

# Transilvania University of Braşov, Romania

## Study program: Practical integrated methods for propulsion systems engineering

Faculty: Mechanical Engineering

Study period: 2 years

### 1<sup>st</sup> Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Industrial economics for engineers	MPIISP.01	3	1	1		

**Course description (Syllabus):** Size and structure of organisations. Separation of ownership and control. Price competition. Entry deterrence and entry accommodation. Product differentiation and price discrimination. Vertical relations. Market structure. Industrial policy

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Measuring techniques used in manufacturing and Quality Assurance	MPIISP.02	5	2		1	

**Course description (Syllabus):** Dimensional metrology. Geometrical Dimension & Tolerancing. Quality assurance and quality management. Measurement small tools and data management. Optical measurement. Profile (micro and macro) and form measurement. Dimensional coordinate measurement – Coordinate Measuring Machines's architectures, probes, auxiliaries. Quality assurance with Measurlink software. Quality assurance with Q-Das software. Quality assurance with Minitab software

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mechanics of materials	MPIISP.03	5	2		1	

**Course description (Syllabus):** Introduction Models. Description, classification, areas of use. Elastic properties of composite materials. Elasticity of composite materials. Anisotropic elasticity. Stress and strain in fiber-reinforced multilayer composite structures. Mechanical behavior of fiber-reinforced multilayer composite tubes, non-stressed tubes required under internal pressure. Numerical and theoretical approaches. Determination of mechanical properties for some types of composites. Fiber-matrix interaction.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Reformulated fuels	MPIISP.04	5	2		1	

**Course description (Syllabus):** Fuels –Definitions, classification. Characteristics of engine fuels. Conventional engine fuels. Methods of manufacturing. Petrol fuel and diesel fuel. Characteristics. Gaseous fuels. Natural gas. Liquefied petroleum gas. Hydrogen. Reformulated fuels. Reformulation of petrol and diesel fuel. Biofuels.Oxygenated compounds. Alcohols and ethers. Biofuels.Fatty acid metyl esters.Straight vegetable oils. Biofuels. Biogas. Biogas to liquid. Biofuels. Carbon footprint. Global warming potential. Toxicity indices.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Noise and vibrations in manufacturing (01)	MPIISP.05a	5	2		2	

**Course description (Syllabus):** Basic of vibrations. The cutting process. Identification of the cutting process system parameters. Particular cases of cutting process systems. Variation of the parameters of the cutting process depending on the machining conditions. The elastic structure of the machine tools. Stability of the time invariant dynamic machining systems. Noise. Noise protection systems

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Predictive maintenance for industrial equipment (01)	MPIISP.05b	5	2		2	

**Course description (Syllabus):** Predictive maintenance basics. Data acquisition. Signal processing. Vibration sources, path, response. Machine fault diagnosis based on vibration analysis. Different predictive maintenance. Correcting faults that cause vibrations – 2 (technique). Correcting faults that cause vibrations –2 (machine elements). Correcting faults that cause vibrations – 3 (machine tools)

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Ethics and Academic Integrity	MPIISP.06	2	1			

**Course description (Syllabus):** Introductory course (presentation of the course and administrative aspects). Introductory notions in the field of ethics of scientific research. The concept of ethics and the general aspects of the research ethics in engineering sciences. Ethical conduct of the researcher. Scientific integrity. Ethics of scientific research in the European Community and Romania. Legislation on the ethics of scientific research. Ethical and non-ethical in scientific research. Problems, dilemmas, solutions. Ethical codes and legislation regarding the research, innovation, development activity

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Professional internship	MPIISP.07	5				12

**Course description (Syllabus):** Identify issues for project practice. Establishing project design practice. Identification of development directions of the theme. Analysis of the actual situation. Determination of the solutions encountered problems. Presentation of projects

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Shopfloor management	MPIISP.08	5	2			1

**Course description (Syllabus):** Lean – concept, principles and methodology. Gemba, gembutsu. Value, Value Stream, Flow, Pull, Perfection. Lean measurement: Cycle time, Takt time, Lead time. Value stream mapping- Current. Value stream mapping- Future state mapping state mapping. 4 P model - Philosophy, Process, People and partners, Problem solving. Hexagon of Shop Floor Management. Problem solving. Change point management. Visual management. 5 M. Standards. 5 S. Communication. Efficiency improvement

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
ERP Systems (SAP)	MPIISP.09	5	2		1	

**Course description (Syllabus):** Introduction: ERP,SAP. ERP Software systems. ERP systems architecture. SAP ERP modules. Logging On, Interface, Menus. SAP navigation, Sessions multiple, Matchcode. Basic concepts in SAP: Organization elements, Master Data, Transactions. Sales and Distribution (SD). Production Planning. Material Requirements Planning. Purchasing. Outbound delivery, Picking, Transfer Order.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Design for manufacturing (02)	MPIISP.10a	4	1			1

