PELMOB

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Catalogue of Courses

Integrated Report

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University of Pristina Kosovska Mitrovica

Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs

Call: ERASMUS-EDU-2022-CBHE-STRAND-2

Project Number: 101082860

PROJECT INFO

Project title	Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Project acronym	PELMOB
Project reference number	101082860/ERASMUS-EDU-2022-CBHE-STRAND-2
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Web address	www.pelmob.pr.ac.rs
Coordination institution	University of Mitrovica
Project duration	01 December 2022 – 30 November 2025

DOCUMENT CONTROL SHEET

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Title of deliverable	D3.3: Catalogue of courses
Lead institution	Óbudai Egyetem (OE)
Author(s)	Ágota Drégelyi-Kiss, Andrea Tóth, Tímea Keserű, Nebojsa Arsic, Aleksandra Petrovic, Branimir Jaksic
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VERSIONING AND CONTRIBUTION HISTORY

Version	Date	Revision description	Partner responsible
v.01	02/16/2024	Final	UPKM, OE

General Contents

PELMOB

Funded by the European Union

Catalogue of Courses

University of Mitrovica (UPKM)

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Title of deliverable	D3.3: Catalogue of courses
Lead institution	Óbudai Egyetem (OE)
Author(s)	Nebojsa Arsic, Jordan Radosavljevic, Aleksandra Petrovic, Sasa Statkic, Branimir Jaksic, Bojan Perovic, Milos Milovanovic
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Dissemination level	Internal

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Contents

1. DESCRIPTION OF THE STUDY PROGRAM

The Electrical and Computer Engineering study program was created on the basis of modern scientific knowledge in the field of electrical engineering and computing, based on similar study programs of leading universities in the world. It is harmonized with the Bologna recommendations, the Strategy of Scientific and Technological Development of the Republic of Serbia, the Law on Higher Education of the Republic of Serbia and the standards and instructions of the National Accreditation Body.

1.1 Title of the study program

Electrical and Computing Engineering.

1.2 Structure of the study program

Teaching in basic academic studies takes place over 4 years, i.e. 8 semesters. The preparation of the final (diploma) work is scheduled in the eighth semester. Each semester carries 30 ECTS credits, so that after completing the studies, the student achieves a total of 240 ECTS credits.

The Electrical and Computer Engineering study program has three modules (study groups):

1. Power Engineering (PE), within which the areas of production, transmission, distribution and use of electricity are studied.

2. Electronics and Telecommunications (ET), within which the fields of electronics, telecommunications, information systems and television technology are studied.

3. Computing and Informatics (CI), within which the fields of computer technology, information technologies and software engineering are studied.

The first two semesters of study are common to all three modules. Students within the chosen module have compulsory and elective courses. Compulsory courses provide necessary and basic knowledge. Elective courses are chosen from the list of proposed courses, which gives students the opportunity to further profile themselves within the chosen study module. Professional practice is mandatory and is carried out during the eighth semester.

1.3 Objectives of the study program

The purpose of this study program is to educate students for the profession of a graduate engineer in electrical engineering and computer science in accordance with the needs of the economy, the knowledge-based economy and society as a whole.

The Electrical and Computer Engineering study program is designed to ensure the acquisition of competencies that a graduate in electrical engineering and computer

science should possess within all three optional modules: Power Engineering, Electronics and Telecommunications, and Computing and Informatics. The important role of all actors in this study program is the education of engineers ready to actively participate in regional development, responsible for maintaining Serbia's high technological and research potential in the fields of electrical engineering and computing.

The study program is organized in such a way that it can easily respond to possible changes in the demands of the labor market, and offer competent engineers to work in various sectors of industry, public and private companies, such as: production, transmission and distribution of electricity, mining, transport, production of electrical devices, telecommunications, television, information technology, software industry, large business systems as IT and software support, education, government institutions, etc.

1.4 Outcomes of the study program

The outcomes of the learning process include knowledge, skills and competencies for effective problem solving in engineering practice, use of professional literature and enabling the continuation of studies at master's academic studies, in case the students decide to do so.General outcome of the learning process at the end of the second cycle at FEE.

1.5 Title of diploma

Since 2012, a new curriculum has been introduced at the Faculty of Technical Science, according to which bachelor studies last for four years, i.e. eight semesters. This means that the FTS opted for the 4+1 scheme, according to which after four years of study the title of graduate engineer of electrical and computing engineering is obtained, and after another additional year the title of graduate engineer - master of electrical and computing engineering in accordance with the new Law on Higher Education and the principles of the Bologna Declaration.

1.6 Conditions for enrolment in the study program

Candidates who have completed a four-year high school can apply for enrollment in the first year of the study program. All educational profiles are acceptable for enrollment in the study program. A necessary condition for enrollment is passing the entrance exam in mathematics.

1.7 Study programme of basic academic studies

All student activities are scored according to the ECTS credit system, so that each semester brings 30 ECTS credits. In the last, eighth semester, the student is required to do a professional internship that carries 3 ECTS credits, study research work on theoretical basics of the diploma thesis that carries 3 ECTS credits and a final thesis that carries 4 ECTS credits, which carries 10 ECTS credits. Two semesters make up one school year. Each semester lasts 15 weeks, which includes classes and dates for the colloquium. The school year begins on October 1 and ends on September 30 next year.

Classes are taught by courses, which according to the curriculum must be one-semester. In all courses, students' pre-examination activities, such as colloquia and homework, are performed during the semester in which the course taught. In the structure of the total number of points, at least 30 and at most 70 points must be provided for activities and knowledge tests during the semester. A total of 100 points are earned by fulfilling pre-exam obligations and taking exams. Final exams are taken in the appropriate exam deadlines, which are: January, April, June, August and September.

1.8 A list of compulsory and elective courses

Method of conducting studies - the score of each course expressed in accordance with the European Credit Transfer System (ECTS).

Table 1 The first year – Common basis - Bachelor academic studies in Electrical and Computing Engineering

Num.	Code	Name of course	Sem.	ECTS	Status	Type
The first year – Common basis - Bachelor academic studies in Electrical and Computing Engineering						
1	20.OE1	Mathematics 1	1	7	Comp.	GA
2	20.OE2	Fundamentals of Electrical Engineering 1		7	Comp.	TM
3	20.OE3	Physics		5	Comp.	GA
4	20.OE4	Programming 1		4	Comp.	AP
5	20.OE5	Laboratory exercises in Physics		2	Comp.	AP
6	Elective Courses Group 1 (PE ET CEIT). Students choose one of the two courses					
	20.OE72	Practicum MATLAB Programming	1	3	Elective	AP
	20.OE73	Practicum in computer applications		3	Elective	AP
7	Elective Courses Group 2 (PE ET CEIT). Students choose one of the two courses					
	20.OE74	English Language 1	1	2	Elective	GA
	20.OE75	Russian Language 1		2	Elective	GA
Summary number of ETCS credits for Semester 1				30		
8	20.OE6	Mathematics 2	2	7	Comp.	GA
9	20.OE7	Fundamentals of Electrical Engineering 2		7	Comp.	TM
10	20.OE8	Programming 2		4	Comp.	AP
11	20.OE9	Fundamentals of Computer Engineering		5	Comp.	AP
12	20.OE10	Laboratory Exercises in Fundamentals of Electrical Engineering		2	Comp.	AP
13	Elective Courses Group 3 (PE ET CEIT). Students choose one of the two courses					
	20.OE76	Introduction to Electronics	2	3	Elective	AP
	20.OE77	Introduction to object-oriented programming		3	Elective	AP
14	Elective Courses Group 4 (PE ET CEIT). Students choose one of the two courses					
	20.OE78	English Language 2		2	Elective	GA
	20.OE79	Russian Language 2		2	Elective	GA
Summary number of ETCS credits for Semester 2				30		
Summary number of ETCS credits for Year 1				60		

GA - General academic education,
TM - Theoretical – methodological,
SP - Scientific and artistic professional,
AP - Applied professional
Comp. - compulsory course
Elective – elective course

Table 2 The Secund year – Bachelor academic studies in Electrical and Computing Engineering

Elective Area - Module: Power Engineering (PE)						
Num.	**Code**	**Name of course**	**Sem.**	**ECTS**	**Status**	**Type**
The Secund year – Bachelor academic studies in Electrical and Computing Engineering						
1	20.OE11	Electrical Circuit Theory	3	7	Comp.	TM
2	20.OE12	Electrical Measurements 1	3	7	Comp.	AP
3	20.OE13	Materials in Electrical Engineering - Modernize	3	7	Comp.	SP
4	Elective Courses Group 5 (PE ET CEIT). Students choose one of the two courses					
	20.OE80	Elements of Electronics	3	7	Elective	TM
	20.OE24	Object-oriented Programming 1	3	7	Elective	SP
	20.OE23	Numerical Analysis and Discrete Mathematics	3	7	Elective	GA
5	Elective Courses Group 6 (PE ET CEIT). Students choose one of the two courses					
	20.OE81	English Language 3	3	2	Elective	GA
	20.OE82	Russian Language 3	3	2	Elective	GA
Summary number of ETCS credits for Semester 3				30		
6	20.OE14	Electromagnetics	4	6	Comp.	TM
7	20.OE15	Thermal Process in Power Engineering	4	6	Comp.	TM
8	20.OE16	Electrical Measurements 2	4	6	Comp.	AP
9	20.OE17	Electrical Machines 1	4	7	Comp.	TM
10	Elective Courses Group 7 (PE ET CEIT). Students choose one of the two courses					
	20.OE83	Mechanics	4	5	Elective	TM
	20.OE84	Introduction to Management	4	5	Elective	GA
	New	Introduction to Climate Change Management	4	5	Elective	GA
Summary number of ETCS credits for Semester 4				30		
Summary number of ETCS credits for Year 2				60		

GA - General academic education,
TM - Theoretical – methodological,
SP - Scientific and artistic professional,
AP - Applied professional
Comp. - compulsory course
Elective – elective course

Table 3 The Third year – Bachelor academic studies in Electrical and Computing Engineering

Elective Area - Module: Power Engineering (PE)						
Num.	**Code**	**Name of course**	**Sem.**	**ECTS**	**Status**	**Type**
The Third year – Bachelor academic studies in Electrical and Computing Engineering						
11	20.OE29	Low-voltage Electrical Installations	5	6	Comp.	SP
12	20.OE30	Electrical Machines 2	5	6	Comp.	AP
13	20.OE31	Automatic Control Systems - Modernize	5	6	Comp.	SP
14	20.OE32	Elements of Power Systems	5	6	Comp.	SP
15	20.OE33	Power Converters- Modernize	5	6	Comp.	SP
Summary number of ETCS credits for Semester 5				30		
16	20.OE34	High Voltage Technique 1	6	6	Comp.	SP
17	20.OE35	Distributed and Industrial Networks-Modernize	6	6	Comp.	SP
18	20.OE36	Computer-aided Design in Power Engineering	6	6	Comp.	AP
19	20.OE37	Electrical Machines 3	6	7	Comp.	SP
20	Elective Courses Group 13 (PE). Students choose one of the two courses					
	20.OE87	Practicum - Elements of Power Systems	6	5	Elective	AP
	20.OE88	Telecommunications in Power Engineering	6	5	Elective	AP
	New	Internet of Things for Electric Vehicle	6	5	Elective	AP
Summary number of ETCS credits for Semester 6				30		
Summary number of ETCS credits for Year 3				60		

GA - General academic education,
TM - Theoretical – methodological,
SP - Scientific and artistic professional,
AP - Applied professional
Comp. - compulsory course
Elective – elective course

Table 4 The Fourth Year – Bachelor academic studies in Electrical and Computing Engineering

Elective Area - Module: Power Engineering (PE)						
Num.	**Code**	**Name of course**	**Sem.**	**ECTS**	**Status**	**Type**
The Fourth Year – Bachelor academic studies in Electrical and Computing Engineering						
21	20.OE52	Power Plants	7	5	Comp.	SP
22	20.OE53	Renewable Energy Sources	7	5	Comp.	SP
23	20.OE54	Electrical Drives	7	5	Comp.	SP
24	20.OE55	Power System Analysis 1	7	5	Comp.	SP
25	Elective Courses Group 20 (PE). Students choose one of the two courses					
	20.OE97	Technical Automatic Control System in Power Engineering	7	5	Elective	SP
	20.OE98	High Voltage Equipment	7	5	Elective	SP
26	Elective Courses Group 21 (PE). Students choose one of the two courses					
	20.OE99	Cable Technology	7	5	Elective	SP
	20.OE100	Thermal Process in Renewable Energy Sources	7	5	Elective	AP
Summary number of ETCS credits for Semester 7				30		
27	20.OE56	Power System Protection	8	5	Comp.	TM
28	20.OE57	Power Systems Substations	8	5	Comp.	SP
29	Elective Courses Group 22 (PE). Students choose one of the two courses					
	20.OE101	Power System Analysis 2	8	5	Elective	AP
	20.OE102	Power Engineering Optimization Methods	8	5	Elective	AP
30	Elective Courses Group 23 (PE). Students choose one of the two courses					
	20.OE103	Regulation of Electrical Drives	8	5	Elective	AP
	20.OE104	Specialized Software Applications for Design Renewable Energy Sources	8	5	Elective	AP
	New	Automotive Systems and Software Engineering	8	5	Elective	AP
31	20.OE58	Internship	8	3	Comp.	AP
32	20.OE59	Study Research Work on Theoretical Basics of the Diploma Thesis	8	3	Comp.	SP
33	20.OE60	Diploma Thesis	8	4	Comp.	SP
Summary number of ETCS credits for Semester 8				30		
Summary number of ETCS credits for Year 4				60		
Summary number of ETCS credits for all four years of studies				240		

GA - General academic education,
TM - Theoretical – methodological,
SP - Scientific and artistic professional,
AP - Applied professional
Comp. - compulsory course
Elective – elective course

2. LIST OF NEW AND MODERNIZED COURSES AT UPKM/FTS RELATED TO EM

Since the most important deliverable is development and implementation of EM curricula, in the table below named **Syllabuses table** are listed study programmes, study programme level, courses and number of ECTS, which each of WB HEIs plans to incorporate into the curriculum during the project lifetime.

Table 5 Syllabuses table: University of Mitrovica - UPKM (Bachelor)

	Course name	ECTS	
1	Introduction to Climate Change Management	5	New
2	20.OE13 Materials in Electrical Engineering	7	Modernized
3	20.OE35 Distribution and Industrial Networks - Modernize	6	Modernized
4	Automotive Systems and Software Engineering	5	New
5	20.OE33 Power Converters - Modernize	6	Modernized
6	20.OE31 Automatic Control Systems - Modernize	6	Modernized
7	Internet of Things for Electric Vehicle	5	New
	TOTAL	40	

2.1. Syllabuses of new and modernized courses

Study program:	Electrical and computing engineering
Course title:	Introduction to Climate Change Management
Lecturer/Instructor:	Irma Dervišević
Course status:	Elective
ECTS:	5
Admission and requirements: No	

Course goals

Develop an understanding of the fundamental concepts of climate change. Explore the impacts of climate change. Identify international initiatives which support countries to plan for climate change. Examine strategies for mitigation greenhouse gas emissions and adaptation to the impacts of climate change. Understand the policy and governance frameworks related to climate change

Learning Outcomes

Students will learn how to assess climate-related risks and vulnerabilities, and develop strategies to enhance resilience at individual, community, and organizational levels.

Students will be able to critically analyze and evaluate climate change policies, both at the national and international level.

Students will gain knowledge of conducting Environmental Impact Assessments (EIAs) and be able to assess the potential environmental impacts of projects or policies related to climate change mitigation or adaptation.

Acquiring skills in project management, including planning, implementation, monitoring, and evaluation of climate change initiatives.

These learning outcomes enabling students to develop the necessary knowledge, skills, and attitudes to tackle the challenges posed by climate change.

Course Content per Week

1. The science background of climate change and global warming.
2. Relationship between human activities and climate change.
3. Basic principles of the science of climate change, including the causes, impacts, and potential solutions.
4. Various impacts of climate change on agriculture, water resources, ecosystems, and public health.
5. Identification risks associated with climate change, including vulnerabilities and potential impacts on various sectors.
6. Climate change vulnerability assessment
7. Climate change policy framework
8. Counting carbon
9. Measuring, reporting, and verification GHG emissions.
10. Appropriate measures and adaptation strategies to minimize the negative impacts of climate change.
11. Different mitigation strategies and technologies for reducing greenhouse gas emissions.
12. Transitioning to a Low-Carbon Economy
13. The Path to Net Zero
14. Planning processes for climate change

Literature

1. John C. Shideler, Jean Hetzel, „*Introduction to Climate Change Management- Transitioning to a Low-Carbon Economy*", https://doi.org/10.1007/978-3-030-87918-1, Springer Cham, 2021.
2. Walter Leal Filho, "*Climate Change and Disaster Risk Management*", DOI 10.1007/978-3-642-31110-9, Springer-Verlag Berlin Heidelberg 2013.

3. Walter Leal Filho, Marina Kovaleva, Fátima Alves, Ismaila Rimi Abubakar, "*Climate Change Strategies: Handling the Challenges of Adapting to a Changing Climate*", Springer Cham 2023, ISBN 978-3-031-28727-5, https://doi.org/10.1007/978-3-031-28728-2,
4. Lawrence M. Krauss, „*The Physics of Climate Change*", ISBN 9781642938166, Post Hill Press 2021.
5. Walter Leal Filho, „*Handbook of Climate Change Management - Research, Leadership, Transformation*", ISBN:9783030227593, Springer International Publishing, 2020.
6. „Закон о климатским промена", (Сл- гласник РС, бр.26/2021), https://www.paragraf.rs/propisi/zakon-o-klimatskim-promenama.html.
7. Consumer Footprint Calculator, EPLCA, https://eplca.jrc.ec.europa.eu/ConsumerFootprint.html

Course Meeting Times (weekly)	**L (lecture):** 2	**T (tutorial):** 2

Teaching Methods

Lectures: Lectures: This is a traditional teaching method where the instructor presents information on climate change theories, concepts, and management strategies. This can be enhanced by incorporating multimedia presentations, real-world case studies, and guest speakers.

Discussions and Debates: Encourage students to actively participate in discussions where they can share their thoughts, ask questions, and engage in debates related to climate change management. This helps foster critical thinking and enhances understanding of the subject matter.

Problem-based Learning: Assign students' real-life scenarios or case studies related to climate change management. By working on these problems in groups or individually, students can apply their knowledge, analyze data, and develop practical solutions, thereby enhancing their problem-solving skills.

Field Trips and Site Visits: Organize visits to local organizations, governmental agencies, or even climate-related projects to give students hands-on experience. Seeing the practical aspects of climate change management can provide a deeper understanding of the challenges and potential solutions.

Group Projects: Divide students into groups and assign them specific topics or projects related to climate change management. This allows them to collaborate, conduct research, and present their findings or proposals. It also promotes teamwork and enhances communication skills.

Multimedia and Technology: Utilize multimedia resources such as videos, interactive simulations, and online platforms to engage students and facilitate their understanding of complex climate change concepts. This can also include virtual field trips or guest lectures from experts around the world.

Assessment Methods: Use a variety of assessment methods, such as quizzes, exams, presentations, and research papers, to evaluate students' understanding of climate change management. This ensures a comprehensive evaluation of their knowledge and skills.

Method of knowledge assessment (maximum number of ETSCs is 100)

Pre-exam obligations	ETSCs	**Final Exam**	ETSCs
Activity during the lecture	10	Presentations	10
Student research work	10	Seminars	10
Workshop sessions	10	Written exam	20
Debates	10	Oral exam	20

The way to check knowledge can be different, the table above is just a few options: (written exams, oral exam, project presentation, seminars, etc...

*maximum required 2 pages of A4 format

Study program:	Electrical and computing engineering		
Course title:	Materials in Electrical Engineering - Modernized		
Lecturer/Instructor:	Nebojša Arsić		
Course status:	Compulsory		
ECTS:	**7**		
Admission and requirements: No			
Course goals Introducing students to modern materials used in electrical engineering.			
Learning Outcomes The students have mastered the subject and become familiar with modern materials used in electrical engineering today.			
Course Content Theoretical teaching: Conductors, semiconductors, and insulators. Material classification. Chemical bonds. Fluids and crystals. Thermal treatment. Conductive materials. Bimetals. Superconductive materials. Materials for: resistors, heating elements, contacts, fuses, thermocouples, and chemical current sources. Semiconductor materials. Materials for crystal rectifiers and transistors. Material for photoresistors. Materials for solar batteries. Materials for infrared and nuclear radiation detectors. Magnetic materials. Magneto-ceramic materials. Insulators. Superdielectric materials. Insulating gases. Construction materials. Metals, alloys, ceramics, and plastics. Composite materials. Shaping. Material fatigue. Joining processes. Material protection and refining. High-performance anode materials for rechargeable lithium-ion batteries. Advances in the cathode materials for lithium rechargeable batteries Practical teaching: Exercises, Other forms of teaching, Study research work Laboratory exercises			
Literature 1. P. Osmokrović, Electrotechnical Materials, Academic Thought, Belgrade, 2003. 2. D. Raković, P. Osmokrović, N. Arsić, Electrotechnical materials - a collection of examples, Academic Thought, Belgrade, 2004. 3. Bruno Scrosati, Jürgen Garche, Werner Tillmetz, „ *Advances in Battery Technologies for Electric Vehicles“,* https://doi.org/10.1016/C2014-0-02665-2, ISBN 978-1-78242-377-5, 2015 Elsevier Ltd. 4. Jiuchun Jiang, Caiping Zhang, „ *Fundamentals and Applications of Lithium-ion Batteries in Electric Drive Vehicles* “, DOI:10.1002/9781118414798, ISBN:9781118414781, John Wiley & Sons 2015.			
Course Meeting Times (weekly)	**L (lecture):** 2	**T (tutorial):** 2	
Teaching Methods **Lectures, Laboratory exercises**			
Method of knowledge assessment (maximum number of ETSCs is 100)			
Pre-exam obligations	ETSCs	**Final Exam**	ETSCs
Activity during the lecture	10	Written exam	
Practical teaching	40	Oral exam	50
Colloquium			
Seminars			

Study program:	Electrical and computing engineering
Course title:	Distribution and Industrial Networks - Modernized
Lecturer/Instructor:	Jordan Radosavljević
Course status:	Compulsory
ECTS:	6

Admission and requirements: Basic knowledge of the subjects: Electrical circuit theory, Electromagnetics, Elements of power systems

Course goals

The main objective of the course is to introduce students to the concepts, technologies, planning and exploitation of distribution networks. In addition, it is necessary to introduce students to aspects of the network economy, power quality, and microgrids concepts..

Learning Outcomes

1. Demonstrate knowledge and understanding of the fundamental concepts of distribution networks
2. Demonstrate knowledge and understanding of the basic principles of designing, planning, analysis and optimization of distribution networks and industrial medium with emphasis on computer applications.

Course Content

Theoretical teaching. General considerations. Load characteristics. A household as an element of the system. Industrial consumers. Principle network solutions. Load forecasting. Load flow. Reliability and security. Reconfiguration and losses. Technical and economic aspects. The economic load. Optimal parameters of the network. Thermal aspects of the network elements loading. Electric power quality. Voltage regulation. Compensation of reactive power.

