03/SMEF04	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

3rd Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Environmental management	SMTCSM	4	2	1		

Course description (Syllabus): Fundamentals of environment. Environment. Avoid environmental pollution. Ecological reconstruction of the environment. Management of resources. Monitoring key environmental factors. Conceptual framework and Legislative Environmental Management System. ISO 14001: 2007 - Environmental Management Systems. Requirements and user's guide. Vocabulary and terminology in the field of Environment Management System. The concept of Environmental Management. The main documents of the EMS. Environmental Policy. EMS implementation and certification.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Quality management	SMMGCL	4	2	2		

Course description (Syllabus): Fundamentals of Quality Management. The main precursors of the Quality Management. Standardization. Vocabulary and terminology in quality. ISO 9000. The concept of Quality Management (QM). Quality Control (QC). Quality Assurance (QA). Quality Management System (QMS). The main documents of the QMS. Principles of Quality Management according to ISO 9000. Total Quality Management (TQM). TQM principles. Assessment and certification QMS. Strategic planning quality. Quality Awards.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Sustainable development	SMVRSD	4	2			2

Course description (Syllabus): General characteristics about secondary resources; The valorification of secondary resources from industrial technological processes like: hot processing of metals, from plastics, polymers, elastomers, etc. The valorification of secondary resources from domestic waste; The energetic regenerable resources as a main component of sustainable development in Romania; New technologies in reconversion energy from: sun, wind, waves, geothermal water, combustion cells, etc. Main laws and theorems that explains the functioning of the equipments, apparatus and specific machines.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Computer aided design	SMPCAL	5	2		2	

Course description (Syllabus): Computer aided design fundamentals. 2D and 3D representations. 3D CAD software. 3D wireframe and surface models in AutoCAD. Solid models in AutoCAD. Solid primitives. Creating complex parts through Boolean operations with solids. Material properties assignation to solid models. Sketches transformation into drawings by geometric constraints. Solid modeling based on features in SolidWorks. Obtaining views and sections from 3D models. Design applications for molds and dies.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Basic of nanomaterials and nanotechnologies	SMNANO	5	2	1		1

Course description (Syllabus): Introduction to nanomaterials and nanotechnologies. Evolution of nanomaterials. Size influence on the behavior and properties of materials. Characterization methods for nanomaterials. Nanometrology. The structure, shape and properties of different types of nanomaterials. Carbon nanotube-structure, properties, areas of use. Technologies for obtaining carbon nanotubes. Technologies for obtaining nanopowders, structures, properties, areas of use. Nanobiotechnologies.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Accounting and costs estimation	CONTA	4	2		2	

Course description (Syllabus): Financial and accounting statements: balance sheet; profit and loss; Companies accounting regime: account and account charts, operating accounts rules; Capital accounts; Accounting for fixed assets; stock accounting; treasury accounting; Accounting for settlements with third parties; trial balance accounting; Activities at the close of financial year.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Logistics management	SMMEAL	4	2	2		

Course description (Syllabus): Definitions of the maintenance and logistics; Short history of their apparition and development; Types of maintenances; Procedures and plan; Logistics, separation of marketing; Clients, transport, products, stocks.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Operational research	SMCOP1	3	2	1		

Course description (Syllabus): Introduction in operational research; Introduction to linear programming; Linear programming models; Solutions by simplex method; Introduction to optimization modelling; Optimizing manufacturing production; Introduction to multi-objective decision making; Decision making under uncertainty; Production cost-volume analysis; Inventory models; Project management; Regression and forecasting models.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Metallographic analysis	SMMAIM	4	2	2		

Course description (Syllabus): Microscopic analysis; Quantitative metallography elements; Automatic methods of analysis in quantitative metallography; Electronic microscopy.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Production management	SMMAPR	3	2	2		

Course description (Syllabus): Production process in an industrial enterprise. General overview. Organizing production systems, types of production. Methods and techniques to study and analyze the production process. Calculating elements for a production line flow. VSM (Value Stream Mapping) diagrams. Production efficiency, elements of Lean Manufacturing, Just in Time production. Production capacity. Production cycle, production system indicators. 5S system.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Finance	FIN	5	2	2		

Course description (Syllabus): Introduction to business finance; Balance sheet analysis; Analysis on income and loss account; self-financing capacity Breakeven; Analysis based on rate method; Planning financial activities; Short-term management of the enterprise; medium and long term financing of the enterprise; Stocks; investment funding; dividends policies; Financing plan; capital cost and structure; economic and financial risk.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Automation and commands	SMACTA	3	2		1	