**Course description (Syllabus):** Parts' machinability. Criteria used to assess the machinability of the parts. Putting the allowances and quality surface in accordance with needs related to parts' working. Technological and non-technological shapes. Parts families and group technologies. Parts produced in large dimensional ranges. Involvement on shapes design. Dimensions for assembly. Concurrent engineering

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
CNC Machining (02)	MPIISP.10b	4	1			1

**Course description (Syllabus):** Presentation of course objectives, general and introductory notions, definitions. Main components of numerical driving equipment. Classification of numerical driving equipment and five-axis milling machines. Structure of programmes, subprogrammes and fractions in numerical management. Coordinate systems in numerical management. Geometric and technological addresses. Preparatory G Functions. Auxiliary functions M

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Advanced design for engines systems	MPIISP.11	5	2			2

**Course description (Syllabus):** Advanced design of modern gas exchange system, variable distribution system, electrohydraulic distribution system design, variable compression engine design requirement. Advanced design of the SI engines fuelling system. Advanced design of the GDI engines fuelling system. Advanced design of the CI engines fuelling system. Advanced design of the engines lubricating system. Advanced design of the engine supercharging system. Advanced design of the engines cooling system. Modern design of the engine exhaust gas system after treatment

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Technical analysis in mechanical engineering	MPIISP.12	5	2		1	1

**Course description (Syllabus):** Prototype parts analysis of the development of products using various methods. Correlation of results obtained from tests with product specifications for the establishment of optimization measures. Competitive product analysis activities and establishing product development strategy. Product testing following factors durability and functionality of products and mechatronic systems. Statistical analysis of data

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Professional internship	MPIISP.13	6				12

**Course description (Syllabus):** Identify issues for project practice. Establishing project design practice. Identification of development directions of the theme. Analysis of the state of art. Determination of the solutions encountered problems. Presentation of projects

## 2<sup>nd</sup> Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Advanced manufacturing technology	MPIISP.14	5	2			2

**Course description (Syllabus):** Machining processes (turning, milling, drilling, broaching, boring, threading). Additive fabrication. Nontraditional machining processes. Cold plastic deformation processing technologies. Incremental deformation processing technology. Abrasive machining and finishing operations (honing, superfinishing, lapping). Specific technologies to manufacture parts of motor vehicle engines.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Automation in manufacturing	MPIISP.15	5	2		1	

**Course description (Syllabus):** Energy sources used in automation of technological processes. Control elements used in the automation of technological processes. Processing elements for automation of technological processes. Control of actuators in automation systems. Execution elements used in the automation of parts manufacturing. Handling elements. Electropneumatic control in the automation of technological processes. . The GRAFCET concept used in the automation of technological processes. Ladder language used in the automation of technological processes.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Product development process	MPIISP.16	5	2	1		

**Course description (Syllabus):** Introduction in the design of the development of a product from the motor vehicle industry. Product development strategy. The phases of the evolution of a production process. The virtual design process of a product in the automotive industry. Systems Engineering Processes. Management processes for complete vehicle development. Primary and complete features relevant to the client. Increase success in product development. Develop a product brand strategy. Life cycle stages of the product. Improve the success rate of the new product.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Project management	MPIISP.17	4	1			1

**Course description (Syllabus):** The project – general aspects, types of projects. Project development main elements. Phases and processes involved in the projects. Project management – general aspects. The project management knowledge areas.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
FEM simulation for mechanical engineering	MPIISP.18	5	2			2

**Course description (Syllabus):** Numerical methods applied in the MEF. Double articulated flat bar element. Plane stress element. Symmetrical axial plane state element. Hexaedric finite element. Finite element homogeneous plane plate. Procedures in the method of finite elements applied in the field of nonlinear. Method of finite elements applied in non-linear problems in the elastic field. Method of finite elements applied in non-linear problems in the field of elastoplastic. Finite elements method applied in contact issues.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Professional internship	MPIISP.19	6				12

**Course description (Syllabus):** Identify issues for project practice. Establishing project design practice. Identification of development directions of the theme. Analysis of the state of art. Determination of the solutions encountered problems. Presentation of projects.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Professional internship	MPIISP.20	20				22

**Course description (Syllabus):** Identify issues for project practice. Establishing project design practice. Identification of development directions of the theme. Analysis of the state of art. Determination of the solutions encountered problems. Presentation of projects

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Dissertation project activity (6 x14=84 hours)	MPIISP.21	10				6

**Course description (Syllabus):** Identify issues for project practice. Reviewing the theoretical foundations required for the project theme. Establishing the table of contents and bibliography. Analysis of the current stage and trends in the field of the Diploma project (scientific importance, applicability, realization). Identification of the theme development directorates in the dissertation project. Theoretical substantiation of the basis of diploma. Experimental substantiation of the basis of diploma.