Optimal planning of electric vehicle charging in power systems with integrated renewable energy sources. Optimization of power flows and distributed management of electric vehicle charging in smart microgrids

Practical teaching. Each teaching unit is accompanied by tasks based on practical examples. Application of computer I specialized software packages for performing calculations in complex networks.

Literature

1. N. Rajaković, D. Tasic and G. Savanović, Distributive and Industrial Networks, ETF and Academic Thought, Belgrade, 2008.
2. N. Rajaković, D. Tasic, N. Arsenijević and M. Stojanović, Collection of solved tasks from distributive and industrial networks, Faculty of Electrical Engineering, Academic Misao, Belgrade, 2005.
3. J. Radosavljević, M. Jevtić, Analysis of distribution networks with distributed generators, FTN Kosovska Mitrovica, 2013.
4. D. Popović, D. Bekut and V. Treskanica, Specialized DMS algorithms, DMS group, Novi Sad, 2004.
5. M. Tanasković, T. Bojković, D. Perić and V. Šiljkut, Collection of solved problems from distribution and of electricity sales, Academic Club, Belgrade, 2006.
6. W. Kersting, Distribution System Modeling and Analysis, Third Edition, CRC Press, Taylor & Francis Group, 2012 (Original title)
7. J. Radosavljević, Metaheuristic Optimization in Power Engineering, London, IET, 2018. (Original title)

Course Meeting Times (weekly)	**L (lecture):** 2	**T (tutorial):** 2

Teaching Methods

Lectures through PowerPoint presentations and on the blackboard. Blackboard exercises and computer simulations.

Method of knowledge assessment (maximum number of ETSCs is 100)

Pre-exam obligations	ETSCs	**Final Exam**	ETSCs
Activity during the lecture		Written exam	
Practical teaching		Oral exam	30
Colloquium	2x35		

Seminars			
The way to check knowledge can be different, the table above is just a few options: (written exams, oral exam, project presentation, seminars, etc...			
*Maximum required 2 pages of A4 format			

Study program:	Electrical and computing engineering
Course title:	Automotive Systems and Software Engineering
Lecturer/Instructor:	Aleksandar Žorić
Course status:	Elective
ECTS:	5

Admission and requirements: No

Course goals

One of the main goals is to establish a strong foundation in understanding the various components and systems that make up an automobile.

Gaining knowledge in software engineering principles: The goal is to be able to design, develop, and test software solutions for automotive systems.

The course should introduce students to the fundamental concepts and principles of software engineering, such as software development life cycle, requirements engineering, software testing and quality assurance, software project management, and software maintenance.

The course should focus on teaching students the specific techniques, tools, and methodologies used in developing software applications for automotive systems.

The course should expose students to the current trends, challenges, and opportunities in the automotive software engineering field.

Learning Outcomes

Acquiring skills in developing embedded software for automotive applications, considering real-time constraints, resource limitations, and hardware-software integration.

Gaining knowledge and skills in software engineering principles and practices, including requirements engineering, software design, implementation, testing, and maintenance.

Developing a comprehensive understanding of the different systems in an automobile, including powertrain, chassis, safety, infotainment, and communication systems.

Course Content per Week

1. Automotive Software Engineering: Past, Present, and Future
2. Software Architectures: Views and Documentation
3. Automotive Software Development
4. Standardized software architecture framework for automotive electronics - AUTOSAR
5. Detailed Design of Automotive Software
6. Requirements Engineering for Automotive Embedded Systems
7. Integration programming environment winIDEA tool for automotive software development
8. Family of 32-bit Automotive Microcontrollers
9. AutoDevKit Studio for 32-bit power architecture MCUs
10. Code Generator, Quick resources configurator and Eclipse development environment for SPC5 MCUs
11. Automotive Infotainment Systems On Chips (SoCs)
12. Stellar Software Development Tools
13. Use of Communication Protocols in Automotive Software Development Process
14. Current Trends in Automotive Software Architectures

Literature

1. Yanja Dajsuren, Mark van den Brand, „ *Automotive Systems and Software Engineering “,* https://doi.org/10.1007/978-3-030-12157-0, ISBN 978-3-030-12156-3, Springer 2019.
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Principles and Applications ", https://doi.org/10.1201/9781003269908, ISBN 9781003269908, CRC Press 2022.

3. AutoDevKitTM a new development approach to Automotive & Transportation applications, © STMicroelectronics - November 2022
4. AutoDevKit Studio for 32-bit power architecture MCUs, STMicroelectronics, https://www.st.com/en/embedded-software/stsw-autodevkit.html.
5. SPC5-STUDIO, SPC5 Software Development Tools, STMicroelectronics, https://www.st.com/en/development-tools/spc5-studio.html.
6. Stellar Software Development Tools, STMicroelectronics, https://www.st.com/en/development-tools/stellar-software-development-tools.html.

Course Meeting Times (weekly)	**L (lecture):** 2	**T (tutorial):** 2

Teaching Methods

Lectures: Traditional lectures can be used to introduce new concepts, theories, and principles related to automotive systems and software engineering.

Hands-on activities: Practical hands-on activities, such as laboratory sessions or workshops, can help students apply the knowledge gained in lectures. These activities may involve working with automotive systems, software tools, or simulators to reinforce understanding and develop practical skills.

Case studies: Case studies can be used to present real-world scenarios and challenges faced in the automotive industry.

Group projects: Assigning group projects encourages collaboration and teamwork among students.

Online resources: Utilizing online resources, such as websites, videos, and interactive simulations, can complement traditional teaching methods. These resources can be used for self-study, revision, and exploration of specific topics.

Field trips and industry visits: Organizing field trips to automotive manufacturing plants, research facilities, or industry conferences can give students exposure to real-world automotive applications.

Method of knowledge assessment (maximum number of ETSCs is 100)

Pre-exam obligations	ETSCs	**Final Exam**	ETSCs
Activity during the lecture	10	Presentations	10
Student research work	10	Seminars	10
Workshop sessions	10	Written exam	20
Debates	10	Oral exam	20

The way to check knowledge can be different, the table above is just a few options: (written exams, oral exam, project presentation, seminars, etc...

*Maximum required 2 pages of A4 format

Study program:	Electrical and computing engineering
Course title:	Power Converters - Modernized
Lecturer/Instructor:	Saša Štatkić
Course status:	Compulsory
ECTS:	5
Admission and requirements: No	

Course goals

Acquiring theoretical and practical knowledge about the basic topologies of single-phase and three-phase power converters, their impact on the quality of electrical energy. Acquiring knowledge about the calculations and dimensioning of semiconductor modules of power converters and the calculation of the apparent power of energy transformers for supplying power converters.

Learning Outcomes

Students will be able to select the appropriate configuration of the power converter according to the specified requirements and assess its efficiency of operation and its impact on the power grid and the consumer itself.

Course Content

Theoretical teaching. Single-phase and three-phase phase regulators. Single-phase and three-phase, half-bridge and bridge, uncontrollable, semi-controllable and fully controllable grid-driven rectifiers. Coupling of rectifiers into multi-pulse couplings. Active PWM rectifiers.

Apparent power, voltage and current distortions, total power factor of different rectifier topologies and measures to improve the quality of electricity at their energy network connection Calculation of the power of energy transformers for powering energy converters.

Single-phase and three-phase inverters with square output voltage, harmonic distortions and filtering the output voltage of the inverter. Principles and techniques of pulse-width modulation, PWM voltage inverters. Multilevel inverters. Analysis of harmonic distortion and output voltage inverter.

Charging Architectures for Electric and Plug-In Hybrid Electric Vehicles. Bidirectional Converter Topologies for Plug-In Electric Vehicles. Bidirectional Dual Active Converter for Vehicle to Grid.

Practical teaching. Analysis of the operation of power converters using waveforms of variable quantities obtained on-line converter models. Assessment of the heating of energy converters depending on the type of semiconductor modules and cooling conditions using online software offered by equipment manufacturer

Literature

1. Miloš Nedeljković, Network-driven converters, 2nd edition, Академска мисао, Belgrade, 2012.
2. Miloš Nedeljković, Power converters – collection of solved exam questions, 2003.
3. SemiSel, SEMIKRON online calculation and simulation tool for power electronic components.
4. Infineon Designer – Online SPICE Simulator
5. L. Ashok Kumar; S. Albert Alexander, „ *Power Converters for Electric Vehicles “,* ISBN: 9780367626853, CRC Press 2021.

Course Meeting Times (weekly)	**L (lecture):** 2	**T (tutorial):** 2

Teaching Methods

Teaching is conducted through lectures, auditory and computer exercises.

Method of knowledge assessment (maximum number of ETSCs is 100)

Pre-exam obligations	ETSCs	**Final Exam**	ETSCs
Activity during the lecture	5	Written exam	30
Practical teaching	5	Oral exam	30
Colloquium	10		

Seminars	20		
The way to check knowledge can be different, the table above is just a few options: (written exams, oral exam, project presentation, seminars, etc...			
*Maximum required 2 pages of A4 format			

Study program:	Electrical and computing engineering
Course title:	Automatic Control Systems - Modernized
Lecturer/Instructor:	Aleksandar Micić
Course status:	Compulsory
ECTS:	5
Admission and requirements: Mathematics 1, Mathematics 2, Theory of electric circuits	

Course goals

Students gain knowledge about theoretical concepts and certain practical implementations of automatic control systems

Learning Outcomes

Successful application of acquired knowledge to solving specific engineering problems in the field of automatic control, as well as successful monitoring of other professional subjects that rely on the field of automatic control systems.

Course Content

Theoretical teaching. Basic principles and concepts of the automatic control system (ACS). Mathematical models of ACS components. Linear ACS. Analysis of transient regime and stationary state in ACS. Analysis of the stability of linear ACS by analytical methods. Analysis and synthesis of linear ACSs using the method of the geometric root locus. Analysis and synthesis of ACS in the frequency domain. Nyquist stability criterion. Bode diagrams and their application in the analysis and synthesis of ACS. Conception of the state of the system. Designing and setting parameters of standard industrial PID controllers.

Sensor's technologies and Adaptive Control Algorithms for Electric Vehicles Applications. Automotive electric actuators.

Practical teaching. Introduction to the MATLAB software package and its application in the analysis and synthesis of automatic control systems. Using the Control Station software package to demonstrate the operation of various regulators in several processes: gravity tanks, heat exchangers, distillation columns, DC motors, Electric Vehicles Applications.

Literature

1. K.Ogata, Modern Control Engineering, Prentice Hall, New Jersey, 2005.
2. Kovačević, Ž. Đurović, Automatic control systems, Collection of solved examples, Nauka, Belgrade, 2000.
3. Kwang Hee Nam, „ *AC Motor Control and Electrical Vehicle Applications* ", ISBN 978-1-138-71249-2, Taylor & Francis Group 2019.

Course Meeting Times (weekly)	**L (lecture):** 2	**T (tutorial):** 2

Teaching Methods

Lectures, computational exercises and laboratory exercises. The colloquium is organized when one unit of material is finished. By successfully passing the colloquium, the written part of the exam is eliminated. The written part of the exam is eliminative. The oral part of the exam is taken at the end.

Method of knowledge assessment (maximum number of ETSCs is 100)

Pre-exam obligations	ETSCs	**Final Exam**	ETSCs
Activity during the lecture	10	Written exam	20
Practical teaching	10	Oral exam	30
Colloquium	30		
Seminars			

The way to check knowledge can be different, the table above is just a few options: (written exams, oral exam, project presentation, seminars, etc...

*Maximum required 2 pages of A4 format	
Study program:	Electrical and computing engineering
Course title:	Internet of Things for Electric Vehicle
Lecturer/Instructor:	Vladimir Maksimović, Jelena Todorović
Course status:	Elective
ECTS:	5
Admission and requirements: No	

Course goals

Understand the fundamentals of IoT: The course should aim to provide students with a comprehensive understanding of the basics of IoT, including its underlying technologies, communication protocols, and the concept of connecting devices and sensors to the internet.

Explore the applications of IoT in Electric Vehicles: Introduce the students to various applications of IoT in the context of electric vehicles.

Learn about IoT architecture and components: Teach students about the different components and layers of an IoT architecture, such as sensors, actuators, connectivity modules, gateways, cloud platforms, and analytics. Help them understand how these components work together to enable IoT applications in electric vehicles.

Familiarize with IoT protocols and standards: Introduce students to common IoT protocols and standards used in the automotive industry, such as MQTT, CoAP, OBD-II, and CAN bus.

Develop skills in data analysis and interpretation: Emphasize the importance of data collection, analysis, and interpretation in IoT applications for electric vehicles. Teach students how to process and analyze the data generated by sensors and actuators, and translate it into meaningful insights and actions.

Stay updated with industry trends: Encourage students to stay updated with the latest advancements and trends in IoT for electric vehicles.

Learning Outcomes

Understanding of IoT concepts: Developing a solid understanding of IoT principles, including network communication protocols, data transmission, cloud computing, and data analytics, as they apply to electric vehicles.

Knowledge of sensors and data collection: Gaining knowledge of different types of sensors used in electric vehicles, such as GPS, accelerometers, temperature sensors, and battery monitoring systems, along with their integration and data collection methods.

Proficiency in connectivity technologies: Acquiring skills in various connectivity technologies used in IoT for electric vehicles, including cellular networks, Wi-Fi, Bluetooth, and dedicated short-range communication (DSRC).

Data management and analytics: Learning techniques for managing and analyzing large volumes of data collected from IoT-enabled electric vehicles, including data preprocessing, storage, real-time processing, and predictive analytics.

Security and privacy considerations: Understanding the importance of security and privacy in IoT for electric vehicles, including authentication, encryption, secure data transfer, and compliance with relevant regulations and standards.

Integration of IoT platforms: Acquiring knowledge of IoT platforms, such as cloud services and edge computing, and their integration with electric vehicle systems for data management, remote monitoring, and control.

Development of IoT applications: Gaining skills in developing IoT applications for electric vehicles, such as remote diagnostics, predictive maintenance, energy management, fleet management, and smart

charging.

Course Content per Week

1. Connected Vehicles in the IoV: Concepts, Technologies and Architectures
2. Spatial Intelligence and Vehicle-to-Vehicle Communication: Topologies and Architectures
3. Integrating Vehicular Technologies Within the IoT Environment
4. IoT for Telematics -integration of telecommunications and information technology in vehicles
5. Smart Transportation Tracking Systems Based on the Internet of Things Vision
6. Enhancing Telematics Systems and Fleet Management with IoT
7. Shortest Distance Calculation Techniques in IoT-Based Wireless Sensor Networks
8. Intelligent Transportation System Based on Internet of Things (IoT)-Based Cloud Applications
9. IoT technology for Smart Charging Infrastructure, vehicle to charging station communication
10. IoT in Energy Management and Grid Integration of Electric Vehicles
11. Smart Charging of EVs to Harvest Flexibility for PVs
12. Safety and Security Electric Vehicles with IoT Technology
13. Secure communication between EVs and the grid infrastructure with IoT
14. Data Analytics and Predictive Maintenance

Literature

4. Zaigham Mahmood, „ *Connected Vehicles in the Internet of Things -Concepts, Technologies and Frameworks for the IoV ",* ISBN 9783030361693, Sringer 2021.
5. Vahid Vahidinasab, Behnam Mohammadi-Ivatloo, „ *Electric Vehicle Integration via Smart Charging Technology, Standards, Implementation, and Applications ", https://doi.org/10.1007/978-3-031-05909-4, ISBN 978-3-031-05911-7, Springer 2022.*

Course Meeting Times (weekly)	**L (lecture):** 2	**T (tutorial):** 2

Teaching Methods

Lectures: Begin by providing lectures that introduce the fundamental concepts of IoT and its applications in the context of electric vehicles. Use visuals, examples, and real-world case studies to make the content more relatable and understandable.

Hands-on Projects: Practical sessions the course where students can work on hands-on projects related to IoT and electric vehicles.

Simulations and Virtual Labs: Utilization simulation tools and virtual labs to give students a hands-on experience of working with IoT devices and systems in the context of electric vehicles.

Online Resources and Collaborative Platforms: Provide students with access to online resources such as research papers, articles, videos, and tutorials related to IoT and electric vehicles.

Field Trips and Industry Visits: Plan field trips to relevant industries, research centers, or IoT development companies working on electric vehicles.

Assessments and Assignments: Include regular assessments and assignments to evaluate students' understanding and progress throughout the course.

Method of knowledge assessment (maximum number of ETSCs is 100)

Pre-exam obligations	ETSCs	**Final Exam**	ETSCs
Activity during the lecture	10	Presentations	10
Student research work	10	Seminars	10
Workshop sessions	10	Written exam	20
Debates	10	Oral exam	20

The way to check knowledge can be different, the table above is just a few options: (written exams, oral exam, project presentation, seminars, etc...

*Maximum required 2 pages of A4 format

2.2 Matrix of competencies

Competencies		Mandatory MS/Elective subjects ES						
		1	2	3	4	5	6	7
		ES	MS	MS	ES	MS	MS	ES
Generic competencies	Capacity for analyses and synthesis	X	X	X	X	X	X	X
	Capacity for applying knowledge in practice	X	X	X	X	X	X	X
	Oral and written competencies	X	X	X	X	X	X	X
	Development of computer competencies	X		X	X		X	X
	Development research skills	X	X	X	X	X	X	X
	Managing information skills	X	X	X	X	X	X	X
	Critical and self-critical abilities	X			X	X	X	X
	Capacity for adopting to new situations	X			X		X	X
	Capacity for generating new ideas (creativity)	X	X	X	X	X	X	X
	Solving problems	X	X	X	X	X	X	X
	Teamwork	X	X	X	X	X	X	X
	Leadership	X			X			X
	Ability to work in a multidisciplinary team	X			X			X
	Ability to communicate with people in the field	X			X			X
	Initiative and entrepreneurial spirit	X	X		X			X
	Integrity and ethical commitment	X	X	X	X	X	X	X
	Making Decisions	X	X	X	X	X	X	X
	Synthesis of information to determine the perspective of a problem or trend in traffic safety	X	X		X	X	X	X
	Holistic and proactive approach	X	X	X	X	X	X	X
	Recognizing differences	X	X	X	X	X	X	X
	Awareness of workload and limitations	X	X	X	X	X	X	X
	Awareness of professional responsibility	X	X	X	X	X	X	X

1.	Climate Change Management - ES							
Subject-specific competencies	Understanding of Climate Science	X						
	Policy and Regulatory Knowledge	X						
	Emission Reduction Strategies	X						
	Adaptation Planning	X						
	Stakeholder Engagement and Collaboration	X						
	Data Analysis and Monitoring	X						
	Financial and Economic Knowledge	X						
	Mitigating greenhouse gas emissions	X	X	X	X	X	X	X
	Communication Skills	X	X	X	X	X	X	X
	Project Management	X						
	Lifelong Learning and Adaptability	X						

2.	Materials in Electrical Engineering (Modernized) - MS							
Subject-specific competencies	Understanding of material properties		X					
	Knowledge of different materials		X					
	Material selection for specific applications		X					
	Understanding of material processing techniques		X					
	Material characterization		X					
	Environmental impact and sustainable materials	X	X	X	X	X	X	X
	Application-specific knowledge		X					
	Understanding battery chemistry and physics		X					
	Evaluating different types of batteries		X					
	Conducting safety assessments and risk management	X	X	X	X	X	X	X

3.	Distributed and Industrial Networks (Modernized) - MS							
Subject-specific competencies	Understanding of power grid infrastructure			X				
	Renewable energy integration			X				
	Grid modernization technologies			X				
	Power system protection			X				
	Energy management and control			X				
	Grid resilience and reliability			X				
	Power quality and harmonics			X				
	Regulatory and standards compliance	X	X	X	X	X	X	X
	Cybersecurity and data analytics			X				

	Electric vehicle (EV) charging infrastructure			X				
	Vehicle-to-Grid (V2G) integration			X				
	Energy management for EV fleets			X				
	Grid impact assessment			X				
	Integration of renewable energy sources			X				
	Edge computing and IoT for EV networks			X				
	Regulatory compliance and standards			X				

4.	**Automotive Systems and Software Engineering - ES**							
Subject-specific competencies	Understanding automotive systems				X			
	Proficiency in software engineering				X			
	Familiarity with automotive-specific software standards				X			
	Embedded systems development				X			
	Automotive communication protocols				X			
	Safety-critical systems development				X			
	Software architecture design				X			
	Validation and verification				X			
	Cybersecurity in vehicles				X			
	Collaboration and teamwork	X	X	X	X	X	X	X

5.	**Power Converters (Modernized) - MS**							
Subject-specific competencies	Understanding of power converter fundamentals					X		
	Power converter topologies					X		
	Power semiconductor devices and control					X		
	Magnetics design and analysis					X		
	Power converter control					X	X	X
	Modeling and simulation	X	X	X	X	X	X	X
	Design for reliability and efficiency					X		
	Troubleshooting and testing					X		
	Electric vehicle powertrain integration					X	X	X
	Energy storage systems integration			X		X	X	X
	High-power converter design					X		
	Grid interaction and vehicle-to-grid (V2G) capability					X	X	X
	Cybersecurity and functional safety					X	X	X

6.	Automatic Control Systems (Modernized) - MS							
Subject-specific competencies	Understanding of control system principles						X	
	Analysis and design of control systems						X	
	Controller implementation and tuning						X	
	Modeling and simulation	X	X	X	X	X	X	X
	Digital control and real-time implementation					X	X	X
	Control system optimization and robustness					X	X	X
	Control system applications						X	
	Troubleshooting and maintenance						X	
	Electric vehicle dynamics and control						X	X
	Battery and energy management control					X	X	X
	Powertrain control integration					X	X	X
	Vehicle system health monitoring and diagnostics						X	X
	Connected and autonomous vehicle control						X	X
	Cybersecurity and Functional Safety in Control Systems						X	X
	Grid Interaction and Vehicle-to-Grid Control					X	X	X

7.	Internet of Things (IoT) in Electric Vehicles - ES							
Subject-specific competencies	Understanding of IoT concepts							X
	Knowledge of sensors and data collection							X
	Proficiency in connectivity technologies							X
	Data management and analytics							X
	Security and privacy considerations					X	X	X
	Integration of IoT platforms					X	X	X
	Development of IoT applications							X
	Interoperability and standardization					X	X	X
	Regulatory and ethical considerations						X	X
	Continuous learning and staying updated					X	X	X
	Smart Charging Infrastructure						X	X
	Energy Management and Grid Integration							X
	Safety and Security							X

PELMOB

Funded by the European Union

Catalogue of Courses

University of East Sarajevo (UES)

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be."

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Contents

1. DESCRIPTION OF THE STUDY PROGRAM

Faculty of Electrical Engineering (FEE), as organizational unit of University of East Sarajevo (UES), has four study programs on the second study cycle (master level):

- Automation and Electronics
- Electric Power Engineering
- Computer Technology and Informatics
- Renewable Energy Sources and Smart Grids.

All study programs last for one year (two semesters).