Course description (Syllabus): Fundamental terms: principle of actions with fluid things, general principles of hydrostatics and pneumatic. Hydrostatic and pneumatic generators. Hydrostatic and pneumatic engine. Hydrostatic and pneumatic equipments: distributors, adjusting, clack, assembly blocks. Dynamic fluidic elements. Combined operating circuits. Automatic and combinational operating circuits and systems. Automatic control and operating systems of warm architecture equipment.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Modeling and simulation of industrial processes	SMMOPI	4	2	2		

Course description (Syllabus): Introduction to Modeling and optimization of industrial processes. Technological parameters of modeling. Types of models. Applications of mathematical statistics to the processing and interpretation of experimental data. Calculation of statistical parameters. Correlation analysis. Correlation and simple linear regression. Statistical analysis of the regression equation. Optimization techniques used in industry. Constrained optimization by linear programming. Simplex algorithm. Dynamic optimization. Optimization in industrial conditions. Simulation of industrial processes.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Project management	SMMPRO	4	2	2		

Course description (Syllabus): Definition and position in the technical sciences; Concept –idea, general plan, detailed plan, feasibility and decision; Realization – WP, Objectives, Deliverables; Indicators – scaling; Planning – CPM, PERT, PDM; Resource allocation.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Practical activity (90h)	SMPR42	2				

Course description (Syllabus): Analysis of the design methods for synthesis and processing of advanced materials; Computer aided design for materials processing technologies; Industrial management and project management.

4th Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Casting technology	SMPMSL	4	2		1	1

Course description (Syllabus): Basic concepts about history, construction, operation of Casting Technology. General and particular elements about design of Casting Technology. Main laws and theorems that explains the phenomena that occur at metal casting: Calculating of pouring cup, sprue, gating system, runner. Method for casting solidification. Presentation of main casting Technology: Classic and modern equipment for transport, modification, maintenance and pouring liquid alloys. Centrifugal casting. Permanent mold casting. Shell molding Technology. Investment casting Technology. Casting defects.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Plastic deformation technology	SMTDPL	5	2		1	1

Course description (Syllabus): General and specific elements about the design of Processing of Materials in Solid State. Classification of plastic deformation processes (open die forging - closed die forging, cold and hot plastic deformation). Processing technologies by plastic deformation – design. Plastic deformation technology to hammers – design. Plastic deformation technology to presses – design. Rolling technology- design. The effect of plastic deformation process on microstructure, residual stresses and typical defects. Severe Plastic Deformation, (severe plastic deformation of the titanium alloys for medical implants). Super-plasticity and Superplastic Forming.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Heat treatment	SMTTER	5	2		2	

Course description (Syllabus): Introduction in solid state phase transformations. Thermodynamics of phase transformation (equilibrium of thermodynamic systems, mono-component systems, binary systems, equilibrium in heterogeneous systems). Qualitative and quantitative interpretation of phase equilibrium diagrams (including Gibbs law and iron-carbon diagram). Diffusion processes in metals and alloys (mechanism, diffusion types, Fick laws). Phase transformation in metals and alloys. Time-temperature transformation (TTT) diagrams, continuous cooling transformation (CCT) diagrams.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Economic legislation	SMLECO	4	2	1		

Course description (Syllabus): General notions of law and economic legislation: legal norms, the legal life, legal life participants, legal facts, Kelsen's pyramid. Trader status and restrictions. General rules applicable to companies. Constitutive document of companies and its changes. Dissolution and liquidation of companies. Anticompetitive practices. Competition and unfair competition. Main contracts, common aspects. Sales contract, leasing contract, repurchase contract, commercial mandate agreement, Bank and exchange operations.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Casting equipment	SMEPSL	4	2		1	

Course description (Syllabus): Basic concepts about history, construction, operation of industrial equipment. General and particular elements about design of industrial equipment. Main laws and theorems that explains the functioning of the industrial equipment. Presentation of main casting equipment: Modern molding machines. Classic and modern machines for cores execution. Mechanized and automated formation-casting lines. Classic and modern equipment for transport, modification, maintenance and pouring liquid alloys. Equipment for casting metal shapes. Centrifugal casting.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Industrial robotics	SMROBO	4	2	1		

Course description (Syllabus): Introduction to robotics. Components. Regulations and standards. Modern robots application. Introduction to robot kinematics. Movement space. Introduction to robot dynamics. Sensors. Architectures and functional characteristics. Locomotion and trajectory planning. Mobile robots. Actuation systems. Data and information processing for robot control. Virtual instrumentation and robotics. Biomimetic robots. Advances and modern robot configurations.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Cutting Processing Technologies	SMTPPA	4	2	1		1

