

# Transilvania University of Braşov, Romania

## Study program: Road Safety, Transport and Interaction with the Environment

Faculty: Mechanical Engineering  
Study period: 2 years (master)

1<sup>st</sup> year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Numerical Methods Applied in Engineering	MNAI	5	2	-	1	-

### Course description (Syllabus)

The main issues of the course are: road/intersections/highway traffic optimization issues; traffic congestion issues – (Ford-Fulkerson algorithm - max flow/min cut, Dijkstra algorithm/shortest path); Single and multimodal networks modeling by aid of graph implementation; traffic modeling – macroscopic models (e.g. Greenshields, Underwood, Greenberg, etc.); traffic modeling – microscale models (e.g. General Motors 5, Intelligent Driver model, Greenshields, etc.).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Transport Policies and Regulations	PRTR	5	2	1	-	-

### Course description (Syllabus) – main issues

The course presents elements regarding the policies and regulations applied in transport. The main information is based on the problems of legislation in road transport.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Road Safety	SR	5	1	-	-	2

### Course description (Syllabus) – main issues

This course introduces students to the field of Road Security. In the first part of the course are presented the road safety elements and the main deficiencies encountered in the road safety, notions used in the field of engineering sciences. In the second part of the course are presented the main steps of evaluating road safety project and remediation elements of the road safety.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Project Management	MP	5	1	-	1	1

### Course description (Syllabus) – main issues

This course presents the main aspects regarding the environment of industrial and research projects, as well as the theoretical and practical aspects of project management, its main areas. The students will be able to identify and use the specific elements, tools and techniques for elaborating, implementing and monitoring an industrial and research project.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project

<b>Traffic Flows Theory</b>	<b>TFR</b>	<b>5</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>-</b>
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**Course description (Syllabus) – main issues**

This course introduces students to the field of traffic flows fundamentals. It deals primarily with the mathematical methods used in microscopic and macroscopic traffic flows analysis, the theories and models of road users' behavior, traffic forecast models, queuing applications, data collection equipments and methods, and data processing.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Vehicle Information and Communication Systems</b>	<b>SICA</b>	<b>5</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>-</b>

**Course description (Syllabus) – main issues**

The main issues of the course are: Information representation in computers; Architecture models for embedded systems (microcontrollers, specialized circuits); architecture of the systems distributed on vehicle; Data transmission interfaces; communication buses, protocols; Sensors; power units; actuators; PWM; Information processing on-board; Navigation and guidance systems; Communication systems; Infotainment systems; Systems for driver assistance; Human-vehicle interface.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Evaluation and Control of Chemical Pollution from Vehicles and Traffic</b>	<b>ECPC</b>	<b>5</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>-</b>

**Course description (Syllabus) – main issues**

This course introduces students to the field of: active and passive strategies to reduce pollutant emissions in internal combustion engines; designing systems for reducing pollutant emissions; state-of-the-art alternative fuels and the assessment of their emissions; assessment of air pollution in urban areas; modeling and simulation of the dispersion of the pollutant emissions generated by road traffic; strategies to reduce CO2 emissions in vehicles; alternative vehicles propulsion systems.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Intelligent Transportation Systems</b>	<b>SIT</b>	<b>5</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>-</b>

**Course description (Syllabus) – main issues**

This course introduces students to the field of intelligent transportation systems. It deals primarily with standard architecture of ITS (logical and physical architecture), ITS applications, user needs and services, support technologies, monitoring and surveillance systems, design of regional and national ITS architecture.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Advanced Methods for Investigating the Technical Condition of Vehicles</b>	<b>PAISTA</b>	<b>5</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>-</b>

**Course description (Syllabus) – main issues**

The main issues presented to the students are: general principles of computerized diagnostics and its role in the vehicle maintenance system; diagnosing passive safety systems (air bag, seat belts); ignition diagnosis in spark ignition engines; diagnosing the fuel system for internal combustion engines; diagnosing the air flow meter and the throttle valve; diagnosis of the distribution mechanism; diagnosis

of the braking system, ABS, ESP; diagnosis of EGR and lambda probe; principles regarding periodic technical inspection of motor vehicles.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Vehicle - Road Interaction Management</b>	<b>MIVD</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>2</b>	<b>-</b>

**Course description (Syllabus): – main issues**

The main issues presented to the students are: vehicle control basics; wheel-ground interaction; vehicle performance improve by slip electronic control; vehicle handling; torque vectoring systems; vehicle performance improve by yaw electronic control; vehicles with hybrid propulsion system; particularities of torque management.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>On-board Vehicle Diagnostics</b>	<b>DBA</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>2</b>	<b>-</b>

**Course description (Syllabus) – main issues**

The main issues presented to the students are: general principles of in-vehicle diagnostics; OBD and OBD II system; diagnosis in passive safety systems (air bag, seat belts); serial data transmission; interpretation of serial data; error codes.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Geographical Information Systems</b>	<b>GIS</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>

**Course description (Syllabus) – main issues**

This course introduces students to the field of GIS Technology (Geographical Information Systems). In the first part of the course are presented GIS software and GIS applications used in the field of engineering sciences. In the second part of the course are presented methods for building GIS databases and GIS applications used in the field of transport.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Evaluation and Mitigation of Environmental Noise</b>	<b>EAZA</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>

**Course description (Syllabus) – main issues**

The main objectives of the course are: to transmit to the learner the basics related to modelling and analyzing the level of environmental noise, the possibilities of evaluation by drawing up conflict maps and action plans, offering technical solutions to reduce the noise level due, especially, urban traffic; development of oral and written communication skills in different professional contexts; developing the ability to conduct experiments, analyzing and interpreting of data and using modern computing technique and the ability of critical thinking; the ability to analyze the social, economic and environmental implications of environmental noise assessment technical solutions.