The proposed courses (subjects) within the PELMOB project, which are related to electromobility (EM), will be introduced as new optional (elective) courses on the second study cycle (master study), at the study program Automation and Electronics.

The study program Automation and Electronics on the second study cycle is a continuation of the study program Automation and Electronics on the bachelor level. The master students on this study program acquire advanced knowledge from the following areas: robotics, mechatronics, industrial automatization, control systems design, intelligent control methods, embedded systems, programmable logic controllers, optoelectronics, power electronics, etc.

After successful completion of this study program, the master graduates acquire 60 ECTS, which is, along with the first study cycle (240 ECTS), in total 300 ECTS. The title of acquired qualification is: Master of science in Electrical Engineering –300 ECTS – Automation and Electronics.

1.1 Title of the study program

Title: Automation and Electronics.

1.2 Structure of the study program

The study program Automation and Electronics on the second study cycle lasts for one study year (two semesters). In the first semester, there are three compulsory courses: Methodology of scientific work (3 ECTS), Robotics and automatization (6 ECTS), and Control systems stability theory (6 ECTS). Also, there are three elective courses (all have 5 ECTS). In the second semester, there is one compulsory course: Project 3 (5 ECTS), and one elective course (5 ECTS). Also, there is compulsory Final master thesis (20 ECTS). In total, after completion of this study program, the master graduate acquires 30 ECTS+30 ECTS = 60 ECTS. Along with the first study cycle (bachelor level), which is worth 240 ECTS (four study years), that is 300 ECTS in total.

Upon enrollment, the master students choose the elective courses from the list of courses.

1.3 Objectives of the study program

The study of the second cycle (master study) at FEE prepares students for a higher degree of study and enables them to acquire the general and specific knowledge needed to engage in scientific and research work in a specific field. Upon completion of the second cycle of studies, the academic title of Master of Electrical Engineering is acquired, which is translated into English as Master of Science (M.Sc.), with an indication of the study program. The educational degree of the second cycle in all study programs lasts one study year, that is, two semesters, which corresponds to 60 ECTS points. In addition to compulsory subjects, students also take optional subjects. After completing two semesters, each student must write and defend a final work - a master's thesis.

In addition to the general objectives, which are the same as for the first cycle of studies, for the second cycle of studies the following are added as general objectives:

- efficient and rational higher education of professional-scientific personnel in the field of electrical engineering, through curricula and programs with many elective subjects, the contents of which are mainly related to the latest achievements in the field of electrical engineering,
- engagement of teaching staff with recognized scientific results who are able to introduce students to the methodology of research and scientific work, both from the theoretical aspect and from the aspect of further practical application,
- professional-scientific preparation of candidates for continuing education, third cycle of studies (doctorate).

Apart from the general objectives of the Automation and Electronics study program, there are also specific ones:

- training for monitoring and participating in research and scientific work in the field of automation of production processes in various industrial branches, traffic, service activities,
- training for monitoring and participating in research and scientific work in the field of robotics, industrial robots, robots in hazardous environments,

- training for monitoring and participating in research and scientific work in the field of power electronics, embedded systems, sensors, renewable energy, Internet of Things,
- getting to know, understanding and using complex modern software packages that have been developed for applications in various areas of automation and electronics.

1.4 Outcomes of the study program

General outcome of the learning process at the end of the second cycle at FEE:

- professionally trained scientific and professional staff with well-founded abilities for independent or team scientific research work, who:
  - understands and is easily involved in modern scientific and professional achievements,
  - has the ability to form a research team and propose, justify and find financial support for a research project of interest,
  - is able to independently identify problems and tasks that need to be solved through specific research, which can increase the efficiency and economy of a certain procedure or system,
  - within the specialty, and beyond, follows the development of the latest scientific and professional achievements and recognizes the needs and opportunities to deepen, expand and apply these achievements in the working environment.

Special outcomes of the learning process after the end of the second cycle on the study program Automation and Electronics, are:

- professionally trained scientific and professional staff with well-founded abilities for independent or team scientific research work in various narrow areas for the field of Automation and the field of Electronics. These areas include: power electronics, mechatronics, embedded systems, industrial automation, control systems design, modern control algorithms, etc.

1.5 Title of diploma

After successful completion of the second study cycle, on the study program Automation and Electronics, the candidates acquire the diploma (academic title): Master of Science in Electrical Engineering –300 ECTS – Automation and Electronics.

1.6 Conditions for enrolment in the study program

The candidates (students) who want to enroll in the study program Automation and Electronics, on the second study cycle, must finish the first study cycle (bachelor's degree) with 240 ECTS. At the FEE, there is a vertical education system, which means that the students who finish the first study cycle on the study program Automation and Electronics (240 ECTS), can enroll in the second cycle on the study program Automation and Electronics (they have the same name on both study cycles). There is no qualification exam. The students must apply within the public call. After completion of the call, the FEE announces the list of accepted candidates. The candidates are evaluated according to the success (average grade) on the first study cycle.

However, if candidates finished some other study program on the first cycle at the FEE, or at the other HEI, the equivalence process is needed. These candidates should have a minimum of 80 % of similarity with the study program Automation and Electronics on the first study cycle, to enroll in the master study. If the similarity is less, then they must pass the exams difference to obtain a minimum of 80 % of similarity.

1.7 Competences

Based on the developed Catalogue of Competencies for Electrical Mobility, competences for the new developed elective courses on the master study at FEE, on the study program Automation and Electronics, are summarized below.

Competencies		Elective courses						
		Power electronics converters in electric vehicles	Sensors, actuators and control systems in electric vehicles	Energy storage and battery management systems in electric vehicles	Modelling and simulation of electric vehicles	Internet of Things in electric vehicles	Intelligent control techniques in electric vehicles	Electric vehicle machines and drives
Generic competencies	Ability to investigate and learn new achievements and challenges in electrical mobility and all related fields	X	X	X	X	X	X	X
	Ability to learn and adopt new policies, regulations, and incentives related to electrical mobility on local, regional, and national levels	X	X	X		X	X	
	Understanding and	X	X	X		X	X	X

	adoption of the latest regulations, standards, and safety requirements for electrical mobility							
	Ability to create innovations, to critically think and make decisions which support promotion and development of electrical mobility	X	X	X	X	X	X	X
	Ability to create new ideas and technical solutions in different areas within electrical mobility, which will contribute to the improvement of this field	X	X	X	X	X	X	
	Developed professional ethics and respect for professional norms	X	X	X	X	X	X	X
	Strong communication skills with team members	X	X	X	X	X	X	X
	Ability to lead projects: distribute tasks equally, organize meetings, monitor progress of working packages, prepare reports, etc.	X	X	X	X	X	X	X
Subject-specific competencies	Understanding the working principles of various power electronics converters and their control structures in electric vehicles	X	X		X		X	X
	Understanding the working principles of various electric drives and their control structures in electric vehicles	X	X		X		X	X
	Understanding the working principles of energy storage systems (batteries) and their			X	X			

	management systems in electric vehicles							
	Understanding the working principles of embedded systems in electric vehicles, including sensors, actuators, measurements modules and automatic control systems		X		X	X	X	X
	Understanding the working principles of Internet of things and communication protocols in electric vehicles		X			X		
	Understanding the working principles of different artificial intelligence control algorithms used in electric vehicles		X			X	X	
	Knowledge of different software tools for modelling, analysis and simulation of electric vehicles	X	X		X		X	X
	Ability to perform experimental work and analysis in the field of electrical mobility and all related fields	X	X	X		X	X	X
	Ability to apply different methods of scientific research in the field of electrical mobility	X	X	X	X	X	X	X
	Completely trained for the scientific work and publication of scientific and professional papers in the field of electrical mobility and all related fields	X	X	X	X	X	X	X

2. LIST OF NEW COURSES AT FEE/UES RELATED TO EM

The new courses within PELMOB project will be introduced as new elective courses on the second study cycle (master study), on the study program Automation and Electronics, at FEE. Also, students of other master study programs at FEE can select two elective subjects from the proposed list.

	Course title	ECTS	Study level	Department/Faculty	Status of the course
1	Power electronics converters in electric vehicles	5	Master (second cycle)	Automation and Electronics/Faculty of Electrical Engineering	Optional (elective)
2	Sensors, actuators and control systems in electric vehicles	5	Master (second cycle)	Automation and Electronics/Faculty of Electrical Engineering	Optional (elective)
3	Energy storage and battery management systems in electric vehicles	5	Master (second cycle)	Automation and Electronics/Faculty of Electrical Engineering	Optional (elective)
4	Modelling and simulation of electric vehicles	5	Master (second cycle)	Automation and Electronics/Faculty of Electrical Engineering	Optional (elective)
5	Internet of Things in electric vehicles	5	Master (second cycle)	Automation and Electronics/Faculty of Electrical Engineering	Optional (elective)
6	Intelligent control techniques in electric vehicles	5	Master (second cycle)	Automation and Electronics/Faculty of Electrical Engineering	Optional (elective)
7	Electric vehicle machines and drives	5	Master (second cycle)	Automation and Electronics/Faculty of Electrical Engineering	Optional (elective)

2.1. Syllabuses of new courses

	UNIVERSITY OF EAST SARAJEVO Faculty of Electrical Engineering			
	Study program: *Automation and Electronics*			
	Second study cycle	First year of study		
Full name of the course	**POWER ELECTRONICS CONVERTERS IN ELECTRIC VEHICLES**			
Subject code	**Subject status**		**Semester**	**ECTS**
	Elective		I, II	5.0
Teacher(s)				
Associate(s)				

Number of lessons/teaching workload (weekly)			**Individual student workload (in hours per a semester)**			**Student workload coefficient S_o**
L	**AE**	**LE**	**L**	**AE**	**LE**	**S_o**
2	1	1	45	22.5	22.5	1.5

total teaching workload (in hours, per semester) W= 2*15 + 1*15 + 1*15 =60 hours	total student workload (in hours, per semester) T= $2*15*S_o + 1*15*S_o + 1*15*S_o$ = 90 hours
Total workload of the subject (teaching + student): In_{opt}= W + T = 60 + 90 = 150 hours per semester	

Learning outcomes	By mastering this subject, the student will be able to: 1. Understand different types of electric vehicles. 2. Understand role and significance of power electronics converters in electric vehicles. 3. Understand different topologies of converters used in electric vehicles. 4. Explain operating principles of battery chargers/dischargers in electric vehicles. 5. Explain operating principles of converters within electric drives in electric vehicles. 6. Explain operating principles of converters control structures in electric vehicles.
Prerequisites	There are no requirements for registering and listening to the subject.
Teaching methods	Lectures, auditory and laboratory exercises.
Subject content per weeks	1. Introduction. Historical review of the development of electric vehicles. Role, significance and advantages of electric vehicles. 2. Types of electric vehicles. 3. Energy sources in electric vehicles. Batteries. 4. Types of electric motors in electric vehicles. 5. Role and significance of power electronics converters in electric vehicles. Review of converters topologies in electric vehicles. 6. Application and types of AC/DC converters in electric vehicles. 7. Application and types of DC/DC converters in electric vehicles. 8. Application and types of DC/AC converters in electric vehicles. 9. Battery chargers/dischargers in electric vehicles. Review of charging topologies. 10. Converters for electric drives in electric vehicles. 11. Converters control structures in electric vehicles. 12. Impact of electric vehicles on grid. 13. Electric vehicles as energy generators to grid. 14. Application of new advanced topologies and technologies of converters in electric vehicles. 15. Application of new advanced control methods for converters in electric vehicles.

Compulsory literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
Kumar L. Ashok, Alexander S. Albert	Power Converters for Electric Vehicles, CRC Press, Taylor & Francis Group, LLC	2021	

Additional literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
Md. Rabiul Islam, Md. Rakibuzzaman Shah, Mohd. Hasan Ali	Emerging Power Converters for Renewable Energy and Electric Vehicles – Modeling, Design, and Control, CRC Press, Taylor & Francis Group, LLC	2021	
Iqbal Husain	Electric and Hybrid Vehicles – Design Fundamentals, CRC Press, Taylor & Francis Group, LLC	2021	

	Type of student work evaluation	**Points**	**Percentage**
Obligations, forms of knowledge assessment and grading	Pre-examination obligations		
	attendance at lectures	5	5 %
	laboratory exercises	15	15 %
	seminar work	50	50 %
	final exam (oral)	30	30 %
	TOTAL	100	100 %
Web page			
Certification date			

	UNIVERSITY OF EAST SARAJEVO Faculty of Electrical Engineering	
	Study program: *Automation and Electronics*	
	Second study cycle / First year of study	

Full name of the course	**SENSORS, ACTUATORS AND CONTROL SYSTEMS IN ELECTRIC VEHICLES**

Subject code	**Subject status**	**Semester**	**ECTS**
	Elective	I, II	5.0

Teacher(s)	
Associate(s)	

Number of lessons/teaching workload (weekly)			**Individual student workload (in hours per a semester)**			**Student workload coefficient S_o**
L	**AE**	**LE**	**L**	**AE**	**LE**	**S_o**
2	1	1	45	22.5	22.5	1.5

total teaching workload (in hours, per semester) W=2*15 + 1*15 + 1*15 = 60 h	total student workload (in hours, per semester) $T=2*15*S_o + 1*15*S_o + 1*15*S_o$ = 90 h
Total workload of the subject (teaching + student): In_{opt}= W + T = = 60 + 90 = 150 hours per semester	

Learning outcomes	By mastering this subject, the student will be able to: 1. understand the operational principles of sensors and actuators in electric vehicles, 2. analyze and select the most appropriate sensors and actuators for a specific application to electric vehicles, 3. design different types of controllers for the stabilization of control systems in electric vehicles, 4. design networked control systems and apply automotive standards and communication protocols to electric vehicles, 5. integrate sensors, actuators and controllers in basic control schemes for electric vehicles.
Prerequisites	There are no requirements for registering and attending the lectures.
Teaching methods	Lectures, auditory exercises, laboratory exercises
Subject content per weeks	1. Resistive sensors. Electromagnetic sensors. Capacitive sensors. 2. Piezoelectric sensors. Optoelectronic sensors. Digital sensors. 3. Linear and angular displacement sensors. 4. Speed and acceleration sensors. Force and torque sensors. 5. Pressure sensors. Level sensors. Flow sensors. Temperature sensors. 6. Sensors in electric vehicles: wheel speed sensor, vehicle speed sensor, throttle position sensor, temperature sensor, accelerometer (knock sensors), MEMS (microelectromechanical systems)… 7. Electromechanical actuators. Pneumatic actuators. 8. Hydraulic actuators. Microactuators. 9. Actuators in electric vehicles: DC motor, stepper motor, solenoids, solid-state switches… 10. Continuous time and discrete time control system representation for electric vehicles. Stability analysis. 11. Feedback systems in electric vehicles. 12. Conventional control strategies (PID, PI…). 13. Microprocessor-based control strategies. 14. Networked control systems in electric vehicles. Communication protocols. CAN. 15. Examples of sensors, actuators and controller integration in control systems for electric vehicles (braking control, battery charging control, thermal control, cooling and heating control...).

Compulsory literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
W. Ribbens	Understanding Automotive Electronics: An Engineering Perspective, 7th Edition, Elsevier Inc.	2012	
Robert Bosch GmbH (Ed.)	Bosch Automotive Electrics and Automotive Electronics: Systems and Components, Networking and Hybrid Drive, 5th Edition, Springer Vieweg	2014	
J. Fraden	Handbook of Modern Sensors, Springer	2010	
A. Khajepour, S. Fallah, A. Goodarzi	Electric and Hybrid Vehicles Technologies, Modeling and Control: a Mechatronic Approach, John Wiley & Sons Ltd.	2014	
K. Ogata	Modern Control Engineering, 5th Edition, Prentice Hall	2010	
R.C. Dorf, R.H. Bishop	Modern Control Systems, Pearson Prentice Hall	2008	
Additional literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
B. Popović, T. Šekara	Sensors and measurements - Collection of solved problems, ETF East Sarajevo	2019	
Č. Milosavljević	Basics of Automation – Methodical problems collection, FE Niš	1995	

	Type of student work evaluation	**Points**	**Percentage**
Obligations, forms of knowledge assessment and grading	Pre-examination obligations		
	attendance at lectures/exercises	5	5%
	midterm exam	30	30%
	lab. exercises/practical work	10	10%
	seminar paper	10	10%
	final exam (written/oral)	45	45%
	TOTAL	100	100%
Web page			
Certification date			

	UNIVERSITY OF EAST SARAJEVO Faculty of Electrical Engineering	
	Study program: *Automation and Electronics*	
	Second study cycle / First year of study	

Full name of the course	**ENERGY STORAGE AND BATTERY MANAGEMENT SYSTEMS IN ELECTRIC VEHICLES**

Subject code	**Subject status**	**Semester**	**ECTS**
	Elective	I, II	5.0

Teacher(s)	
Associate(s)	

Number of lessons/teaching workload (weekly)			**Individual student workload (in hours per a semester)**			**Student workload coefficient S_o**
L	**AE**	**LE**	**L**	**AE**	**LE**	**S_o**
2	1	1	45	22.5	22.5	1.5

total teaching workload (in hours, per semester) W= 2*15 + 1*15 + 1*15 = 60 hours	total student workload (in hours, per semester) T= 2*15*So + 1*15*So + 1*15*So = 90 hours

Total workload of the subject (teaching + student): In_{opt}= W + T = 60 + 90 = 150 hours per semester

Learning outcomes	By mastering this subject, the students will be able to: ● Understand different storage media for electricity, especially regarding power density, delivered power, maintenance, cost, safety, and environmental impact. ● Understand basic principles and challenges with different charging principles. ● Understand operating principles of battery management systems in electric vehicles.
Prerequisites	There are no prerequisites for enrolling in the course.
Teaching methods	Lectures, auditory and laboratory exercises.
Subject content per weeks	1. Introduction on energy storage systems in EV, 2. Key technologies of storage media for electricity in EV, 3. Basic parameters for evaluating energy storage systems, 4. Power batteries as the main energy storage part in electric vehicles, 5. Operation Principle and Types of Power Batteries, 6. Performance Parameter of Power Battery, 7. Battery Model, 8. Key Technologies of Battery Management System (BMS), 9. Key parameter calculations with BMS, 10. Monitoring and Estimating Battery parameters, 11. State Estimation Methods, 12. Optimized Charging Management, 13. Thermal Management and Thermal Safety, 14. Internal and external communication, 15. Cloud Battery Management System.

Compulsory literature

Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
S. Yang, X. Liu, S. Li, C. Zhang	Advanced Battery Management System for Electric Vehicles. Key Technologies on New Energy Vehicles. Springer	2023	

Additional literature

Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
D. Kishan, R. Kannan, B D. Reddy, P. Prabhakaran	Power Electronics for Electric Vehicles and Energy Storage. Emerging Technologies and Developments. CRC Press – Taylor and Francis Group	2023	

	Type of student work evaluation	Points	Percentage
Obligations, forms of knowledge assessment and grading	Pre-examination obligations		
	attendance at lectures/exercises	5	5 %
	laboratory exercises	25	25 %
	seminar work	40	40 %
	final exam (written/oral)	30	30 %
	TOTAL	100	100 %
Web page			
Certification date			

	UNIVERSITY OF EAST SARAJEVO Faculty of Electrical Engineering	
	Study program: *Automation and Electronics*	
	Second study cycle / First year of study	

Full name of the course	**MODELLING AND SIMULATION OF ELECTRIC VEHICLES**

Subject code	**Subject status**	**Semester**	**ECTS**
	Elective	I, II	5.0

Teacher(s)	
Associate(s)	

Number of lessons/teaching workload (weekly)			**Individual student workload (in hours per a semester)**			**Student workload coefficient S_o**
L	**AE**	**LE**	**L**	**AE**	**LE**	**S_o**
2	1	1	45	22.5	22.5	1.5

total teaching workload (in hours, per semester) W= 2*15 + 1*15 + 1*15 =60 hours	total student workload (in hours, per semester) T= 2*15*S_o + 1*15*S_o + 1*15*S_o = 90 hours

Total workload of the subject (teaching + student): In_{opt}= W + T = 60 + 90 = 150 hours per semester

Learning outcomes	By mastering this subject, the student will be able to: 1. Understand the principles and methods of modelling of electric vehicles, from different aspects: ● Modelling of dynamics of electric vehicles ● Modelling of components of electric vehicles: energy sources (batteries), power electronics converters, electric motors, mechanical parts. 2. Apply proper software tools for modelling and simulation of electric vehicles.
Prerequisites	There are no requirements for registering and listening to the subject.
Teaching methods	Lectures, auditory and laboratory exercises.
Subject content per weeks	1. Introduction to the theory of modelling of physical systems. 2. Modelling methods of dynamical systems. 3. Modelling of mechanical systems. 4. Modelling of electrical systems. 5. Modelling of electromechanical systems. 6. Software tools for modelling and simulation of dynamical systems. 7. Modelling and simulation of dynamics of electric vehicles. 8. Modelling and simulation of energy sources in electric vehicles. Battery modelling. 9. Modelling and simulation of power electronics converters in electric vehicles. 10. Modelling and simulation of electric motors in electric vehicles. 11. Modelling and simulation of different mechanical structures in electric vehicles. 12. Modelling and simulation of control systems in electric vehicles. 13. Animation of electric vehicles. 14. Modelling and simulation of impact of electric vehicles on grid – charging from grid and power generation from vehicles to grid. 15. Modelling and simulation of different security aspect of electric vehicles.

Compulsory literature

Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
Seref Soylu	Electric Vehicles - Modelling and Simulations, IntechOpen	2011	

Additional literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
Shuvra Das	Modeling for Hybrid and Electric Vehicles Using Simscape, Springer	2021	

	Type of student work evaluation	**Points**	**Percentage**
Obligations, forms of knowledge assessment and grading	Pre-examination obligations		
	attendance at lectures	5	5 %
	laboratory exercises	15	15 %
	seminar work	50	50 %
	final exam (oral)	30	30 %
	TOTAL	100	100 %
Web page			
Certification date			

	UNIVERSITY OF EAST SARAJEVO Faculty of Electrical Engineering	
	Study program: *Automation and Electronics*	
	Second study cycle / First year of study	

Full name of the course	**INTERNET OF THINGS IN ELECTRIC VEHICLES**

Subject code	**Subject status**	**Semester**	**ECTS**
	Elective	I, II	5.0

Teacher(s)	
Associate(s)	

Number of lessons/teaching workload (weekly)			**Individual student workload (in hours per a semester)**			**Student workload coefficient S_o**
L	**AE**	**LE**	**L**	**AE**	**LE**	**S_o**
2	1	1	45	22.5	22.5	1.5

total teaching workload (in hours, per semester) W= 2*15 + 1*15 + 1*15 = 60 hours	total student workload (in hours, per semester) T= 2*15*So + 1*15*So + 1*15*So = 90 hours
Total workload of the subject (teaching + student): In_{opt}= W + T = 60 + 90 = 150 hours per semester	

Learning outcomes	The course aims to teach students: ● the integration of IoT principles into electrical vehicles (EVs), ● practical skills in sensor and actuator implementation, exploring connectivity protocols, ● data analytics and machine learning applications tailored for EVs, ● security and privacy issues in IoT-enabled EVs.
Prerequisites	There are no prerequisites for enrolling the course. It is necessary to have prior knowledge of the following subjects: Data transmission and acquisition, Analysis of Signals and Systems.
Teaching methods	Teaching is conducted in the form of lectures, auditory and laboratory exercises.