Course description (Syllabus): Basic concepts about Machining technologies: Measurement bases, Constructive-technological and non-technological forms of machined parts, Installation guide and fixing parts on machine tools for machining. General and particular elements about design of Machining technologies. Presentation of main Technology: Manufacturing technology of shafts, bores technological equipment. Manufacturing technology. Flywheels Technology. Bearings Processing Technology. Parts reconditioning technology. Maintenance and repair of technological equipment.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
IT Management	SIM	4	2		2	

Course description (Syllabus): general problem of informatics systems; informational systems and informatics systems; system for transaction processing; informatics systems for management and decisional support; artificial intelligence and expert systems in management; developing methodology of management informatics systems; tools and techniques of systems development; appraisal and selection of management informatics systems; implementation, maintenance and revision of management informatics systems; informatics system management.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Parts manufacturing assisted by CAD models	SMRCAD	4	2		2	

Course description (Syllabus): Introduction to additive manufacturing technologies. Layered manufacturing. Layered manufacturing software. Rapid Prototyping technologies based on photopolymer solidification: Stereolithography, Solid Ground Curing. Rapid Prototyping technologies based on powders: 3D Printing, Selective Laser Sintering. Rapid Prototyping technologies based on submission: Fused Deposition Modeling, Ballistic Particle Manufacturing. RP methods based on the sheets: Laminated Object Manufacturing. Materials in Rapid Prototyping. Rapid Prototyping Applications in Tooling.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Plastic deformation equipment	SMEPSS	5	2		2	2

Course description (Syllabus): Basic notions. The object and the significance of the subject. The development stage of the equipments for plastic deformations in the country and abroad. Classification. The functional structure of equipments and their characteristics. Die-forging hammers. Work principle, classification, characteristics. The

construction and functioning of the hammers. (The study will be done on functional components: cradle, work mechanism, action mechanism, command equipment, accessory equipments, etc.). Foundation. The exploitation and the maintenance of the hammers. Special construction of hammers. Fly presses. Work principle, classification, characteristics. The construction and functioning of the fly press. The exploitation and the maintenance of the fly press. Hydraulic presses. Work principle, classification, characteristics. The construction and functioning of the hydraulic press. The exploitation and the maintenance of the hydraulic press. Mechanic power press. Work principle, classification, characteristics. The construction and functioning of the power press. The exploitation and the maintenance of the power press. Auxiliary equipments of plastic processing departments. Specific equipments of die-forging departments. Specific equipments of rolling-wire – drawing-pulling departments. The mechanization and the automatization in the plastic processing departments. General aspects.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Finite element method	SMMEFI	4	2			2

Course description (Syllabus): Fundamentals of using finite elements. Problem solving phases using the finite element method. Structural modeling concepts. Finite element formulation, choice of finite elements. Meshing the model. Numerical integration; approximation function, convergence conditions. Assembling process and contour conditions. Computer implementation of the finite element method with ALGOR software package. Processing and post-processing, results analysis.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Automatics – Sensors and actuators	SMSENZ	4	2	2		

Course description (Syllabus): General things regarding sensors and transducers. Measuring systems. The notion of sensor and transducer. Transducer's features. Static and dynamic features. Energetic and structural features. Temperature sensors, pressure, speed and level. Gear and revolution sensors, power and couple. Pressure, speed and proximity sensors. Actuators: general aspects, classification, features. In-line, hydraulic and compressed-air actuators. Revolving, electrical, hydraulic and compressed-air actuators. Micro-sensors and micro-actuators.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Thermochemical treatments	SMTTCH	4	2		1	1

Course description (Syllabus): The theoretical basis of thermochemical treatment processes. Carburizing (theoretical basis and technological parameters, calculation of thermochemical parameters, carburizing environments, structure and properties of layer, heat treatments after carburizing). Nitriding (theoretical basis, technological parameters, equipment specific, environments, Plasma nitriding/Ion nitriding, structure and properties of the nitrided layers). Carbonitriding and nitrocarburizing Carbonitriding (fields of use, technological parameters, equipment, layer structure and properties). Aluminizing process (theoretical basis, usage, technology parameters, structure and properties of aluminized layer, specific equipment). Cromizing (theoretical basis, usage, technological parameters, cromizing layer structure). Borizing (theoretical basis, usage, technology parameters, plasma borizing, structure and properties). Sherardizing (theoretical basis, usage, technological parameters, structure and properties).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Practical activity (60h)	SMPRS4	2				

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: Innovative technologies for synthesis and processing of materials. Development of innovative materials. Technologies for materials synthesis and processing. Economic efficiency and environmental impact analysis.