**2<sup>nd</sup> year**

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Environmental Impacts of Road Transport</b>	<b>ITRAM</b>	<b>5</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>-</b>

### Course description (Syllabus) – main issues

This course introduces students to the field of transportation environmental impacts evaluation. Impact notions and examples are presented: principles of environmental impact assessment; identification of impacts; forecasting methodology, forecasting and methods used; impact assessment. In the laboratory are presented procedures for making an impact study of road transport on the environment.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Planning and Design of Road Networks</b>	<b>PPRR</b>	<b>5</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>1</b>

### Course description (Syllabus): – main issues

This course introduces students to the field of road networks optimization. It deals primarily with the mathematical methods (graph theory) used for the analysis of connectivity and accessibility of the road networks, planning and design of road networks, design and modeling of urban networks.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Logistics Concepts of Goods and Passenger Transport</b>	<b>CLTMP</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>-</b>

### Course description (Syllabus): – main issues

This course introduces students to the field of: description of the concepts, theories and methods of organizing the logistics systems in transport; design of transport systems in the strategy of implementing logistics infrastructures; design of a logistics structure based on the criteria of the logistics strategies of the company; adequate use of the fundamental concepts in the field of logistics when analyzing the costs of transport modes, evaluating and tracking services, managing stocks.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Marketing Techniques for Vehicles and Equipments</b>	<b>TCAE</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>-</b>

### Course description (Syllabus): – main issues

This course introduces students to the field of vehicles and equipments marketing techniques. The course presents the principles applied in the activity of selling vehicles and equipment: the company's promotional mix; advertising; sale and its instruments. During the seminar, a marketing strategy is developed for selling a motor vehicle, a fleet of vehicles or equipment, using the appropriate methods: sales promotion; advertising; advertising design; and public relations.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>The Dynamics of Traffic Accidents, Analysis and Modeling</b>	<b>DACAM</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>1</b>

### Course description (Syllabus): – main issues

This course introduces students to the field of: advanced elements of vehicle dynamics; physico-mathematical models used in the modeling and simulation of road traffic accidents; modeling and simulation of traffic accidents; elements of legislation, critical analysis and validation of the results of modeling and simulation of road accidents.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Autonomous Vehicles</b>	<b>AA</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

**Course description (Syllabus): – main issues (no more than 10)**

The main objectives of the course are: introduction to the basic problems of autonomous vehicles; vehicle localization in the environment, probabilistic models; grid-based localization with the Bayes filter; Kalman filters for localization and information fusion; path planning and search algorithms: breadth-first and A\* algorithm; motion planning: generation the smooth path, the pure pursuit model, PID control to follow the path; obstacle avoidance and the potential field method; introduction to digital image processing and learning algorithms: neural networks and deep learning.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Design of Road Infrastructure Safety</b>	<b>PSIR</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course description (Syllabus): – main issues**

The course deepens the students' knowledge about the Audit Safety Inspection presenting the main methods of evaluation and design of the elements of road safety. In the first part of the course are presented the elements of inspection, audit and evaluation of road safety and is made the distinction between the main actors participating in the audit or inspection of road safety.

In the second part of the course are presented the class of deficiencies and more methods to remedy them.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Research on Passive Safety Systems</b>	<b>CSP</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course description (Syllabus): – main issues**

The aim is to sensitize the auditor on the passive safety issues of cars, by studying international regulations, accident reconstruction, modeling and dynamic calculus of components and subassemblies of vehicles that provide protection for passengers and pedestrians, analysis of injury criteria of passengers and pedestrians, analysis of accident dynamics.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>University Ethics</b>	<b>EU</b>	<b>5</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course description (Syllabus): – main issues**

This course introduces students to the field of: academic writing; rules for reader capturing; academic drafting rules; identifying the sources of a scientific paper, extracting information; rules for writing bibliographic references; drafting of technical / scientific texts (technical reports, instructions, procedures, user manuals); choosing the academic vocabulary.

**Practice for research and development (I, II, III and IV) - 1<sup>st</sup> year and 2<sup>nd</sup> year**

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
<b>Practice for research and development</b>	<b>PRD</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>12</b>

**Course description (Syllabus): – main issues**

The course prepares students in areas such as:

- Designing, testing, making, operating and maintaining equipment and machinery in the field of motor vehicles;

- Basing decisions and projects on technical, economic and financial criteria in the field of transport systems;
- Conception, implementation and coordination of the road traffic management system, road safety, transport and environment.