	● Introduction to IoT and EVs (types, components, and architecture). ● The convergence of IoT and EVs. The Internet of Vehicles (IoV): Concepts, Technologies and Architectures. ● Sensors and actuators used in EVs. ● Integration of IoT sensors in EVs for real-time data acquisition. ● IoT-based communication system for EVs: communication protocols for IoT devices in EVs.

Subject content per weeks	• Data analytics and machine learning within the context of EVs. • Vehicle data analysis for predictive maintenance and performance optimization. • IoT applications for energy management in EVs. • IoT technologies utilization for improvement of the charging process and efficiency of EVs. • Introduction to Vehicle-to-Everything (V2X) communication and its relevance in IoT-enabled EVs. • Designing V2X communication protocols. V2X applications for traffic management and safety. • Benefits and challenges of IoT in EV industry. • Privacy and security issues in IoT-enabled EVs. • Utilization of encryption and secure communication protocols to protect user privacy and data integrity in connected EVs. • Investigation of emerging IoT trends for EVs.

Compulsory literature

Author(s)	Publication title, publisher	Year	Pages (from-to)
Padmanaban, S.; Samavat, T.; Nasab, M.A.; Nasab, M.A.; Zand, M.; Nikokar, F.	Electric Vehicles and IoT in Smart Cities. **Artif. Intell.-Based Smart Power Syst.**,	2023	273–290
Mahadik, Y.; Thakre, M.; Kamble, S.	Electric Vehicle Monitoring System Based on Internet of Things (IoT) Technologies. In: Nayak, P., Pal, S., Peng, SL. (eds) IoT and Analytics for Sensor Networks. Lecture Notes in Networks and Systems, vol 244. Springer, Singapore.	2022	311-322
Mahmood, Z.	Connected Vehicles in the Internet of Things: Concepts, Technologies and Frameworks for the IoV, Springer Nature Switzerland AG	2020	

Additional literature

Author(s)	Publication title, publisher	Year	Pages (from-to)

	Type of student work evaluation	Points	Percentage
Obligations, forms of knowledge assessment and grading	Pre-examination obligations		
	attendance at lectures/exercises	5	5 %
	homework	20	20 %
	lab. exercises/practical work	20	20 %
	midterm exams	10	10 %
	final exam (written/oral)	45	45 %
	TOTAL	100	100 %
Web page			
Certification date			

	UNIVERSITY OF EAST SARAJEVO Faculty of Electrical Engineering	
	Study program: *Automation and Electronics*	
	Second study cycle / First year of study	

Full name of the course	**INTELLIGENT CONTROL TECHNIQUES IN ELECTRIC VEHICLES**

Subject code	**Subject status**	**Semester**	**ECTS**
	Elective	I, II	5.0

Teacher(s)	
Associate(s)	

Number of lessons/teaching workload (weekly)			**Individual student workload (in hours per semester)**			**Student workload coefficient S_o**
L	**AE**	**LE**	**L**	**AE**	**LE**	**S_o**
2	2		2*15*1,5= 45	2*15*1,5= 45		1.5

total teaching workload (in hours, per semester) W = 2*15 + 2*15 + 0*15 = 60	total student workload (in hours, per semester) T = 2*15*1,5+ 2*15*1,5 = 90

Total workload of the subject (teaching + student): In_{opt}= W + T = 150 hours per semester

Learning outcomes	1. Students will acquire the basic knowledge and skills necessary for applying artificial intelligence techniques in modeling and designing control systems for electric vehicles, with special reference to the efficient use of computer tools applicable to solving such tasks. 2. Students will be able to develop neural networks, fuzzy logic, genetic, and machine learning algorithms for controlling different aspects of electric vehicles. 3. Students will be able to implement soft computing techniques to solve real problems related to electric vehicles.
Prerequisites	There are no requirements for registering and attending the lectures.
Teaching methods	The teaching is realized through the frontal form of work - lectures, and interactive form of work - tests, homework, research paper.
Subject content per weeks	1. Definition of artificial intelligence. Mathematical logic, knowledge and reasoning. 2. Mathematical fundamentals of intelligent control. 3. State space. Production system. Search strategies. 4. Expert systems. Knowledge representation. 5. Structure of expert systems. Expert systems design. 6. Neural networks. Neuron and neuron model. Structure of neural network. 7. Perceptrons: single-layer and multi-layer. Recurrent networks. Learning

Subject content per weeks	and training algorithms. 8. Fuzzy logic and modeling. Fuzzy sets: theory, definitions, representation, operations. 9. Fuzzy relations. Linguistic variables. Fuzzy rules. 10. Structure of fuzzy system. Fuzzy controller. 11. Evolutionary algorithms. Genetic algorithms. 12. Fitness function. Selection. Mutation. Recombination. Reproduction. 13. Machine learning: unsupervised, supervised, and reinforcement learning. 14. Design of intelligent control systems for electric vehicles. 15. Programming languages in intelligent control systems for electric vehicles.

Compulsory literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
M. Negnevitsky	Artificial Intelligence: A Guide to Intelligent Systems, 3rd edition, Pearson/Addison Wesley	2011	
Rutkowski, L.	Computational Intelligence: Methods and Techniques, Springer	2008	
Engelbrecht, A. P.	Computational Intelligence: An Introduction, 2nd edition, John Wiley, New York	2007	
Jain L., De Wilde P. (eds.)	Practical applications of computational intelligence techniques, Kluwer Academic Publishers, Boston	2001	
Jang J.-S. R., Sun C.-T., Mizutani E.	Neuro-Fuzzy and Soft Computing, Prentice Hall, Upper Saddle River	1997	
A. Gupta M. M., Sinha N. K.	Intelligent Control Systems, IEEE Press, New York	1996	

Additional literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**

	Type of student work evaluation	**Points**	**Percentage**
Obligations, forms of knowledge assessment and grading	Pre-examination obligations		
	attendance at lectures/exercises	5	5%
	midterm exam	30	30%
	homework	10	10%
	research paper	25	25%
	Final exam		
	final exam (written/oral)	30	30%
	TOTAL	100	100%
Web page			
Certification date			

	UNIVERSITY OF EAST SARAJEVO Faculty of Electrical Engineering	
	Study program: *Automation and Electronics*	
	Second study cycle / First year of study	

Full name of the course	**ELECTRIC VEHICLE MACHINES AND DRIVES**

Subject code	**Subject status**	**Semester**	**ECTS**
	Elective	I, II	5.0

Teacher(s)	
Associate(s)	

Number of lessons/teaching workload (weekly)			**Individual student workload (in hours per a semester)**			**Student workload coefficient S_o**
L	**AE**	**LE**	**L**	**AE**	**LE**	**S_o**
2	2	0	45	45	0	1.5

total teaching workload (in hours, per semester) W= 2*15 + 2*15 = 60 hours	total student workload (in hours, per semester) T= 2*15*So + 2*15*So = 90 hours

Total workload of the subject (teaching + student): In_{opt}= W + T = 60 + 90 = 150 hours per semester

Learning outcomes	By mastering this subject, the students will be able to: ● Demonstrate understanding of the function of basic design parameters and their impact on the electric motors for electric vehicles (EV). ● Demonstrate knowledge of trends in research and development in electric motors for EV / Hybrid electric vehicles (HEV). ● Assimilate research results in the field of electrical motors and its application in EV/HEV.
Prerequisites	There are no prerequisites for enrolling in the course.
Teaching methods	The teaching process is realized mainly through a frontal form of work - lectures and an interactive form of work - auditory exercises
Subject content per weeks	1. Introduction of EV. Classification, challenges, overview of various developed technologies 2. DC motor drives for EVs, 3. Induction motor drives for EVs, 4. Permanent magnet brushless motor drives for EVs, 5. Switched reluctance motor drives for EVs, 6. Advanced motor drives for EV, 7. Stator-Permanent Magnet Motor Drives, 8. Magnetic-Geared Motor Drives, 9. Vernier Permanent Magnet Motor Drives, 10. Structure of Hybrid EVs, 11. Advanced Magnetless Motor Drives, 12. Integrated-Starter-Generator Systems, 13. Planetary-Geared Electric Variable Transmission Systems, 14. Double-Rotor Electric Variable Transmission Systems, 15. Magnetic-Geared Electric Variable Transmission Systems.

Compulsory literature

Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
K. T. Chau	Electric Vehicle Machines and Drives. Design, Analysis and Application, John Wiley & Sons	2015	

Additional literature			
Author(s)	**Publication title, publisher**	**Year**	**Pages (from-to)**
M. Ehsani, Y. Gao, S. Longo, K. Ebrahimi	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles. CRC Press - Taylor and Francis Group	2018	

	Type of student work evaluation	**Points**	**Percentage**
Obligations, forms of knowledge assessment and grading	Pre-examination obligations		
	attendance at lectures/exercises	5	5 %
	homework	5	5 %
	midterm exam I	30	30 %
	midterm exam II	30	30 %
	final exam (written/oral)	30	30 %
	TOTAL	100	100 %
Web page			
Certification date			

PELMOB

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Catalogue of Courses

Džemal Bijedić University of Mostar (UDBM)

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University of Pristina Kosovska Mitrovica

Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Call: ERASMUS-EDU-2022-CBHE-STRAND-2
Project Number: 101082860

PROJECT INFO

Project title	Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Project acronym	PELMOB
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Funding scheme	Capacity Building in the field of Higher Education: Strand 2
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DOCUMENT CONTROL SHEET

Work package	WP3: Development of EM curricula and labs
Ref. no and title of activity	T3.3: Designing of EM courses
Title of deliverable	D3.3: Catalogue of courses
Lead institution	Óbudai Egyetem (OE)
Author(s)	Edin Šunje, Edin džiho, Emir Nezirić, Safet Isić, Damir Špago, Merima Ćupina (UDBM)
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VERSIONING AND CONTRIBUTION HISTORY

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V.01.	12/25/2023	Final	UDBM

Contents

1. DESCRIPTION OF THE STUDY PROGRAM

Faculty of Mechanical Engineering, as organizational unit of Džemal Bijedić University of Mostar, has three study programs on first and second study cycle (master level).

At the bachelor level, the faculty offers three study programs:

1. Production Engineering,
2. Energy Engineering,
3. Computer Engineering.

At the master level, the faculty offers three study programs:

1. Production Engineering,
2. **Renewable Energy Sources**,
3. Computer Engineering.

Doctoral study is organized within the University doctoral study program of Polytechnics. Total number of 480 students is enrolled at the Faculty (380+90+10) Teaching process covers a total of 34 teachers and associates, in permanent employment and visiting professors.

As a project partner in the TEMPUS project "Renewable Energy Studies in Western Balkan Countries" – RESI, Faculty of Mechanical Enginering in Mostar has developed and introduce new study programme Renewable energy sources in 2015/2016. Based on the student's interest, study programme prosperity, while after, Energy engineering study programme has been developed and introduced in the bachelor level in 2017/2018. Renewable energy is highly important for the future economy in the partner countries in the Balkan region with limited energy resources in a growing economy and with the related environmental problems. Recently, energy market and needs are changing rapidly, so the study programme curricula should follow the market needs. In that context, we recognize the need for improvements in Energy engineering and Renewable energy sources studies programmes.

1.1 Title of the study program

Title: Renewable Energy Sources.

1.2 Structure of the study program

Study programme on master level has been organized in four semesters. Where in first three semester are reserved for the teaching process, while in forth semester student should write master thesis. Total number of ECTS is 120.

Study programme Renewable energy sources includes a compulsory course Research project (Exchange with the companies). The goal is that a student performs certain research related to the relevant problematics from the area of Renewable energy sources. Research is normally conducted in the production companies, under the supervision of relevant teacher. During the research student is getting familiar with the scientific research methodology and all relevant project elements. After the project has been completed student should present it in front of teacher and other colleagues. The goal is to:

- Make link between theoretical and research practice, collecting, processing and interpretating the results, description and explaining the problems related to renewable energy sources.
- Gaining the knowledge in real environment for self-handling of a renewable energy project

Structure of study program consists of following courses:

Study programme: Renewable energy sources

Semester 1

NB	Code	Course	ECTS
1.		Mathematics III	6
2.		Applied fluid mechanics	6
3.		Applied thermodynamics	6
4.		Maintenance of energy plants	6
5.		Elective course	6
		Total:	**30**

Elective courses (Semester 1)

NB	Code	Course	ECTS
1.		Automation	6
2.		Flexible production systems	6
3.		Environmental engineering	6
4.		Advanced construction materials	6

Semester 2

NB	Code	Course	ECTS
1.		Dynamics and oscillations	6
2.		Hydro energy power plants	6
3.		Solar energy power plants	6
4.		Wind energy power plants	6
5.		Elective course	6
		Total:	**30**

Elective courses (Semester 2)

NB	Code	Course	ECTS
1.		Biomass Energy	6
2.		Industrial Management	6
3.		Strength of Materials II	6
4.		Re-Engineering and Rapid Prototyping	6

Semester 3

RB	Šifra	Naziv predmeta	ECTS
1.		Research project	12
2.		Environmental impact assessment methodology	6
3.		Energy monitoring and management systems	6
4.		Elective course	6
		Total:	**30**

Elective courses (Semester 3)

NB	Code	Course	ECTS
1.		Entrepreneurship	6
2.		Constructions testing	6
3.		Object programming	6
4.		Geothermal Energy	6
5.		Robotics	6

Semester 4

NB	Code	Course	ECTS
1.		Master thesis	30
		Total:	**30**

1.3 Objectives of the study program

The study of the second cycle (master study) at Faculty of Mechanical Engineering at UDBM prepares students for a higher degree of study and enables them to acquire the general and specific knowledge needed to engage in scientific and research work in a specific field. Upon completion of the second cycle of studies, the academic title of Master of Mechanical Engineering is acquired, with an indication of the study program. The educational degree of the second cycle in all study programs lasts two study year, that is, four semesters, which corresponds to 120 ECTS points. In addition to compulsory subjects, students also take optional subjects. After completing four semesters, each student must write and defend a final work - a master's thesis. The objectives could be divided into short-term and long-term objectives.

Short-term objectives:

- Student education in the Area of Renewable Energy Sources
- increase the level of quality of scientific and research and innovation work
- promoting cooperation with other universities and institutes in the country and abroad
- achieving comparability of this master's programme with similar programs in the EU
- education of experts who could improve energy sources, education, science, economy and other segments of our society

Long-term objectivies:

- Education of personnel on the importance and exploitation of renewable energy sources, which will with the use of the latest knowledge to organize and solve problems from this field.
- Education of professional staff to solve complex problems in the field renewable energy sources in order to increase the production of energy from renewable energy energy efficiency, and the achievement of sustainable development principles.
- Active cooperation between BiH and the European Union in the field of renewable energy sources, environmental protection and sustainable development, and scientific and research projects and development program
- Transfer of technologies and knowledge from developed countries in BiH, related to renewable sources energy and environmental aspects.

1.4 Outcomes of the study program

General outcome of the learning process at the end of the second cycle at Mechanical Engineering at UDBM:

- solve complex problems in the field of renewable energy sources, energy efficiency, environmental aspects and sustainable development principles related to renewable energy sources (Research, design and implementation of technical and technological solutions for production of energy from renewable sources, etc.);
- independently develop studies and design solutions for the construction of energy plants for the energy production from renewable sources using the best available techniques
- implement technical and technological solutions for the production of energy from renewable energy the best, using the best available techniques
- implement measures related to the application of cleaner technologies and negative environmental impacts through the design, construction and exploitation of technical systems in the field of renewable energy sources (hydro, solar, wind, geothermal energy, as well as energy of different forms of biomass of plant and animal origin, etc.);
- identify and solve known professional identification problems in the field of RES
- independently monitor the latest results in their own field of study and related fields

1.5 Title of diploma

After successful completion of the second study cycle, on the study program Renevable Energy Study Programme, the candidates acquire diploma Master of of Mechanical Engineering, Renevable Energy Sources

1.6 Conditions for enrolment in the study program

Normally conditions for the enrolment in university studies are prescribed by law regulations and/or University rules, where the students must have finished 4-year secondary school. Beside that University can prescribe some other specific condition, which is not our case. The candidates (students) who want to enroll in the study program on the second study cycle, must finish the first study cycle (bachelor's degree) with 180 ECTS. Also a student has to achieve an average grade at least 7.5.). There is no

qualification exam. The students must apply within the public call. The candidates are evaluated according to the success (average grade) on the first study cycle.

2. LIST OF MODERNIZED AND NEW COURSES INTRODUCED AT FACULTY OF MECHANICAL ENGINEERING/UDBM RELATED TO EM

The list of modernized and newly introduced course has been shown in following table.

Nb.	Course name	ECTS	Status	Modernized/New course
1	Automation	6	Elective	M
2	Mechatronics	6	Elective	M
3	Applied Fluid Mechanics	6	Mandatory	M
4	Dynamics and Oscillations	6	Mandatory	M
5	Electrical Vehicle Engineering	6	Elective	N
6	Environmental Engineering	6	Elective	M
	TOTAL	36		

2.1. Competences related to courses

Competencies		Mandatory M/Elective subjects E					
		E1	E2	M1	M2	E3	E4
Generic competencies	Capacity for analysis and synthesis	X	X	X	X	X	
	Capacity to apply knowledge in practice	X	X	X	X	X	X
	Oral and written communication	X	X	X	X	X	X
	Development of computer skills	X	X			X	
	Development of research skills	X	X			X	X
	Information management skills		X	X			X
	Critical and self-critical abilities	X		X		X	X
	Capacity to adapt to new situations	X	X		X		X
	Capacity to generate new ideas (creativity)	X	X	X	X	X	X
	Troubleshooting	X		X	X	X	X
	Teamwork	X	X	X	X	X	X
	Leadership						X
	Ability to work in a multidisciplinary team	X	X	X	X	X	X
	Ability to communicate with people in the field	X	X		X		X
	Initiative and entrepreneurial spirit						X
	Integrity and ethical commitment	X	X	X	X	X	X
	Making decisions	X	X	X	X		X
	Synthesis of information to determine viewpoints, perspectives, problems or trends in traffic safety					X	
	A holistic and proactive approach	X	X	X	X	X	X
	Appreciation of differences						X
	Awareness of own scope of work and limitations			X		X	X
	Awareness of professional responsibility	X	X	X	X	X	X
Specific subject competencies	Acquiring knowledge and skills for training in a comprehensive understanding of responses at the output of the automation systems	X					
	Ability to apply acquired knowledge in real situations.	X					
	Acquiring knowledge to independently determine stability of automation system	X					
	Acquiring knowledge to reduce multi-block diagram system to one block diagram	X					
	Acquiring knowledge and skills to understand mechatronics systems		X				
	Acquiring knowledge and skills to understand sensors, converters, actuators and mechanical drive systems		X				

	Acquiring knowledge and skills for a comprehensive understanding of microprocessors, programmable logic controllers, modules		X				
	Acquiring knowledge for the identification and analysis problems in the field of applied fluid mechanics			X			
	Acquiring knowledge about the pumps, fluid motors, friction, valves, fittings, power required by pumps and pump efficiency			X			
	Acquiring knowledge about the fans, blowers, compressors, and the flow of gases			X			
	Acquiring knowledge about analysing simple oscilations of particle, solid and flexible body				X		
	Identifying and solving problems of motion and oscilations of solid body and system of particles using the laws of motion				X		
	Understanding natural frequencies of the mechanical structures				X		
	Acquiring knowledge about impact of the different harmonic and non-harmonic forces (unbalance, missalignment bending force, bump forces) on the structures				X		
	Acquisition of knowledge and skills for the ability to comprehensively understand the concept of e vehicles and also develop the concept of E engineering					X	
	Gaining knowledge of the application of safety standards and regulations in E vehicles.					X	
	Practical application of acquired knowledge in real situations.					X	
	Development of initiatives, e vehicles, and e mobility in engineering					X	
	Gaining knowledge about identification, analysis, and evaluation of negative emissions						X
	Acquiring skills and basic knowledge to for the implementation of measures to mitigate and prevent negative emissions into the environment						X
	Acquiring knowledge about the principles of sustainable				X		X

	development and assess the carbon footprint						
	Acquiring knowledge and skills in the development and planning of space and mobility for people with reduced mobility.				X		

2.2. Syllabuses of modernized and new courses

DŽEMAL BIJEDIĆ UNIVERSITY OF MOSTAR FACULTY OF MECHANICAL ENGINERING **STUDY PROGRAMME: All**			
Course title:	**Automation**		**Course code: 0000**
Study level, year, semester	Master		Year / Semester
Teacher:			
Contact details:	Consultations: Room number E-mail: name.surname@unmo.ba Tel.: 0000		
Teaching hours:	Lectures: 2	Exercises :2	Total (30+30)
ECTS-value:	6 ECTS		
Study programme:	Master level: All		
Course status:	Elective		
Requirement:	None		
Restrictions:	--		
Structure of ECTS value	--		
Course objective:	To provide basic knowledge of control systems, dynamic models of control systems through transfer functions, stability of linear control systems and regulators.		
Course outcomes / competences:	Upon successful completion of this course, students will be able to independently determine responses at the output of the systems, described by differential equations. Students perceive advantages offered by the Laplace transformation. Upon successful completion of this course, students will independently determine whether some systems are stable or not, also will be able to reduce multi-block diagram system to one block diagram.		
Course content:	1. Control of open and closed loop systems 2. Basic algorithms of control system functioning 3. Mathematical techniques for control systems 4. Laplace transformation and its properties, inverse Laplace transformation. 5. Application of Laplace transformation at differential equations 6. Dynamic system represented by the transfer function. 7. Mid-term tests 1 8. Block diagram algebra, signal flow graph chart 9. First and second order systems 10. Routh-Hurwitz stability criterion 11. Root loci (RL) 12. Proportional regulator, proportional-integral regulator 13. Proportional-derivative regulator		

	14. Proportional-integral-derivative regulator, electric regulator 15. Mid-term tests 2
Teaching methods:	Lectures, Exercises
Other obligations of students (if they are required):	Seminar work is precondition for final exam
Knowledge assessment:	Knowledge assessment structure: Mid-term tests 1: 50 % Mid-term tests 2: 50% Upon completion of mid-term tests, a final oral exam will be organized. Final mark will be arithmetic mean of mid-term tests and final exam.
Literature:	1. Naser Prljača, Zenan Šehić: Automatsko upravljanje: analiza i dizajn, Tuzla, 2008 2. Humo E.: Principi i elementi automatske regulacije, Svjetlost, Sarajevo 1987 3. Humo E., Jovanovic G.: Automatska regulacija-Zbirka zadataka, Elektrotehnički fakultet, Sarajevo 1973 4. Božičević J.: Automatsko vođenje procesa, Tehnička knjiga, Zagreb 1971 5. Humo Emir i Isić Safet: Inžinjersko modeliranje
Quality assurance	Questionary survey among the students

DŽEMAL BIJEDIĆ UNIVERSITY OF MOSTAR FACULTY OF MECHANICAL ENGINERING **STUDY PROGRAMME: All**			
Course title:	**Mechatronics**		**Course code: 0000**
Study level, year, semester	Master		Year / Semester
Teacher:			
Contact details:	Consultations: Room number E-mail: name.surname@unmo.ba Tel.: 0000		
Teaching hours:	Lectures : 2	Exercises :2	Total (30+30)
ECTS-value:	6 ECTS		
Study programme:	Master level: All		
Course status:	Elective		
Requirement:	None		
Restrictions:	--		
Structure of ECTS value	--		
Course objective:	The goal of the course is to enable students to aquire basic knowledge from mechatronics, and autonomy to solve practical examples and trained to monitor new disciplines such as robotics, intelligent systems, electrical vehicles		
Course outcomes / competences:	Upon successful completion of this course, the student will learn the possibilities offered by this field, as well as the importance of mechatronics, robotics and intelligent systems in modern mechanical engineering.		
Course content:	1. The concept of mechatronics. Designing mechatronic systems. 2. Sensors and converters of position, speed, force, pressure, flow, temperature, selection of sensors, switches. 3. Amplifiers, filters, Winston's bridge, digitalin signals. 4. Digital logic. Data presentation systems. 5. Pneumatic and hydraulic actuators, pneumatic and hydraulic systems, valves, cylinders, servo valves, 6. Rotary actuators, mechanical drive systems. 7. Electric actuators, electric systems, solenoids, DC motors, AC motors, stepper motors. 8. Mid-term test 1 9. Basic system model, models of rotary translational systems, electromechanical systems, hydraulic-mechanical systems. 10. Dynamic system response, dynamic system modeling, first-order systems, second-order systems. 11. System transfer functions, open and closed loop control, 12. Proportional – Integral – Derivative (PID) controllers, digital controllers, adaptive control. 13. Microprocessors, programmable logic controllers, modules,		

	PLC programming languages. communication systems. 14. Mid-term test 2 15. Project
Teaching methods:	Lectures, Exercises, Project
Other obligations of students (if they are required):	-
Knowledge assessment:	Knowledge assessment structure: Class attendance: 5 % Mid-term tests: 50 % Final Exam: 45%
Literature:	6. Karabegović, E. Husak, S. Vojić, S. Isić, M. Mahmić, E. Karabegović, E. Šemić, M. Đukanović: MEHATRONIKA, Modeliranje, simulacija, projektovanje, Mostar/Bihać, 2021. 7. M. Đukanović, M.M. Markuš, V. Gavrilovski, J. Jovanova: UVOD U MEHATRONIKU, Podgorica, 2013. 8. F. Kolonić, N. Švigir: OSNOVI MEHATRONIKE, Fakultet elektrotehnike i računarstva, Zagreb, 2006. 9. Heimann, gerth, Popp: MECHATRONIK, Fachbuchverlag Leipzig, 2001. 10. Ž. Čučej: KOMUNIKACIJE V SISTEMI DALJINSKEGA VOĐENJA, FERI Maribor, 1998. 11. Cetinkunt: MECHATRONICS 12. Bradley, Dawson: MECHATRONICS, Chapman and Hall, 1991.
Quality assurance	Questionary survey among the students

DŽEMAL BIJEDIĆ UNIVERSITY OF MOSTAR
FACULTY OF MECHANICAL ENGINERING
STUDY PROGRAMME: All

Modul	APPLIED FLUID MECHANICS		Modul code: xxx
The level of cycles, years of study, semester	II cycle		Year I/ I Semester
Teacher:			
Contact details:			
The total number of modul hours:	Lectures per week:2	Exercise per week: 2	Total Hours 30+30 (L+E)
ECTS	6 ECTS		
Qualifications	II cycles of study		
Modul description	1. Introduction: Conservation of energy, Bernoulli's equation, interpretation, limitations and application 2. Torricelli's theorem. Discharge of fluid with a change of level in the vessel 3. General energy equation, energy losses and gains, pumps, fluid motors, friction, valves, elements (fittings), power required by pumps and pump efficiency. 4. Reynolds number, Laminar flow, Turbulent flow and energy loseses due to friction. Velocity profiles for circular sections and flow in noncircular sections 5. Local losses, resistance coefficients for valves and elements (fittings) of pipelines, equivalent length. Application of standard valves and pipe elbows 6. Series pipeline systems: Class I, Class II (method II-A, method II-B, method II-C) and Class III (method III-A, method III-B). General principles of piping system design 7. ***I COLLOQUIUM*** 8. Parallel pipeline systems. A system with two branches, a system with three or more branches - pipe networks 9. Application and pump selection. Pump types and performance. 10. Centrifugal pumps. Performance, similarity laws and manufacturer data. Required power, efficiency of pump, required NPSH (Net Positive Suction Head), operating point of the pump, cavitation and steam pressure. 11. Movement of fluid with a free surface, flow in channels or open streams. Hydraulic radius and Reynolds number. Critical flow and specific energy 12. Similarity theory, hydrodynamic similarity and model, similarity based on differential equations. The physical meaning of Reynolds and Froude's number 13. Dimensional analysis – homogeneity. PI – theorem 14. Fans, Blowers, Compressors, and the Flow of Gases 15. ***II COLLOQUIUM***		

Teaching / learning methods	Lectures, exercises
Examination method and the weight factor assessment %	During the semester two colloquiums are held. Weighting factors in the final grade are: 1. The presence and participation in teaching- 5% 2. Colloquiums - 20%+20% = 40% 3. Final exam - 55%
List of basic literature and Internet web references	1. Mott, Robert L.: *Applied Fluid Mechanics*, Pearson Prentice Hall, New Jersey, Columbus Ohio, USA, 2006. 2. Post, Scott: *Applied and Computational Fluid Mechanics*, Jones and Bartlett Publishers, Bradley University, 2011. 3. Piping System Design Software: HydroFlo, PumpBase, HCalc (Download software at: www.tahoesoft.com)
Monitoring of quality and efficiency of modul performing	An anonymous survey among students about the success of teaching.

„DŽEMAL BIJEDIĆ“ UNIVERSITY OF MOSTAR FACULTY OF MECHANICAL ENGINEERING			
Course name:	**Dynamics and oscilations**		**Course code: 0000**
Cycle level, year, semester	Master degree		1st. academic year. / summer
Course teacher:	Assoc.prof. Emir Nezirić		
Contact:	Room: O007 E-mail: emir.neziric@unmo.ba Tel.:+38736571258		
Student workload in hours:	Lectures weekly: 2 hours	Excercises weekly: 2 hours	Total: (30+30)
Number of ECTS credits:	ECTS: 6		
Base qualification:	Mechanical engineering		
Course status:	Mandatory		
Preconditions for Course:			
Limitations for Course:	None		
ECTS explanation:	60 in class (lectures, auditory excercises, labratory excercises) / 25 = 2,4 ECTS 25 hours of homework / 25 = 1 ECTS 15 hours of reading / 25 = 0,6 ECTS 50 hours of examples solving (home) / 25 = 2 ECTS TOTAL = 6 ECTS		
Course goal:	First goal is to provide the understanding the concept of the vibrations and to teach them basical mathematical tools to do the analysis of vibrations phenomena. Second goal is to teach the students the skills to do the modeling and analysis of different vibrational systems and phenomenas (i.e. rotating wheels vibrations, random vibrations imposed by terrain on the shock absorber, netural frequencies of structures, etc.). Modeling and analysis of different vibrational systems will be done though different approaches and techniques: D'Alembert principle, Lagrange's equation, Energy method, Morley, Rayleigh and Dunkerley method. Knowledge will be applicable to the different mechanical structures: vehicles, rotational machinery, pedestal structures, etc.		
Description of the general and speciffic competences (knowledge and skills) / learning outcomes:	After the completition of this course, students should be able to: 1. Analyse simple oscilations of particle, solid and flexible body; 2. Solve problems of motion and oscilations of solid body and system of particles using the laws of motion; 3. Calculate natural frequencies of the mechanical structures; 4. Calculate the impact of the different harmonic and non-harmonic forces (unbalance, missalignment bending force, bump forces) on the structures;		

Course contents:	1. Dynamics of systems of particles and solid body. Moment of inertia. D'Alembert principle for material system. Differential equations of solid body motion. 2. Solid body basic laws of motion. Momentum and conservation of momentum of solid body. Kinetic energy of and solid body. Work-energy relation for solid body. 3. Gyroscopic motion. 4. Elementary analytical mechanics. Introduction to theory of linear vibrations of discreete systems, natural frequency and types of vibrations. 5. Rectilinear vibrations of particle. Stability of mechanical system. Free vibrations of material system with single degree of freedom (SDOF), pendulum, torsional vibrations. 6. Energy method for equation of motion determination. Lagrange's equations of second kind. 7. Damped vibrations of material system with SDOF. 8. Forced vibrations of material system with SDOF, resonance, beating. 9. Unbalance as harmonic force, (balancing of wheel, balancing of flywheel). 10. Vibrations of mechanical system with finite number of DOF. Generalized coordinates and degrees of freedom od system of particles. 11. Vibrations of continuum. Transversal vibrations of string. 12. Axial vibrations of prismatic beam (shock absorber). Torsional vibrations of circular beam (transmission shafts). Transfersal vibrations of prismatic beam and vibration of the plates (chassis, structures). 13. Critical speeds of shafts. Morley, Rayleigh and Dunkerley method.
Form of teaching:	Lectures, auditory excercises, laboratory excercises
Other student obligations:	-
Items of Assesment:	Two partial tests during semester (7th and 15th week). Final grade: Attendance – 5%. Partial tests – 30%+30% = 60% Final exam – 35%
Base literature and references:	1. V. Doleček, A. Voloder, S. Isić: Vibracije, Sarajevo 2009. 2. S.P. Timošenko, D.H.Jang: Teorija oscilacija, Beograd 1966. 3. L. Meirowitz: Fundamentals of vibrations, McGRaw-Hill, NY (USA), 2001. 4. C.F. Beards: Structural vibration: Analysis and damping, Halsted Press, NY, 1996.
Course quality measurement:	Anonymous survey

DŽEMAL BIJEDIĆ UNIVERSITY OF MOSTAR
FACULTY OF MECHANICAL ENGINERING
STUDY PROGRAMME: Renewable energy sources

Course title:	**Electrical Vehicle engineering**		**Course code: 0000**
Study level, year, semester	Master		Year / Semester
Teacher:			
Contact details:	Consultations: Room number E-mail: name.surname@unmo.ba Tel.: 0000		
Teaching hours:	Lectures : 2	Exercises :2	Total (30+30)
ECTS-value:	6 ECTS		
Study programme:	Master level: Renewable Enbergy Sources		
Course status:	Elective		
Requirement:	None		
Restrictions:	--		
Structure of ECTS value	--		
Course objective:	To enable students to acquire basic professional knowledge and skills on the application and exploitation of electric vehicles in transport, as well as the E-car sharing system. The aim of the course is to train students to understand, analyze and apply the concept of e vehicles transport and transport, in order to develop and promote the concept of sustainable urban mobility.		
Course outcomes / competences:	✓ Acquisition of knowledge and skills for the ability to comprehensively understand the concept of e vehicles and also develop the concept of E engineering ✓ Gaining knowledge of the application of safety standards and regulations in E vehicles. ✓ Competence for practical application of acquired knowledge in real situations. ✓ Development of initiatives, e vehicles, and e mobility in engineering		
Course content:	1. Introduction to electric vehicles 2. Overview of legislation related to E vehicles 3. Electric vehicles in transport, exploatation and comparative analysis 4. Batteries for electric vehicles 5. Drive system of E vehicles 6. Charging stations for electric vehicles, classification, performance and risks 7. Safety aspect of electric vehicles 8. Mid-term test I 9. Risks and hazards when using and charging electric vehicles 10. Safety elements of the electric vehicle 11. E vehicles and environment, safety aspect of maintenance and battery disposal 12. Safety aspects relatet to servicing and maintaining electric		

	vehicles 13. Electrical vehicles in industrial plants 14. Devices for testing electronic systems in the vehicle 15. Mid-term test II
Teaching methods:	Lectures, Exercises
Other obligations of students (if they are required):	Seminar work
Knowledge assessment:	Knowledge assessment structure: Class attendance: 5 % Mid-term tests: 35 % Seminar work: 15% Final Exam: 55%
Literature:	– A. Sbihi and R. W. Eglese, Combinatorial optimization and Green Logistics, 4OR-A Quarterly Journal of Operations Research, 2007 – Basarić, V.: Model upravljanja raspodelom putovanja na vidove prevoza u funkciji održivog razvoja, Doktorska disertacija, Fakultet tehničkih nauka, Univerzitet u Novom Sadu, 2010. – Dalkmann H., Brannigan C.: Transport and climate change, Modul 5e: Sustainable transport: A sourcebook for policy-makers in developing cities, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn, Germany. 2007. – Gwilliam, K. (ed): Cities on the Move: A World Bank Urban Transport Strategy Review, Strategy Paper, Washington, DC: World Bank, 2001. – Integracija vozila na električni pogon (elektromobila) u elektroenergetski sistem i njihov utjecaj na poboljšanje kvaliteta zraka u dijelu Grada Sarajeva, Institut za saobraćaj i komunikacije d.o.o. Sarajevo, 2017 – J.-M. Timmermans, J. Matheys, J. V. Mierlo and P. Lataire, Environmental rating of vehicles with different fuels and drive trains: A univocal and applicable methodology, European Journal of Transport and Infrastructure Research, 2006 – K. Krawiec, S. Markusik, G. Sierpiński, Electric Mobility in Public Transport—Driving Towards Cleaner Air, Intelligent Transportation and Infrastructure, 2021 – L. Turcksin, O. Mairesse, C. Macharis and J. V. Mierlo, Encouraging Environmentally Friendlier Cars via Fiscal Measures: General Methodology and Application to Belgium, Energies, 2013 – Lah, O.: Sustainable Urban Mobility Pathways, Wuppertal Institute for Climate, Environment and

Energy & Climate Action Implementation Facility, Berlin, Germany, 2019.
- Legal regulation of national and lower levels
- Lindov O., Pikula B.: Electromobility models and sustainable urban development – Sarajevo case study, International Conference Towars a Human City, 2019.
- M. Mustafa, Planiranje u saobraćaju, prevozu i komunikacijama, Univerzitet u Sarajevu, Fakultet za saobraćaj i komunikacije, 2017
- Međunarodni i europski standardi u oblasti električnih vozila
- P. Eng., N. Enge, S. Zoepf, Electric Vehicle Engineering, 1st Edition, McGraw Hill, 2021
- Zietsman J., Rilett L. R.: Sustainable Transportation: Conceptualization and Performance Measures, Report No. SWUTC/02/167403-1, Texas Transportation Institute, The Texas A&M University System College Station, Texas. 2002.
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- F. Michael Ashby, Case Study: Electric Cars, Materials and Sustainable Development, 2016
- Gwilliam, K. (ed): Cities on the Move: A World Bank Urban Transport Strategy Review, Strategy Paper, Washington, DC: World Bank, 2001.
- J. Dižo and M. Blatnický, "Investigation of ride properties of a three-wheeled electric vehicle in terms of driving safety," *Transportation Research Procedia*, vol. 40, pp. 663–670, Jan. 2019.
- Lindov O., Pikula B.: Electromobility models and sustainable urban development – Sarajevo case study, International Conference Towars a Human City, 2019.
- Lah, O.: Sustainable Urban Mobility Pathways, Wuppertal Institute for Climate, Environment and Energy & Climate Action Implementation Facility, Berlin, Germany, 2019.
- Mehinović H., Mujezin H., Lindov O.: Enhancing competitiveness and innovation in the green and smart mobility, International Conference Towars a Human City,

	2019. – O. Lindov, Sigurnost u cestovnom saobraćaju, Fakultet za saobraćaj i komunikacije Univerziteta u Sarajevu, Sarajevo, 2008. – P. Van den Bossche, Safety considerations for electric vehicles, Citelec, Brussels Belgium – Q. Yu *et al.*, "Evaluation of the safety standards system of power batteries for electric vehicles in China," *Applied Energy*, vol. 349, p. 121674, Nov. 2023. – Q. He, Y. Yang, C. Luo, J. Zhai, R. Luo, and C. Fu, "Energy recovery strategy optimization of dual-motor drive electric vehicle based on braking safety and efficient recovery," *Energy*, vol. 248, p. 123543, Jun. 2022. – W. Mitchell, R. Chin, A. Sevtsuk, Chapter 11 - The Media Laboratory City Car: A New Approach to Sustainable Urban Mobility, Urban Energy Transition, 2008 pp: 267-282 – W. Li, J. Zhu, Y. Xia, M. B. Gorji, and T. Wierzbicki, "Data-Driven Safety Envelope of Lithium-Ion Batteries for Electric Vehicles," *Joule*, vol. 3, no. 11, pp. 2703–2715, Nov. 2019.
Quality assurance	Questionary survey among the students

„DŽEMAL BIJEDIĆ“ UNIVERSITY OF OSTAR FACULTY OF MECHANICAL ENGINEERING Study programme: Renewable energy sources			
stCourse title:	ENVIRONMENTAL PROTECTION ENGINEERING		Course code: -
Cycle level, year of study, semester	II cycle		Year of study: I/I semester
Teacher:			
Contact details:	Consultations: each day. E-mail: damir.spago@unmo.ba		Cabinet number: x Tel.:
Total number of course hours::	Lecture hours per week: 2	Hours of excercises per week: 2	Total number of hours (30+30)
ECTS point value:	6 ECTS		
Matric qualification:	Environment protection		
Course status:	Elective		
Competences	Students acquire competences for identifying, analyzing and evaluating negative emissions in certain parts of the environment as well as the basis for the implementation of measures to mitigate and prevent negative emissions into the environment. Students will be able to apply the principles of sustainable development and assess the carbon footprint of individual plants, plants and types of transport as well as reduce it after implemented measures.		
Content of the course:	1. Introduction (Basic concepts of environmental protection engineering) 2. Pollution of surface water 3. Surface water treatment 4. Soil and groundwater pollution 5. Groundwater treatment 6. Types of waste 7. Waste management (I colloquium) 8. Climate and energy 9. Air pollution 10. Air pollutant emission calculation 11. The impact of electromobility on air quality 12. Noise pollution 13. Light pollution 14. LCA and LCC 15. Principles of circular economy (II colloquium)		

Forms of teaching/learning methods:	Lectures Auditory and laboratory exercises Program/seminar
Other obligations of the student (if foreseen):	I colloquium - 40 points II colloquium – 40 points Seminar paper – 15 points Attendance at classes – 5 points (Total 100 pt).
List of basic literature and Internet web references:	1. Šećerov-Sokolović, R., Sokolović, S.: Inţenjerstvo u zaštiti okoline, Novi Sad, 2002. 2. Hodolič, J., Badida, M., Majernik, M., Šebo, D.: Mašinstvo u inženjerstvu zaštite životne sredine, Fakultet tehničkih nauka, Novi Sad, 2005. 3. Kiely, G.: Environmental Engineering, Mc Graw-Hill, 1998. 4. Husika, A., Jamaković , I., Toljević, A.: Kvalitet zraka, Mašinski fakultet Sarajevo, Sarajevo, 2017.
The method of monitoring the quality and success of course performance:	An anonymous survey among students about the success of teaching.

PELMOB

Funded by the European Union

Catalogue of Courses

University POLIS (UPOLIS)

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University of Pristina Kosovska Mitrovica

Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs

Call: ERASMUS-EDU-2022-CBHE-STRAND-2

Project Number: 101082860

PROJECT INFO

Project title	Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Project acronym	PELMOB
Project reference number	101082860/ERASMUS-EDU-2022-CBHE-STRAND-2
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Coordination institution	University of Mitrovica
Project duration	01 December 2022 – 30 November 2025

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Ref. no and title of activity	T3.3: Designing of EM courses
Title of deliverable	D3.3: Catalogue of courses
Lead institution	Óbudai Egyetem (OE)
Author(s)	Dr. Flora Krasniqi; Dr. Klodjan Xhexhi; PhDcand. Gregor Andoni; PhDcand. Albi Alliaj
Document status	FInal
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Dissemination level	Internal

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Version	Dates	Revision description	Responsible partner
v.01	08/31/2023	Draft	UPOLIS
v.02	11/29/2023	Draft	UPOLIS
v.03	02/13/2024	Final	UPOLIS

POLIS University/ U_POLIS

Today, POLIS marks 16 years of activity and can be considered a leading higher education institution in Albania in the fields of architecture, planning and design, civil engineering, environmental science, computer science as well as entrepreneurship and innovation, adopting an interdisciplinary approach while preparing students for a rapidly changing labour market through the incorporation of practice-based learning in various curricula.
POLIS represents an integrated structure consisting of main units, base units and other units, pursuant to the statute. The organizational structure of POLIS University distinguishes 3 (three) types of constituent organizational units:
a) The main unit is the faculty, i) Faculty of Architecture and Design; ii) Faculty of Planning, Environment and Management and iii) Faculty of Research and Innovation; each consisting in two departments and a research center.
b) The auxiliary units are laboratories, workshops, professional studios, etc.;
c) The inter-departmental center for Interdisciplinary, Research and Innovation Studies
Cooperating with European and international institutions through programmes ranging from Erasmus+ and Creative Europe to Horizon Europe, Polis has built long-term relationships with its collaboration partners, simultaneously enabling support and exchange of knowledge and capacities, thus spurring institutional growth.

1.1. Description of the study program

1.1.1. Name of study program and title

Study Program: Integrated Master of Science in Urban Planning and Management

1.2. The purpose of the study program

The integrated 5 years Master of Science program in "Urban Planning and Management" is a program delivered from the Faculty of Planning, Environment and Urban Management. The faculty had three main specialized courses respectively in Urban Planning, Environmental and Management Studies and Business Management studies. The 3 programs have been the main pillar for capacity building in the field of planning and the total reform of territorial planning legislation in the country, as well as territorial administrative reform, and regionalization towards the EU.

1.3. Objectives of the study program

Study Program: Master of Science in "Urban Planning and Management"
In summary, the objectives can be stated as follows:

- To enable students to recognize the history, concepts, knowledge and practices of urban planning area and develop an ability to evaluate and interpret urban and environmental problems.
- To provide a scientific background for further study or research.
- To enable students in integrating them into project courses based on co-designing concepts which involves different stakeholders, such as communities, local authorities etc.
- To acquire the knowledge and skills for employment in the public and private sector related to urban planning area.
- To open new horizons for this profession in Albania such as sustainable urban planning, transport planning, planning policies, environmental planning, mobility, place making, etc.

1.4. Competences of graduate students

- This planning program is designed as an integrated programme of the second level in addition it provides 300 credits and its duration is 5 years. The programme provides a comprehensive array of topics covering not only urban design but also planning theory, economics, local finance, housing, transportation, EU territorial policies, sustainable development, environmental planning, etc
  Designed and set up in accordance with the institutional objectives, the Integrated Program of Master of Science studies in "Urban Planning and Management", has been established with a local and European mentality and focus. As one of the unique programs of its kind in Albania, the curriculum has been initially designed referring to European models and adopted to the specific Albania context. Therefore, it includes case studies in EU level or inter-regional / cross-border level but most of the projects are based within Albania, where the spatial focus covers spatial planning, regional development and neighbourhood.

1.5 Quality, modernity and international compliance

Project-based learning and laboratory work. Many of the research projects are proposed by staff members in their areas of interest. These projects are then developed in collaboration with multiple local and European partners each providing facilities, subject experts, laboratories or academic staff to ensure continuity. Some of the lectures or studios/laboratories/seminars are offered in English for the subjects or modules of the program which are developed by foreign lecturers. These professors come from universities with which U POLIS has cooperation agreements.
The teaching methodology is subject to continuous change and improvement. Academic staff continuously try to convey knowledge in the most suitable and attractive forms for students, here we can mention games theory, scenarios, lecture, group work, stimulations, court cases, use of applications or technologies, practices, etc. Especially for the last two years, Polis and its staff have experimented with virtual classrooms, remote control to demonstrate problem solving, virtual meeting place and many other forms to encourage student engagement, but also to provide support especially during the pandemic.
POLIS University has a great advantage and support thanks to the unit of projects and international exchanges thanks to local, bilateral and international projects, especially Erasmus+, Horizont, AKSHi, etc. POLIS is one of the most successful institutions in the participation and management of many projects financed by the European Commission. This fact guarantees exchanges, further qualifications and laboratory practices for academic, research, administrative staff and students.
The International Doctorate Program in Architecture and Urban Design has guaranteed the career advancement, renewal and refresh of the qualification of an important part of the academic staff, positively influencing the overall quality of the study program as well as its sustainability.

1.6. Subjects for innovation-modernize and new subjects

1.6.1 Existing Subjects for modernize – innovation

Since the study program does not have the full competencies to the related field of the electrical mobility, it has been foreseen that for the existing elective courses it can be identified three of them to be reorganized or modernized following the below structure of the syllabi (the courses in yellow).

Elective Course 1:	Urban Planning Laboratories 2	6 ECTS
Elective Course 2:	Public Services and Local Finance	6 ECTS
Elective Course 3:	Local Government and Urban Legislation	6 ECTS

Elective Course 4:	Urban Planning Laboratories 1	6 ECTS
Elective Course 5:	Marketing City	3 ECTS
Elective Course 6:	Environmental impact assessment	6 ECTS
Elective Course 7:	Coastal zone management	6 ECTS
Elective Course 8:	Strategic Environmental Assessment	6 ECTS

1.6.2 Syllabuses table of planed courses of EM curricula

The most important deliverable is development and implementation of EM curricula, in the table below named Syllabuses table are listed study programmes, study program level, courses and number of ECTS, which each of WB HEIs plans to incorporate into the curriculum during the project lifetime.

Syllabuses table: Polis University

Modernize the existing course *Strategic Environmental Assessment (Elective Course 8)* **to new course** *Electric and Hybrid Vehicle System Technology* **Faculty:** Planning, Environment and Urban Management **Department:** Urban Planning and Management	As energy based on fossil fuel sources is becoming scarcer than ever, there already are practices that allow for more energy-efficient consumption such as electric or hybrid vehicles. The development of the next generation of fuel-efficient and environmentally responsible advanced electric and/or hybrid vehicles is one of the many nations' top priorities. This course will enable students to understand and analyze the current technology used in vehicles and those used in electric and hybrid ones. Students will understand the environmental impact assessments of both systems and be able to create solutions from sceneries that are relevant to achieving sustainability goals This course will provide general but essential information on Strategic Environmental Assessment (SEA). It will explain the evolution of the SEA concept, the birth of this concept in the European Union, and the implementation so far; areas of application such as application in Albania (evolution of the concept in the last two decades, case studies, etc.). At the same time, students will learn the instruments of use in practice in cases of	6 ECTS

	drafting a special Strategic Environmental Assessment report for plans and programs. The proposed modernized course attempt to focus in the main following lines: *Electric Propulsion Systems* *Electric Motors and Battery Systems* *Hybrid Powertrains* *Parallel Hybrids* *Series Hybrids* *Power Split or Series-Parallel Hybrids* *Regenerative Braking* *Charging Infrastructure* *Vehicle-to-Grid (V2G) Technology* *Energy Management Systems* *Materials and Lightweight Design* *Advanced Electronics and Sensors* *Government Incentives and Regulations*	
Modernize the existing course *Public Services and Local Finance (Elective Course 2)* **to new course** *Entrepreneurship and business* **Faculty:** Planning, Environment and Urban Management **Department:** Urban Planning and Management	As innovation is a driving force in the development of new and sustainable markets, smart business practices and financial management, including fundraising, and start-up practices as of essential importance. The students will understand the fundamentals of management and business administration; business functions: accounting, marketing and sales, organization, industry analysis, business units, and strategy. The students will get acquainted with the concepts of supply chain management, distribution and logistics, production and quality, and personnel. Business planning is already a very widespread concept in the literature and practice. All organizations, whether private or public, need to plan their future and determine how they will achieve their medium or long-term goals. Successful planning must materialize in a written document, the Business Plan (BP). The design of the BP represents an essential element in the private sector, aiming to attract funds, find strategic partners, orient human resources towards objectives and beyond, and define a general line for achieving the objectives. Business	6 ECTS

	planning is just as important in the public sector, although the motivation on which it would be based is somewhat different. The proposed modernized course attempt to focus in the main following lines: *Entrepreneurial Characteristics* *Business Idea Generation and Plans* *Legal and Regulatory Considerations* *Business Structure* *Permits and Licenses* *Financing:* *Startup Capital* *Funding Sources* *Market Research* *Branding and Positioning* *Operations and Management* *Business Operations* *Team Building* *Technology Integration* *Risk Management* *Identifying Risks* *Mitigation Strategies* *Innovation and Adaptability* *Social Responsibility and Sustainability*	
Modernize the existing course *Local Government and Urban Legislation (Elective Course 3)* **to new course** *Energy and Smart Urban Planning Policy*	The course is developed in one (1) semester. it contains a partial program of public law and its branches, constitutional law, administrative law, and legal urban planning. The course focuses on general legal knowledge of the main concepts of democracy, state, basic functions of public administration, the principles of functioning of this administration, the main bodies in the field of urban planning which are part of Administrative Law which summarizes a complex of norms that regulate the planning and use of the territory. The urban legal framework, ie the regulation of territory as a concept was born in the modern era, to correct and manage the negative effects of derivatives of industrial cities, and this proves once again that urban law is a new complex right rule of law. In conclusion, with the completion of the	6 ECTS

Faculty: Planning, Environment and Urban Management **Department:** Urban Planning and Management	course, it is intended that the student has acquired the sufficient and necessary knowledge of the main mechanisms of functioning of public administration, mainly of bodies operating in the field of urban planning, and a mindset of a necessary legal culture in the future. The course's main objective is to provide students with basic knowledge of urban law and legislation. Legal frameworks stand at the cornerstone of the infrastructures that need to be regulated for the development of smart cities, practices, and technologies within and outside of energy utility and urban planning. This course will enable students to recognize the fundamentals of Civil, Private, and Commercial Law as well as Public Law and its role in regulating the transport-related industry; finally, the students will get acquainted with the governance and regulatory framework of today's transport systems, on global, EU and local levels. The proposed modernized course attempt to focus in the main following lines: *Renewable Energy Integration* *Incentives and Mandates* *Smart Grids* *Transportation Planning* *Electric Mobility* *Green Spaces and Urban Design* *Mixed-Use Development* *Technological Integration* *Smart City Technologies* *Energy Management Systems* *Community Engagement* *Public Awareness* *Resilience and Adaptation* *Regulatory Framework*	

1.7. The connection between competences and subjects

Professional competence

During the last decade, many governments have announced new climate change mitigation commitments that include national or regional commitments to reduce their carbon emissions in the 2025-2035 timeframe. Furthermore, the Commission's proposal to reduce greenhouse gas emissions by at least 55% below 1990 levels by 2030 puts Europe on a responsible path to becoming climate neutral by 2050.
The underlying government planning efforts and national actions do tend to be linked with a major transformation in the transport sector toward advanced efficiency technology with a shift to lower-carbon energy sources and electric vehicles.
Based on the EEA report on electric vehicles, it was found that electric vehicles emit approximately 17-30% less greenhouse gases compared to petrol and diesel vehicles. Furthermore, as the production processes for electric vehicles continue to improve and the generation of electricity becomes cleaner, it is projected that the overall emissions of a typical electric vehicle throughout its lifespan could be reduced by at least 73% by the year 2050.
However, many governments have announced that their original goals will not be met for a variety of reasons, amongst which one of the most important is the lack of skilled and trained personnel with sufficient level of knowledge in this area.
The PELMOB Project has as a goal of the modernization of WB HEIs study programs through introduction of new electric vehicles related courses at the bachelor and master levels of education in WB HEIs. It will be done through creation of new or modernization of existing study programs at bachelor/master levels, in order to create new professionals in the field of EM. Furthermore, an integral approach of multidisciplinary competences and skills is needed to meet the commitments on climate changes. These competences and skills will support the faster development of the EM in the WBC.
Three group of competences for the e-mobility are discussed: Intrapersonal competence, Engineering competence and Interpersonal competence.

2. Intrapersonal competence

Adaptability, self-management, self-esteem, resilience, and time management are the key factors of this competence. This mindset is also known as intrapersonal intelligence. Electrical mobility requires a mix of intellectual, creative, and critical thinking as well as ethical and moral concerns. These characteristics will enable to significantly advance in the field while upholding a strong commitment to security, sustainability, and the general welfare of society. While preserving our flexibility to embrace new standards, a passion for self-directed, lifelong learning is a vital advantage in developing electrical mobility toward a cleaner, and more sustainable future. Engagement in self-analyses, reflections on the goals and accomplishments and life plans will help to overcome the electric mobility problematic.

1. Self-directed, Lifelong Learning

The following competences are useful within this topic:

- Determine your preferred learning style in electric mobility.
- Encourage a positive and self-directed mentality. You must have the mindset that you can continue to study throughout your life if you want to be a lifelong learner in the field, and Surround yourself with other lifelong learners.
- Continually searching to join taking part in continuous educational opportunities and keep in touch with the current and the newest developments in: 1. Electrical mobility, 2. EV technology, and related disciplines.
- Keeping up with local, regional, and federal rules, laws, and incentives relating to electric mobility as they change.
- Making choices concerning the adoption of electric vehicles requires an understanding of government programs, tax incentives, and subsidies in Albania.

2. Ability to follow new standards

- The majority of knowledge-based activities largely rely on technology. The primary problem, however, is that these abilities must be integrated into the field of knowledge where the activity is being conducted.
- Being aware of and adhering to the most recent safety standards, laws, and regulations pertaining to electric cars and electrical mobility.
- Swift standard-change adaptation, with corresponding modifications to EM procedures, designs, and tactics.
- Keeping precise records of standard compliance, including test results, certificates, and safety evaluations.
- Recognizing potential interactions between new standards and other key disciplines including energy management, battery science, and charging infrastructure.

3. Intellectual, Innovative, Critical Thinking

- In addition to new research, technological advancements, and the quick distribution of concepts and methods via the Internet, knowledge is also changing quickly due to an increase in information sources and a wide range in the information's validity or dependability.
- Excellent intellectual ability, an inventive mentality, and critical thinking abilities define intrapersonal competency in electrical mobility.
- Expanding knowledge of energy management systems, charging infrastructure, and electric car technologies should be the aim of this competency.
- It's critical to find effective answers to challenging issues in the area of electrical mobility.

- Identifying prospective developments and enhancements in current methods and technology should to be a part of this competency.

4. Ethical

- This is necessary to establish trust, which is crucial in informal social networks, but it is also wise business practice in a world with many diverse participants and a growing dependence on others to achieve one's own aims.
- Professionals must be dedicated to making sure that work complies with the highest moral principles, making safety, environmental sustainability, and social responsibility a priority.
- To secure consumers and the environment in accordance with Albanian government regulations, it is crucial to keep ethical standards in mind when developing and implementing electric cars and accompanying infrastructure.

5. Conscientiousness

- The ability to locate, assess, analyze, apply, and distribute information within a specific context is a crucial competency in a knowledge-based society.
- We are guided by our conscientious nature to be comprehensive, responsible, and precise in our work with electrical mobility.
- Stakeholders should carefully investigate, organize, and implement EM initiatives, ensuring that all components conform to applicable standards and laws.
- The careful consideration to detail and emphasis on accuracy in EM contribute to the successful development and deployment of electric cars that exceed the highest quality as well as security requirements.

2. Engineering competence

Our engineering competences will help to better understand the electric mobility in cities. Professionals with engineering skills are well-equipped to contribute considerably to the development and progress of electrical mobility. We are able to solve complicated issues in this fast expanding industry because of our technical competence mixed with scientific and mathematical understanding. Furthermore, will be envisioned and build cutting-edge solutions that can impact the future of electric mobility, making it more efficient and sustainable. The incorporation of electric mobility in Albania requires time and effort due to lack of electric infrastructure. Overcoming such issue is a real challenge in Albanian context not just for engineers but also for the other actors within the country.

2.1. Technical, Analytical

- A solid technical basis in electrical mobility is required, including understanding of electric vehicle systems, power electronics, charging infrastructure, and battery technologies.
- Analyze complicated technological challenges connected to electric transportation and utilize knowledge to find efficient solutions.
- Economic Barriers- high costs
- Regulatory Barriers- Characterization of EV charging activity Tariff related issues
- Technical Barriers- Charger standards and protocol issues, Grid stability issues, Battery performance issues.
- Informational Barriers- Lack of awareness, Range anxiety.

2. Scientific

- Understanding the basic concepts underpinning electric car technology and electrical mobility requires scientific expertise.
- The scientific theories behind battery chemistry, electric motor effectiveness, electronic systems, and other components of electric mobility should be thoroughly understood by academic personnel.

3. Mathematical

- In electrical mobility engineering, mathematical expertise is crucial. It is crucial to simulate and assess electric vehicle performance, energy consumption, and charging efficiency using mathematical methods.
- Real time applications and measurements using mathematical problems.

4. Innovative, Creative, Design Thinking

- Clarify, ideate, develop, and implement knowledge and design in electric mobility.

- The need for creativity, inventive problem-solving, and the design thinking methodology enable professionals to imagine novel concepts in electrical mobility.
- It is crucial to always look for new approaches to enhance the sustainability, usability, and performance of electric vehicles.

3. Interpersonal competence

The capacity of students to connect with others and the larger society is the emphasis of the interpersonal competency domain. The capacity for interdependence and collaboration, as well as the ability to establish and sustain healthy, mutually beneficial relationships with others, are all components of competence in this area.

Electrical mobility get used of interpersonal competencies in order to concentrate on effective communication, teamwork, leadership, project management, and cross-cultural competency. These characteristics will help to successfully interact with people from various backgrounds in the search for cutting-edge and sustainable electric transportation solutions. They also will enable to manage teams toward common goals. The development of electrical mobility benefits greatly from the ability to forge strong working connections and foster inclusive workplaces. Due to the continuing evolution of the information base, this process is ongoing in knowledge-based work.

1. Communication

- We need to incorporate social media communication abilities in addition to the traditional communication skills of reading, speaking, and writing effectively and eloquently.
- The capacity to communicate information properly, receive and incorporate comments from a large group of people via the Internet, and see trends and ideas from other sources.
- Strong communication abilities are a defining trait of interpersonal competency in electrical mobility.
- Colleagues, students, stakeholders, and the general public are just a few of the several audiences that team members must successfully communicate difficult technical ideas linked to electric cars and electrical mobility to.
- To ensure that information is properly comprehended, it is crucial to use clear, simple language.
- Collaboration with persons from various backgrounds and technical competence is made possible through communication skills.

2. Teamwork

- Professionals rely largely on cooperation and the exchange of knowledge with others in similar but autonomous organizations, even though numerous knowledge professionals operate independently.
- Knowledge professionals must be able to collaborate electronically and remotely with coworkers, clients, and partners.

- Collective knowledge, problem-solving, and execution necessitate effective cooperation and flexibility in accepting assignments or resolving issues that may fall beyond the authority of a certain job description but are nevertheless crucial for success.
- Recognizing the importance of teamwork and actively participating in collective efforts in electrical mobility.
- Recognize others' contributions, pay attention to other viewpoints, and foster a supportive team environment.
- To achieve shared objectives for electric transportation initiatives, a cooperative and productive environment is fostered by willingness to share expertise and support for colleagues.

3. Leadership, Project Management

- The capacity to influence and direct followers or members of a group, organization, community, or team is known as leadership.
- Leadership and project management in electrical mobility efforts also require interpersonal ability.
- To effectively manage teams and assume leadership responsibilities, team members need to have the necessary leadership skills.
- Electric mobility projects may be planned, organized, and carried out effectively with the help of strong project management abilities.
- Project results are successful when activities are delegated, priorities are established, and resources are managed effectively.

4. Social, Intercultural

- Beyond technical considerations, interpersonal competency in electrical mobility includes social and intercultural competencies.
- Members of the team must be skilled at negotiating a variety of cultural contexts and promoting inclusive settings.
- Effectiveness in projects using electric mobility is increased by the capacity to adjust communication and cooperation methods to fit various cultural situations.
- Successful relationships and cooperation with HEI stakeholders in Europe depend on multicultural skills.
- Social skills can facilitate interaction and communication with others where social rules and relations are created, communicated, and changed in verbal and nonverbal ways.

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Catalogue of Courses

"Aleksander Moisiu" University of Durrës (UAMD)

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University of Pristina Kosovska Mitrovica

Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Call: ERASMUS-EDU-2022-CBHE-STRAND-2
Project Number: 101082860

Project info

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Project acronym	PELMOB
Project reference number	101082860/ERASMUS-EDU-2022-CBHE-STRAND-2
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Lead institution	Óbudai Egyetem (OE)
Author(s)	Alma Golgota, Eduard Ndokaj, Erion Mali, Alma Stana, Flora Merko, Luada Muco, Luiza Lluri
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Dissemination level	Internal

VERSIONING AND CONTRIBUTION HISTORY

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v.01	11/22/2023	Final	UAMD

CONTENTS:

1. INTRODUCTION

1.1. About HEI "Aleksandër Moisiu" University, Albania-UAMD, Faculty of Professional Studied - FSP, Durrës

Faculty of Professional Studieds, Durrës (FSP/UAMD) is established 2006, in Durrës, Albania. The FSP/UAMD is one of the faculty of the "Aleksandër Moisiu" University, Albania-UAMD which is opened on 2005 . One of the Departament of FSP is the department of Engineering Science and Maritime - DSID

The main goal of the DSID/FSP/UAMD, as a part of the UAMD, is the education of graduate professional asistent engineers in traffic, communications and logistics based on the most modern knowledge (theory and practice) in the field of railway, road and safety, land and maritime transport, communications and logistics. The Faculty is accredited and licensed for professional studies programs.

Our Departament offers :

- The study program "Automobile Technology"-TA , was opened by decision of the Minister on 13/04/2007, no. prot 2502.
- The study program " Management Transport Land / Maritime " – MTDT, is opened by decision of the Minister on 13/04/2007, no. prot 2500
- The study program " Management Construction " – MN
- The study program " Electrical Technic " – TE

These sydies programs are under the process of accreditation.

For Albania, as an ecological country with strategic directions of development "tourism and eco-economy", traffic is determined as a basic factor in the realization of those strategic directions. The evident lack of professionals in the field of traffic, communications and logistics defined the mission of the Faculty as professional asistent engineers in traffic, communications and logistics based on the most modern knowledge (theory and practice) in the field of railway, road and safety, land and maritime transport, communications and logistics, based on modern knowledge (theory and practice), which will to be able to develop the transport system of Albania and to effectively include it in the European and world transport system".

1.2. Study program

The studies programs of professional studies are called
"Automobile Technology"-TA,
" Management Transport Land / Maritime "-MTDT,

- Study program "Automotive Technology"- (TA)

This program is designed to impart to students the appropriate professional skills so that they can be successful in the labor market. The 2-year specialist study program in the "Automotive Technology" branch creates a number of opportunities to make a career in the professional field. This study program enables employment in the private and public sector, as it creates complete knowledge of vehicle systems by solving many of its problems.

- The training and education of future professionals in the field of vehicles, studying in detail the mechanisms and systems of the vehicle, the most frequent problems and defects encountered in all joints and details of the vehicle.

- Close familiarity with the kinematic schemes of operation of the main joints of the vehicle, early diagnostics and technical services necessary for the life and safety of the vehicle in professional practices.

Within this Study program, the following modules are formed: Road traffic and safety, land and maritime traffic, Railway traffic. Electronic Communications, Logistics and Management. Study program is based on the latest scientific knowledge and practice and enable the education of engineers who will be able to manage and control processes and systems in various areas of traffic, communications and logistics. In doing so, special attention is paid to the fact that professional asistent engineers acquire knowledge that will represent a good basis for practical work , but also applied knowledge and skills that enable them to be successfully included in traffic, communication and logistics companies.

Where can you get a job after completing your studies?

The 2-year program in "Automotive Technology" develops a series of practical and managerial skills, in order to make the right decisions in vehicle service centers, technical control centers, or in various car showrooms where they can work. The acquired knowledge is of general theoretical-practical training in the field of vehicle technology. At the end of the program, the student benefits from the knowledge and skills of a specialist in the field of vehicles (maintenance-service-repair-vehicles, inspectors of Technical Vehicle Control Centers, technical assistants in the field of vehicles, managers in car dealerships, collators and technical controllers in various mechanical offices in both the private and public sectors.

- study program “Maritime and land transport management” (MTDT)

This program is designed to impart to students numerous professional skills necessary for them to be successful in the labor market. The 2-year study program in "Maritime/Land Transport

Management" creates a number of opportunities to make a career in the professional field. At the same time, it enables employment in the private and public sector, as the program creates complete knowledge of agencies and companies or entities of the transport of passengers and goods, both by sea and by land and air.

The training and education of future professionals in the field of transport, studying in detail the problems of sea and land transport in our country, their models for sustainable and environmentally friendly transport; the interweaving of transport modes to be integrated into the network of road corridors and maritime highways of the countries of the region and the common European space; the benefits that our country has from transportation.

In the implementation of the Study program, the contemporary literature is used and leading teaching staff in the field of traffic, communications and logistics from the country and the region are engaged, with the aim of continuous improvement of the teaching programs of each of the Modules. Just looking at the aforementioned scientific disciplines indicates that at FSP/UAMD, future engineers get a wide range of general and specialized knowledge, which comprehensively educates them and makes them desirable high-quality personnel in the field of land and maritime road traffic.

Where can you get a job after completing your studies?

The 2-year program in "Transport Management Marine/Land" develops a series of skills, such as practical and managerial ones, in order to make the right decisions in agencies, companies or different entities of the transport of goods and passengers, such as sea and land, in the local units in the offices of transport services. The acquired knowledge is of general formation theoretical-practical in the field of transport. At the end of the program, the student benefits from the knowledge and skills of a specialist in the field of transport, assistants, managers in different agencies and companies in the private and public sectors.

1.3. Improvement of the studis programs

Based on the EEA report on electric vehicles[1], it was found that electric vehicles emit approximately 17-30% less greenhouse gases compared to petrol and diesel vehicles. Furthermore, as the production processes for electric vehicles continue to improve and the generation of electricity becomes cleaner, it is projected that the overall emissions of a typical electric vehicle throughout its lifespan could be reduced by at least 73% by the year 2050[2].

[1] https://www.eea.europa.eu/publications/electric-vehicles-from-life-cycle
[2] https://www.eea.europa.eu/en/topics/in-depth/electric-vehicles

However, many governments have announced that their original goals will not be met for a variety of reasons, amongst which one of the most important is the lack of skilled and trained personnel with sufficient level of knowledge in this area.

The PELMOB Project has as a goal of the modernization of WB HEIs study programs through introduction of new electric vehicles related courses at the bachelor and professional levels of education in WB HEIs. Albania is the country on the way to EU and try to follow the EU path related to EM. It will require adaptation and modernization of HIEs stady program. The UAMD as a partner in PELMOB project takes the steps towards this goal. It will modernized the Professional Studies programs. It will be done through creation of new or modernization of existing study programs at professional levels, in order to create new professionals courses in the field of EM.

In this sense, the Departament of the " Engineering Science and Maritime " -DSID / FSP, made a decision No.02 on date 19.10.2023. to modernize the courses shown in Table 1 and to introduce the new couses as it is shown in Table 2.

Table 1. *Overview of courses being moderniyed on the professional study being introduced for PELMOB in* **Study program "AUTOMOBILE TECHNOLOGY"- TA , 2-Year Study Program, Professional Diploma**

No.	Courses	S/Y	Course Status	Hours/ week			ECTS
				L	E	Oth.	
FIRST/SECOND YEAR							
1.	1.1 Alternative food plants in vehicles- new	1/ 2	O	3	1	-	6
2.	6.2 Vehicle construction elements - modernize	2/1	E	3	3		8
3.							
						Total ECTS=	**14**
NOTE: designations: S= semester; L= lectures; E= exercises; Oth.= other types of lectures; ECTS= number of ECTS credits; Status of the course: O= obligatory: Z= elective; Y- year academic. Elective courses: the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.							

Table 2. *Overview of courses on the professional study being introduced for PELMOB in* **STUDY PROGRAM:** "Management Transport Land / Maritime"- MTDT, **2-YEAR STUDY PROGRAM Professional Diploma**

No.	Courses	S/ Y	Course Status	Hours			ECTS
				L	E	Oth.	
FIRST/SECOND YEAR							
1.	2.1 Management of transport terminals- new	1/2	O	3	3	-	8
2.	3.1 Environment and transport- modernize	2/1	O	3	3	-	8
3.	4.2 Operation of Transportation Systems- moderation	1/2	O	3	3	-	8
4.	5.2 Vehicle parks and road safety-new	1/2	O	3	3		8
						Total ECTS=	**24**
NOTE: designations: S= semester; L= lectures; E= exercises; Oth.= other types of lectures; ECTS= number of ECTS credits; Status of the course: O= obligatory: E= elective; Y- year academic . Elective courses: the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.							

Table 3. *Overview of courses being moderniyed on the professional study being introduced for PELMOB in* **Study program *"Electronic equipment specialist"- EES* , 2-Year Study Program, Professional Diploma**

No.	Courses	S/Y	Course Status	Hours/ week			ECTS
				L	E	Oth.	
FIRST/SECOND YEAR							
1.	Sensors And Transducer	2/ 1	O	3	-	-	6
2.							
						Total ECTS=	**6**
NOTE: designations: S= semester; L= lectures; E= exercises; Oth.= other types of lectures; ECTS= number of ECTS credits; Status of the course: O= obligatory: Z= elective; Y- year academic. Elective courses: the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.							

1.4. Competences

The requirements for the competences of EV experts in transport sector are very broad. Skills for integral management of the EM, technical knowledge for dealing with EV, management of everyday problems, challenges and risks, are important elements in the scoupe of modernized and new couses require set of competences. In addition, soft skills are necessary, including appropriate manners during communication and presentation, as well

as experience in project management. Based on the Developed Catalogue of Competencies, competences for the modernized and new courses of the Module "Road Traffic and Safety" are defined, and shown in Table 3.

Tabele 3. *Competence of modernize and new PELMOB courses*

Competencies		Mandatory MS/Elective subjects ES					
		IP1	IP2	IP3	IP4	IP5	IP6
Generic competencies	Capacity for analyses and synthesis	X	X	X	X	X	X
	Capacity for applying knowledge in practice	X	X	X	X	X	X
	Oral and written competencies	X	X	X	X	X	X
	Development of computer competencies	X	X				
	Development research skills	X	X	X	X	X	X
	Managing information skills	X	X	X	X	X	X
	Critical and self-critical abilities	X	X	X	X	X	X
	Capacity for adopting to new situations	X	X	X	X	X	X
	Capacity for generating new ideas (creativity)	X	X	X	X	X	X
	Solving problems	X	X	X	X	X	X
	Teamwork	X	X	X	X	X	X
	Leadership				X		X
	Ability to work in a multidisciplinary team	X	X	X	X	X	X
	Ability to communicate with people in the field				X		
	Initiative and entrepreneurial spirit				X		X
	Integrity and ethical commitment	X	X	X	X	X	X
	Making Decisions	X	X	X	X	X	X
	Synthesis of information to determine the perspective of a problem or trend in traffic safety				X	X	X
	Holistic and proactive approach	X	X	X	X	X	X
	Recognizing differences	X	X	X	X	X	X
	Awareness of workload and limitations	X	X	X	X	X	X
	Awareness of professional responsibilty	X	X	X	X	X	X
Subject-specific competencies	Awareness of the importance of traffic safety of the EM for development of society	X	X	X	X	X	X
	Understanding of the principals of traffic safety systems and defining activities as their response			X	X	X	X
	Understanding requirements and needs of safety systems	X	X	X	X	X	X
	Understanding of traffic safety systems for EV as well as systems components			X	X	X	X
	Understanding the relationship between EM activity and the public	X				X	X

	Understanding the role of regulatory bodies in road safety for EM	X	X				
	Recognizing traffic safety management as a key factor to sustainability of the EM				X		

1.5. Quality, modernity and principles

The professional study program of the Road Traffic and Safety Module is in accordance with European trends and the status of the profession and science in the corresponding educational and scientific field and is comparable to similar programs in foreign and higher education institutions. Harmonization of the modernized Study program for the EM student acquires knowledge, skills and abilities that enable the achievement of competences and learning outcomes required in the Pelmob.

The study program is aligned with the goals of the ERASMUS+ Project Pelmob.

Also, the principles from the Reaccreditation of the Studies Programs for the period 2023-2027 were applied, that each course lasts one semester, has a credit system, electives and does not require new accreditation.

2. SYLLABUSES OF MODERNIZED COURSES AND WORK PROGRAM

The new couses are created in accordance with HEI principals by respective professors and associators and discussed with industries. The modernized and new courses were confirmed by the Decision of the Faculty Council on 13.12.2023 and will be implemented in Curriculum and Courses of 2 study programs, in academic year 2023-2024 and 2024-2025 academic years.

2.1 Syllabuses of the courses

Alternative Food Systems in Vehicles – new course

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UNIVERSITY "ALEKSANDĀR MOISIU" DURĂŠ
FACULTY OF PROFESSIONAL STUDIES
Departmentof Engineering and Marine Sciences

Address: Neighborhood No. 1, "Taulantia" Street, Durrës, Tel: +355 52 39161, www.uamd.edu.al,

APPROVED

Head of the Department

Dr. Ing. Alma GOLGOTA

COURSE SYLLABUS:
Alternative Food Systems in Vehicles

Study Program 2-YEAR
PROFESSIONAL DIPLOMA
AUTOMOBILE TECHNOLOGY

Subject teacher: Dr.cand. ING. Eduart NDOKAJ

DURRS, 2022-2023

COURSE PROGRAM: Alternative Food Systems in Vehicles

Subject head/teacher:Msc.Ing Eduart NDOKAJ
loads: 6 ECTS credits, 60 hours in the auditorium (45 hours of lectures + 15 hours of seminars), (3 hours of lectures + 1 hour of seminar per week), 60 hours outside the auditorium of independent student work.
Subject typology: Basic subject, A
Academic Year/Semester when it takes place: 2022-2023/ First semester /**second year**
Subject type: Obligatore
2-year study program: AUTOMOBILE TECHNOLOGY
Subject code: TA 240
E-mail address of the subject holder/pedagogue: lovatogasalbania@yahoo.it

CODE OF ETHICS

During this course, students must:

a. To implement the lesson schedule and adhere to the rules sanctioned in the Statute and Regulations of "Aleksandër Moisiu" Durrës University.

b. present themselves in a serious and dignified manner in the premises of the institution, which means an appropriate dress.

c. To use appropriate vocabulary, with regular intonations according to the norms of Ethics, morality and courtesy.

d. To respect the academic staff, academic support staff (laboratory) and administrative staff, friends and the rules of the lesson. To address the academic staff, academic assistant and administrative staff in the second person plural as well as with the relevant academic titles.

e. Not to perform provocative or harassing actions and gestures towards the academic staff in the premises of the institution.

f. Not to copy someone else's work, not to fabricate data and to respect the dignity and human and professional integrity of other students.

g. Not to consume alcoholic beverages or tobacco in the premises of the institution.

h. Not to use cell phones or keep them turned off and out of sight during class or exam hours in the auditorium.

i. To use the textbook during the exam schedule, only if this action is approved by the faculty, (or) the relevant unit or the subject lecturer.

SUMMARY AND LEARNING OUTCOMES

- The subject Alternative Food Systems in Vehicles is a subject of the basic training of the program, which provides students with general knowledge on the latest developments in the sector of Vehicles, their Maintenance and Repair.
- *The subject is divided into lectures and seminars. These hours will help students to be updated with technological innovations in the field and the future of this sector.*

BASIC CONCEPTS*:*

- GPL Gas Plants
- CNG gas plants
- Food System in Electric Cars
- Food System in Hydrogen Cars

- Food System with Biomass, Biogas, etc.

COURSE TOPICS
Topic I –Alkanet-GPL. GPL cylinders. Certification. Periodic inspection **Lb**Lecture no. 1, [1–18]. **No. 1**, [12-18].
Topic II– GPL valves. GPL electrovalves. GPL pipes **Lb**Lecture no. 2, [19–32]. **No. 1**, [19-26].
Topic III–GPL Electric Plant **Lb**Lecture no. 3, [33–45]. **No. 1**, [40-47].
Topic IV–ECU-GPL. Plant Programming and Diagnostics. Economic and Ecological Benefits. **Lb**Lecture no. 4, [46–60]. **No. 1**, [50-61].
Topic V–Alkanet-CNG. CNG cylinders. Certification. Periodic inspection **Lb**Lecture no. 5, [61–75]. **No. 2**, [31-39].
Topic VI–CNG valves. CNG solenoid valves. Pipes **Lb**Lecture no. 6, [76–89]. **No. 2**, [40-47].
Theme VII–CNG Power Plant **Lb**Lecture no. 7, [90–105]. **No. 2**, [51-61]. **Intermediate exam. Assignment of course assignments.**
Theme VIII–ECU-CNG. Plant Programming and Diagnostics. Economic and Ecological Benefits **Lb**Lecture no. 8, [106–117]. **No. 3**, [53-58].
Topic IX– Electric Cars. Statistics and Developments **Lb**Lecture no. 9, [118–130]. **No. 3**, [60-71].
Theme X–Electric Car Batteries. Evolution and the Future **Lb**Lecture no. 10, [131–142]. **No. 1**, [110-121].
Topic XI–Electric Motor and Complementary Accessories. **Lb**Lecture no. 11, [143–155]. **No. 4**, [16-26].
Theme XII– Scheduled and Accidental Services in Electric Cars **Lb**Lecture no. 12, [156–168]. **No. 4**, [29-37].
Theme XIII- Hydrogen cars. Developments and possible future.

LbLecture no. 13, [169–183]. **No. 5**, [65-75].
Theme XIV– Biogas & Biomass. Energy efficiency. Sector developments **Lb**Lecture no. 14, [184–198]. **No. 1**, [133-142].
Topic XV –Ecological Benefits of Electric, Hydrogen, Biogas and Biomass Plants **Lb**Lecture no. 15, [199–211]. **No. 1**, [143-151]. **Acceptance and defense of course assignments.**
Final exam.

Lb-Basic literature / Lr-Recommended literature
-Literature from Butan Gas.Literature from Lovato Gas

LITERATURE

a. **Compulsory basic literature**:
   - Lectures written by the subject teacher

b. **Recommended literature:**
   - Autogas Nord manuals
   - Butane Gas Manuals
   - Lovato Gas Manuals

KNOWLEDGE CHECK FORM: In writing and orally
Intermediate exam and final written exam; defense of the oral course assignment (reference before the lecturer/s of the subject and the teaching group of students)

ATTENDANCE:
Obligated

A student who misses 25% of the course hours is automatically graded 4 and must attend the course again during the following year.

CONTINUOUS CONTROL:

The evaluation method is with two exams, the first exam (there are 400 possible points) and the final exam (there are 500 points) and the course assignments (including the student's participation and activation throughout the semester which have 100 possible points). In total, the student can get 1000 possible points. The final exam includes questions from the entire subject (questions on material covered during the 15 weeks of class). The final exam material will include 20% of the material of the first 7 weeks previously developed and 80% of the material of the last 8 weeks.
The minimum to pass is 505 points

Grading	MARKS	Percentages
4	0-504	0-50%
5	505-574	51-57%
6	575-664	58-66%
7	665-754	67-75%
8	755-844	76-84%
9	845-934	85-93%
10	935-1000	94-100%

2.2. Management of Transport Terminals (modernized course)

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IVERSITY "ALEKSANDĀR MOISIU" DURĂŠ
ULTY OF PROFESSIONAL STUDIES
artment of Engineering and Marine Sciences

dress: Ward No. 1, "Taulantia" Street, Durrës, Tel: +355 52 39161,www.uamd.edu.al,

APPROVED

Head of the Department
Dr. Ing. Alma GOLGOTA
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COURSE SYLLABUS:
MANAGEMENT OF TRANSPORT TERMINALS

STUDY PROGRAM
2-YEAR-OLD:

MARINE/LAND TRANSPORT MANAGEMENT

COURSE HEAD / COURSE TEACHERS: Msc.Ing.Drita HIMA

Program Coordinator: Msc.Ing. Luiza LLURI

DURRAS v_2023-2024
Based on VKM no. 879 dated 18.12.2019

COURSE PROGRAM: MANAGEMENT OF TRANSPORT TERMINALS

Subject holder / lecturers: MSc. Ing. HIMA light
loads: 8 ECTS credits,
90 hours in the classroom, 110 hours outside the classroom independent student study (6 hours per week)
(45 hours of lecture (4 ECTS) + 30 hours of seminar (3 ECTS) + 15 hours of Laboratory (1 ECTS)
Subject typology: Characteristic subject, B
Academic year / Semester when it takes place: 2023-2024 / first semester (second year)
Subject type: Mandatory
Study program: 2-year SEA/LAND TRANSPORT MANAGEMENT
Subject code: TRAN 270
E-mail address of the subject holder / lecturer: dritahima1@gmail.com

CODE OF ETHICS

During this course, students must:

j. To implement the lesson schedule and adhere to the rules sanctioned in the Statute and Regulations of "Aleksandër Moisiu" Durres University.

k. present themselves in a serious and dignified manner in the premises of the institution, which means an appropriate dress.

l. To use appropriate vocabulary, with regular intonations according to the norms of Ethics, morality and courtesy.

m. To respect the academic staff, academic support staff (laboratory) and administrative staff, friends and the rules of the lesson. To address the academic staff, academic assistant and administrative staff in the second person plural as well as with the relevant academic titles.

n. Not to perform provocative or harassing actions and gestures towards the academic staff in the premises of the institution.

o. Not to copy someone else's work, not to fabricate data and to respect the dignity and human and professional integrity of other students.

p. Not to consume alcoholic beverages or tobacco in the premises of the institution.

q. Not to use cell phones or keep them turned off and out of sight during class or exam hours in the auditorium.

r. To use the textbook during the exam schedule, only if this action is approved by the faculty, (or) the relevant unit or the subject lecturer.

SUMMARY AND LEARNING OUTCOMES

- **Types of terminalsWhattheir orite.**Railway terminalsAutomobile transport terminals.Airport terminalsTypes of transport technologies that are applied in terminals Construction of transport agencies, procedures for opening the agency. Management of tourist, sea, road, railway transport agencies. Coordination between transport agencies.

- The objective of this course is for the student to master the knowledgebase in relation to trailway terminals, tmotor transport terminals., the airport terminals, the manner of their organization and operation, the management of maritime, railway, road, tourist transport agencies, international agencies, their operation, the procedures needed to open such a business..

BASIC CONCEPTS:

1. Terminal
2. Transportation technology
3. Touristic agency
4. Management of transport agencies

COURSE TOPICS

Topic I-Function and nature of terminals teTRaNSPORT
{Lb 1 - 15 }, {Lr1 3 - 15 }
3 hours Lecture
2 hour seminar
1 hour Laboratory

Topic 11 -Defining the role and function of terminals neports .Containerization structures[Lb 16 - 30],[No. 1. 16-32].
3 hours Lecture
2 hour seminar
1 hour Laboratory

Topic 111-Railway terminals.Automobile transport terminals.Airport terminals[Lb31 - 44] ,[No. 1. 33-44].
3 hours Lecture
2 hour seminar
1 hour Laboratory

Topic 1V- Combined land-sea transport systems in terminals. Infrastructure facilities used in combined transport at terminals. [Lb 44 - 60],[No. 1. 45-62].
3 hours Lecture
2 hour seminar
1 hour Laboratory

Topic V -Loading units. Reloading, securing and depositing in terminals. [Lb 61-73],[Lr1. 64 - 83].

Topic VI- General knowledge on freight and passenger transport agencies. [Lb. 74 - 90],[No. 1.. 84-102].**3 hours Lecture**
2 hour seminar
1 hour Laboratory

Topic VII-Air transport. Management of air cargo and passenger transport agencies. [Lb 91-105],[No. 1. 1 03-130].
3 hours Lecture
2 hour seminar
1 hour Laboratory

Intermediate exam, giving course assignments

Topic VIII -Tourist transport agencies
Management of railway freight and passenger transport agencies. [Lb 106 - 120],[No. 1. 1 31-140].
3 hours Lecture

2 hour seminar **1 hour Laboratory**
Topic IX-Construction and management of tourist packages for national and international transport [Lb 121 - 131],[No. 1 41-150]. **3 hours Lecture** **2 hour seminar** **1 hour Laboratory** _____ **Theme X** Road Transport. Management of road transport agencies, including the transport of electric vehicles. [Lb 132 - 152],[No. 1. 151-162]. **3 hours Lecture** **2 hour seminar** **1 hour Laboratory**
Topic XI-The role of electric vehicles in tourism. Advertising, marketing and personnel qualification.Lb 153 - 175],[No. 1 163 - 174]. **3 hours Lecture** **2 hour seminar** **1 hour Laboratory**
Topic XII- Mixed transport agencies (for goods and passengers) Lb 175 - 195],[L.r1. 175-190]. **3 hours Lecture** **2 hour seminar** **1 hour Laboratory**
Topic XIII-Maritime transport. Management of maritime transport agencies of goods and passengers Customer care [Lb195-209],[L.r1 190 -216]. **3 hours Lecture** **2 hour seminar** **1 hour Laboratory**
.
Theme XIV Structure of international transport for goods and passengers [Lb 209-228][L.r1. 216 – 235] **3 hours Lecture** **2 hour seminar** **1 hour Laboratory** _____ **Theme XV** The economic effectiveness of the business of electric vehicle transport agencies[Lb 229-247][L.r1 236 -215] _3 hours Lecture **2 hour seminar** **1 hour Laboratory** _____ **Final exam, submission of course assignments**

Lb-Basic literature./ Lr-Recommended literature.

LITERATURE

Mandatory basic literature:

Lectures written by the course lecturer

Recommended literature:

1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,

2 - NRA Road Safety Audit,

3 Law No. 8378 dated 22.07.1998 - "Road Code of the Republic of Albania, amended by No. 9808 dated 24.09.2007;

4 Babameto L., "Railway transport, Tirana 1997

FORM OF KNOWLEDGE CHECK:

The control form is done by written exam.

ATTENDANCE:

Obligated

CONTINUOUS CONTROL:

The evaluation method is with two exams, the first exam (there are 400 possible points) and the final exam (there are 500 points) and course assignments (which have 100 possible points). In total, the student can get 1000 possible points. The final exam includes questions from the entire subject (questions on material covered during the 15 weeks of class). The final exam material will include 20% of the material of the first 7 weeks previously developed and 80% of the material of the last 8 weeks. The minimum to pass is 505 points.

2.3. Environment and Transport

REPUBLIC OF ALBANIA
UNIVERSITY "ALEKSANDER MOISIU" DURRES
FACULTY OF PROFESSIONAL STUDIES
Department of Engineering and Marine Sciences

Address: Ward No. 1, "Taulantia" Street, Durrës, Tel: +355 52 39161, www.uamd.edu.al ,

APPROVED

Head of the Department
Dr. Ing. Alma GOLGOTA

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COURSE SYLLABUS:
ENVIRONMENT AND TRANSPORT

2-YEAR STUDY PROGRAM
" MARINE/LAND TRANSPORT MANAGEMENT"

COURSE HEAD / TEACHER: **Dr. Ing. Stela SEFA**

Program Coordinator: **MSc. Ing. Luiza Lluri**

DURRES, 2023-2024
Based on VKM no. 879 dated 18.12.2019

SUBJECT PROGRAM: **ENVIRONMENT AND TRANSPORT**

Title holder / lecturer of the course : Dr. Ing. Stela Sefa

Load : 8 ECTS credits,

90 hours in the classroom, 110 hours outside the classroom independent student work, (6 hours per week)

45 hours of Lecture (4 ECTS) + 30 hours of Seminar/Exercises (4 ECTS) + 14 hours of Subject Practice (0.5 ECTS) + 1 hour of Project/Course Assignment (0.5 ECTS))

Subject typology : Characteristic subject, B.

Academic Year/ Semester when it takes place : 2023 – 2024 / Semester The SECOND

Business The Subject : Elective

Study program : MARINE/LAND TRANSPORT MANAGEMENT

Course code : TRAN 215

E-mail address of the subject holder/pedagogue : stelasefa@gmail.com

SUMMARY AND LEARNING OUTCOMES

- In this course, the student gets basic knowledge about environmental pollution caused by different transportation systems. Pollution of the atmosphere; water pollution; the level of noise from different means of transport, how to protect the environment from the transport of dangerous substances, the measures they take, etc.
- The subject aims for the transport manager to obtain basic knowledge on environmental pollution from transport as well as the efficient measures that must be taken so that the environmental cost is minimal; Learn how to draft an environmental impact assessment report; what are its procedures; prevention of pollution from vehicles, etc.

BASIC CONCEPTS *:*

1. Environment and sustainable development;
2. Environmental pollution: air; land; water; noise pollution
3. Environmental conventions ; _
4. Strategies for environmental protection from transport

COURSE TOPICS		
I	**Topic**	**Chapter I: Introduction on Transport and Environment** Connection transport - environment; Definitions of terms; etc. (pp. 1-10) (No. 1) *(3 hours lecture + 3 hours seminar)*
II	**Topic**	**Chapter II: Environment and Sustainable Development** Understanding the concept of Environment; Circulation of elements; Sustainable Development (Lbp. 10-15) (Lr1) *(3 hours of lecture + 3 hours of seminar)*
Topic III		**Chapter III: Environmental Pollution** Understanding Environmental Pollution; Consequences of pollution etc. (Lbp.15-20) (Lr1) *Subject practice: Display of images through a Digital Projector of Environmental Pollution and its consequences (3 hours of lecture + 3 hours of subject practice)*
IV	**Topic**	**Chapter III: Environmental Pollution / Air Pollution** Atmosphere and its role; Atmospheric gases; Types of reactions in the atmosphere; formation and destruction of O_3 etc. (Lbfg.20 -33) (Lr1 and 2) *(3 hours of lecture + 3 hours of seminar)*
V	**Topic**	**Chapter III: Environmental Pollution / Air Pollution** The ozone hole; Greenhouse effect; Global warming; Primary and secondary pollutants; Pollution sources and measurement methods. (Pages 33 - 47) (Nos. 1 and 2) *Subject practice: Display of images through the Digital Projector of the Greenhouse Effect and Global Warming (3 hours of lecture + 2 seminars + 1 hour of subject practice)*

Topic VI	**Chapter III: Environmental Pollution / Acoustic Pollution** Noise standards; Propagation of sound; noise measurement etc. (Lbp.47-63) (Lr1) *Subject practice: Presentation of images through a Digital Projector of Acoustic Pollution and measures against it. (3 hours of lecture + 3 hours of subject practice)*
Theme VII	**Intermediate exam** Assignment of Course Assignment topics *(3 hours lecture + 2 hours seminar + 1 hour Course Assignment)*
Theme VIII	**Chapter III: Environmental Pollution / Land Pollution** Understanding soil pollution; causes of pollution etc. (Lbp.63-68) (Lr1 and 2) *Subject practice: Display of images through a Digital Projector of soil pollution and measures against it (3 hours of lecture + 3 hours of subject practice)*
Topic IX	**Chapter III: Environmental Pollution / Water Pollution** Water distribution on Earth; Water uses (Lbpg.68-79) (Lr2) *(3 hours lecture + 3 hours seminar)*
Theme X	**Chapter III: Environmental Pollution / Water Pollution** Water pollution; Classification of pollutants; Consequences of pollution etc. (Lbp.79-90) (Lr1) *(3 hours lecture + 3 hours seminar)*
Topic XI	**Chapter IV: Environmental Transport Conventions** International regulatory framework; MARPOL Convention; SECA areas; Principles of the environment *Subject practice: Display of images through the Digital Projector of Environmental Pollution from navigation (3 hours of lecture + 2 hours of seminar + 1 hour of subject practice)* (Lbp.91-113) (Lr3)
Theme XII	**Chapter V: Strategies and policies of environmental protection from transport** **Road transport; Transport of goods. Electric cars** (Lbp.114 -131) (Lr3) *Subject practice: Display of images through the Digital Projector of the means of transport of the future (3 hours of lecture + 2 hours of seminar + 1 hour of subject practice)*
Theme XIII	**Chapter V: Strategies and policies of environmental protection from transport** Maritime transport; Air transport (Lbp.132 - 152) (Lr3) *Subject practice: Display of images through a Digital Projector of means of transport and measures taken to reduce pollution **from electric vehicles** (3 hours of lecture + 2 hours of seminar + 1 hour of subject practice)*
Theme XIV	**Chapter VI: Energy and Transport** (pages 152 - 153) *Subject practice: Display of images through the Digital Projector of the types of energy used by transport. The progress of their use over the years (3 hours of lecture + 2 hours of seminar + 1 hour of subject practice)*
Theme XV	**Repetition . Presentation of the Course Assignment** *(3 hours lecture + 3 hours seminar)*
	EXAM final

Lb-Basic literature. / Lr - Recommended literature.

FORM OF KNOWLEDGE CONTROL
ATTENDANCE : Compulsory

CONTINUOUS CONTROL :
The method of evaluation is with two exams. The first exam has 400 possible points, the second exam has 500 possible points and the coursework which has 100 possible points. In total , the student can THE get 1000 points THE possible . The minimum ABOUT THE History it is 505 points .

LITERATURE

a. **Mandatory basic literature** :

Summary book _ Lectures BY lecturer the subject ;

b. Recommended literature : _

(1) " The Geography of Transport Systems " Dr. Jean-Paul Rodrigue, Dr. Claude Comtois, 2006, 2009, 2013 USA, Canada (Chapter 8: Transport, Energy and Environment).
(2) "Marine Pollution", (2001) Robert Clark
(3) The Law "On Environmental Protection" in Albania

2.4. Operation of Transportation Systems

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Address: Ward No. 1, "Taulantia" Street, Durrës, Tel: +355 52 39161, www.uamd.edu.al,

APPROVED

Head of Department
Dr. Ing. Alma GOLGOTA

COURSE PROGRAM:
OPERATION OF TRANSPORTATION SYSTEMS

STUDY PROGRAM 2-year:
"MARINE AND LAND TRANSPORT MANAGEMENT"

SUBJECT HEAD / TEACHER: Msc. Ing. DRITA HIMA

Program Coordinator: Msc. Ing. Luiza LLURI

DURRS, 2023-2024
Based on VKM no. 879 dated 18.12.2019

COURSE PROGRAM: OPERATION OF TRANSPORTATION SYSTEMS

Subject holder / lecturers: MSc. Ing. HIMA light

loads: 8 ECTS credits,

90 hours in the classroom, 110 hours outside the classroom independent student study (6 hours per week)

(60 hours of lecture (5.2 ECTS) + 30 hours of seminar (2.8 ECTS)

Subject typology: CASE characteristic, B

Academic year / Semester when it takes place: 2023 - 2024 / First semester, second year

Subject type: mandatory

Study program: 2-year-old MARINE/LAND TRANSPORT MANAGEMENT

Subject code: TRAN 240

E-mail address of the subject holder / lecturer:dritahima@uamd.edu.al

CODE OF ETHICS

During this course, students must:

a. To implement the lesson schedule and adhere to the rules sanctioned in the Statute and Regulations of "Aleksandër Moisiu" Durrës University.

b. present themselves in a serious and dignified manner in the premises of the institution, which means a dress ofsuitable.

c. To use appropriate vocabulary, with regular intonations according to the norms of Ethics, morality and courtesy.

d. To respect the academic staff, academic support staff (laboratory) and administrative staff, friends and the rules of the lesson. To address the academic staff, academic assistant and administrative staff in the second person plural as well as with the relevant academic titles.

e. Not to perform provocative or harassing actions and gestures towards the academic staff in the premises of the institution.

f. Not to copy someone else's work, not to fabricate data and to respect the dignity and human and professional integrity of other students.

g. Not to consume alcoholic beverages or tobacco in the premises of the institution.

h. Not to use cell phones or keep them turned off and out of sight during class or exam hours in the auditorium.

i. To use the textbook during the exam schedule, only if this action is approved by the faculty, (or) the relevant unit or the subject lecturer.

SUMMARY AND LEARNING OUTCOMES

- Through the course students will understand the importance of knowing the freight market and planning a successful operation for the transportation business. The methodological parts address how transport information is used to help transport operators allocate their resources (investments, vehicles) or influence public policies. This includes a variety of methods ranging from qualitative to quantitative. Since transportation is an application field, the use of methodologies is particularly important in terms of real-world issues. The convergence between methodologies and information technologies has led to many new opportunities, especially with the emergence of geographic information systems for transportation (GIS-T). It has become a very active field of study and application, largely dealing with automotive, railway, marine and air terminals and the technologies used in terminals.

- *Objective of this course.*Transport is related to mobility, especially how this mobility is developing in the context of a variety of conditions. Mobility is a geographic endeavor as it trades space for costs. Technological and economic forces have shifted this balance many times in the past, but in recent decades a growing expanse of territory has become accessible at a similar cost. It is therefore not surprising to realize that at the same time that technology has allowed improvements in the speed, capacity and efficiency of transport, individuals and corporations have been
  able to take advantage of this improved movement.

BASIC CONCEPTS*:*

1. General knowledge of the freight market and the shipping business.
2. Knowledge of GIS transportation geographic information systems.
3. Transport links with mobility.
4. Terminals.

COURSE TOPICS

Topic I – lecture (4 hours)

Operation of transport systems in space and time.

Seminar (2 hours)

Presentation of the transport operation in Albania.

(Lb p aqe2-43) Msc. Ing. HIMA light

(Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)

Topic II- – lecture (4 hours) Transportation systems and networks. Transportation demand and supply. **Seminar (2 hours)** Basic principles of transport operation. International institutions in the field of transport operations. (Lb p 44 -84) Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic III – lecture (4 hours) Economy and spatial structure of transport systems, linear programming. **Seminar: (2 hours)** Transport law in Albania. (Lb p 85 -114) Msc. Ing. HIMA light (Lr47-https://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic IV – lecture (4 hours) Modes of operation of transport systems. **Seminar (2 hours)** Familiarity with the national transport plan. (Lb p 115 -161) Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic V – lecture (4 hours) International, regional and urban transport. **Seminar (2 hours)** Road Safety Plan. (Lb 162 -222)Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic VI – lecture (4 hours) The impact of transport on the Environment. **Seminar (2 hours)**Environmental Safety Plan. (Lb p 223 – 244) Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic VII – lecture (4 hours) Transport planning, policies and challenges. **Seminar (2 hours)** Illustrations of transport policies and challenges in the EU

Assignment of course assignments. **Intermediate exam.** (LB 245 -270)Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic VIII – lecture (4 hours) Function and nature of terminals teTRaNSPORT"Ports", "Port Sites" and terminals. **Seminar (2 hours)** Examples ofOperation and Composition of Terminals. (Lb 271 -294)Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic IX – lecture (4 hours) Containerization structures in alternative ports and terminal ownership patterns. **Seminar (2 hours)** Examples of the role and function of Terminals in ports and Containerization Structures in Ports. (Lb 295 - 334) Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic X – lecture (4 hours) Combination of different modes of transport. **Seminar (2 hours)** Examples of railway and car terminals. (Lb 335 - 373)Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic XI – lecture (4 hours) Types of car-to-car transport technologies that are applied in terminals. **Seminar (2 hours)** Examples of Airport Terminals. (Lb 374 - 408)Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic XII (4 hours) Combined land-sea transport systems in terminals. **Seminar (2 hours)** Illustrations from the literature of combined land-sea transport systems. (Lb 409 - 452)Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic XIII – lecture (4 hours)

Intermodal Transport.Electric cars have considerable potential in the transportation industry. **Seminar (2 hours)** International practice of intermodal transport in terminals. (Lb453- 474) Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic XIV – lecture (4 hours) Infrastructure facilities used in combined transport at terminals.Charging of electric vehicles. **Seminar (2 hours)** Illustrations from international practice of Infrastructure used in combined transport at terminals. (Lb 475 - 492)Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Topic XV – lecture (4 hours) RO-RO Shipping Technologies. **Seminar (2 hours)** Illustrations from international practices of Bimodal Transport in Terminals. **Submission and defense of coursework.** (Lb 351 -375))Msc. Ing. HIMA light (Nohttps://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en)
Final exam

Lb-Basic literature./ Lr-Recommended literature.

LITERATURE

a. Compulsory basic literature:

1. Lectures written by the course lecturer

b. Recommended reading:

1. https://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en
2. Transportation System Operations and Management
3. Transportation Systems Sector Arlington VA 222020 2007
4. 2003. Highways and private modes of transportation. (EOLSS), UNESCO, Oxford:
5. Kenneth C. Barnaby, "Basic Naval Architecture", London, 1963
6. Thomas C. Gilmer, "Modern Ship Design", United States Naval Institute - Annapolis, Maryland, 1970
7. Funzionamento dei sistemi trasporti lezioni pdf
8. Thomas Walton, "Steel Ships - their constructions and maintenance", London 1964
9. Ing. Kasimati S. & Dr. Ing. Kasemi V., "Auxiliary mechanisms of the ship" - text, - Vlore, 2003
10. Vesho S., "Air transport", Tirana

KNOWLEDGE CHECK FORM:

In writing and orally.
Intermediate exam and final written exam; defense of the oral course assignment (reference before the lecturer/s of the subject and the teaching group of students) ATTENDANCE:
Obligated.

- A student who misses 25% of the course hours is automatically graded 4 and must attend the course again during the following year.
- Students who copy in the exam or commit plagiarism by appropriating the academic work of their colleagues or different authors of the discipline in question will be subject to the same punitive measure.
- Active and passive corruption is prohibited and extreme measures are taken against them.

CONTINUOUS CONTROL:

The evaluation method is with two exams, the first exam (there are 400 possible points) and the final exam (there are 500 points) and the course assignments (including the student's participation and activation throughout the semester which have 100 possible points). In total, the student can get 1000 possible points. The final exam includes questions from the entire subject (questions about the material given during the 15 weeks of the lesson). The final exam material will include 20% of the material of the first 7 weeks previously developed and 80% of the material of the last 8 weeks.
The minimum to pass is 505 points.

2.5 Vehicle Parks and Road Safety (modernize course)

REPUBLIC OF ALBANIA UNIVERSITY "ALEKSANDĐR MOISIU" DURRES
FACULTY OF PROFESSIONAL STUDIES
Department of Engineering and Marine Sciences

Address: Ward No. 1, "Taulantia" Street, Durrës, Tel: +355 52 39161, www.uamd.edu.al,

APPROVED

Head of Department
Dr. Ing. Alma GOLGOTA

COURSE PROGRAM:
"Vehicle PARKS AND ROAD SAFETY"

STUDY PROGRAM 2-year:
"MARINE AND LAND TRANSPORT MANAGEMENT"

SUBJECT HEAD / TEACHER: Msc. Ing. Drita HIMA

Program Coordinator: Msc. Ing. Luiza LLURI

DURRS, 2023-2024
Based on VKM no. 879 dated 18.12.2019

COURSE PROGRAM: CAR PARKS AND ROAD SAFETY

Subject holder / lecturers: MSc. Ing. HIMA light

loads: 8 ECTS credits,

90 hours in the classroom, 110 hours outside the classroom independent student study (6 hours per week)

(45 hours of lecture (4 ECTS) + 30 hours of seminar (2.6 ECTS) + 15 hours of laboratory (1.4 ECTS)

Subject typology:	CASE characteristic, B
Academic year / Semester when it takes place:	2023-2024 / Second semester, second year
Subject type:	mandatory
Study program: 2-year-old MANAGEMENT	MARINE AND LAND TRANSPORT
Subject code:	TRAN 270

E-mail address of the subject holder / lecturer:dritahima@uamd.edu.al

CODE OF ETHICS

During this course, students must:

a. To implement the lesson schedule and adhere to the rules sanctioned in the Statute and Regulations of "Aleksandër Moisiu" Durres University.

b. present themselves in a serious and dignified manner in the premises of the institution, which means an appropriate dress.

c. To use appropriate vocabulary, with regular intonations according to the norms of Ethics, morality and courtesy.

d. To respect the academic staff, academic support staff (laboratory) and administrative staff, friends and the rules of the lesson. To address the academic staff, academic assistant and administrative staff in the second person plural as well as with the relevant academic titles.

e. Not to perform provocative or harassing actions and gestures towards the academic staff in the premises of the institution.

f. Not to copy someone else's work, not to fabricate data and to respect the dignity and human and professional integrity of other students.

g. Not to consume alcoholic beverages or tobacco in the premises of the institution.

h. Not to use cell phones or keep them turned off and out of sight during class or exam hours in the auditorium.

i. To use the textbook during the exam schedule, only if this action is approved by the faculty, (or) the relevant unit or the subject lecturer.

SUMMARY AND LEARNING OUTCOMES

- In this course, the necessary basic concepts on road and traffic, road (automotive and railway) and maritime signage, as well as norms of behavior will be given. It will also describe all the necessary elements related to road safety in order to avoid and minimize accidents.

- The objective of this course is for the student to be able to recognize and apply road signs with the aim of: increasing road safety and reducing the risk during transport, as well as the regulation, discipline and good management of the activity carried out by natural and legal persons in the field of road transport, for their full integration in the European market. Also to present basic ideas, principles and techniques in the practice of transport logistics.

BASIC CONCEPTS:

1. General knowledge on technical services of means of transport.
2. Implementation of technical standards in the services of means of transport.
3. The use of information and communication technology for services in means of transport.
4. General knowledge of roads and traffic.
5. General knowledge on road, railway and marine signage.
6. Norms of driver behavior.
7. Street security.

COURSE TOPICS
Topic I Lecture (3 hours) **Transport parks. Their classification. Car parks**.[Lb 48-54] .[Lr22-85] **Construction, layout and use of park spaces.[**Lb 54-60], .[Lr 86 - 91] **Seminar (2 hours)** **Laboratory (1 hour)**
Topic II Lecture (3 hours) **Car park repair offices. Calculation of jobs for each specialty**.[Lb 60-65] .[Lr92-101] **Parks documentation.[**Lb65-69] **Seminar (2 hours)** **Laboratory (1 hour)**
Topic III Lecture (3 hours) **Legal framework in businesses. Inventory of automobile parks.** **Seminar (2 hours)** **Laboratory (1 hour)** [Lb 69-76] .[Lr102-111]
Topic IV Lecture (3 hours) **Warehouses of repair offices. Categorization and analysis of expenses for each tool**t. [Lb 76-79] , [Lr112-121] **Electronic data processing for electric vehicles** .[Lb 79-85] .[Lr122-131] **Seminar (2 hours)** **Laboratory (1 hour)**
Topic V Lecture (3 hours) **The most economical ways to use the park. Preparation of transport offers.** **Seminar (2 hours)** **Laboratory (1 hour)** [Lb 85-93] .[Lr132-145]
Topic VI Lecture (3 hours) **Security. Road safety features: active, passive.**

Seminar (2 hours)
Laboratory (1 hour)

1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,

Topic VII Lecture (3 hours)
Classification of accidents. Road accident costs.

Seminar (2 hours)
Laboratory (1 hour)

[Lb. 31 -60] Lectures Msc. Ing. HIMA light
1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,

TopicVIII Lecture (3 hours)
What is a Road Safety Audit? The role of signage in road safety.

Seminar (2 hours)
Laboratory (1 hour)

[Lb. 61 -90 } Lectures Msc. Ing. HIMA Light,
1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,

Topic IX Lecture (3 hours)
Norms of behavior. Vehicle signaling. Road definitions and classifications.

Seminar (2 hours)
Laboratory (1 hour)

[Lb. 91 -105] Lectures Msc. Ing. HIMA Light,
1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,

Topic X Lecture (3 hours)
Vertical Signage (danger, priority, imperative, prohibition and obligation, indicative).

Seminar (2 hours)
Laboratory (1 hour)

[Lb. 106 -151] Lectures Msc. Ing. HIMA light,
1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,

Topic XI Lecture (3 hours)
Temporary signals. Signaling in an emergency situation. Complementary Panels. Traffic police signals.

Seminar (2 hours) **Laboratory (1 hour)** [Lb. 117 -166] Lectures Msc. Ing. HIMA Light, 1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,
Topic XII Lecture (3 hours) **Horizontal signals. Safety requirements and Professional models of roundabouts.** **Seminar (2 hours)** **Laboratory (1 hour)** **Assignment of course assignments** **Intermediate exam** [Lb 167 - 202] Lectures Msc. Ing. HIMA light 1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,
Topic XIII Lecture (3 hours) **Bright signals. Classification of traffic light plants, Characteristics. Synchronization of traffic lights.** **Seminar (2 hours)** **Laboratory (1 hour)** [Lb. 202- 236] Lectures Msc. Ing. HIMA Light, 1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,
Theme XIV Lecture (3 hours) Electric cars - the future of transport. **Seminar (2 hours)** **Laboratory (1 hour)** **[**Lb. 236- 276] Lectures Msc. Ing. HIMA light, 1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,
Topic XV Lecture (3 hours) **Types of services in transport and the impact of intelligent electris systems in transport.** **Seminar (2 hours)** **Laboratory (1 hour)** **[**Lb .276 - 301] Lectures Msc. Ing. HIMA light, 1 - Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance,
Final exam

Lb-Basic literature./ Lr-Recommended literature.

LITERATURE

a. Mandatory basic literature:

1. Lectures written by the course lecturer

b. Recommended literature:

1. Llazi Tona "Car and road traffic" Tirana 2005.
2. Guidelines for Road Safety Analysis - Document approved by the Commission for Road Traffic Guidelines and CNR Road Design, Construction and Maintenance.
3. NRA Road Safety Audit,
4. Law No. 8378 dated 22.07.1998 - "Road Code of the Republic of Albania, amended by No. 9808 dated 24.09.2007.
5. Babameto L., "Rail transport, Tirana 1997.

KNOWLEDGE CHECK FORM:
In writing and orally.
Intermediate exam and final written exam; defense of the oral course assignment (reference before the lecturer/s of the subject and the teaching group of students) ATTENDANCE:
Obligated.

- A student who misses 25% of the course hours is automatically graded 4 and must attend the course again during the following year.
- Students who copy in the exam or commit plagiarism by appropriating the academic work of their colleagues or different authors of the discipline in question will be subject to the same punitive measure.
- Active and passive corruption is prohibited and extreme measures are taken against them.

CONTINUOUS CONTROL:
The evaluation method is with two exams, the first exam (there are 400 possible points) and the final exam (there are 500 points) and the course assignments (including the student's participation and activation throughout the semester which have 100 possible points). In total, the student can get 1000 possible points. The final exam includes questions from the entire subject (questions about the material given during the 15 weeks of the lesson). The final exam material will include 20% of the material of the first 7 weeks previously developed and 80% of the material of the last 8 weeks.
The minimum to pass is 505 points.

2.6 Vehicle Construction Elements (modernize course)

REPUBLIC OF ALBANIA
UNIVERSITY "ALEKSANDĀR MOISIU" DURRES
FACULTY OF PROFESSIONAL STUDIES
Department of Engineering and Marine Sciences

Address: Ward No. 1, "Taulantia" Street, Durrës, Tel: +355 52 39161, www.uamd.edu.al

APPROVED

Head of the Department
Dr. Eng. Alma GOLGOTA
_____

COURSE SYLLABUS:

VEHICLE CONSTRUCTION ELEMENTS

STUDY PROGRAM
2-YEAR :

AUTOMOBILE TECHNOLOGY

SUBJECT HEAD / TEACHER: **Msc. Eng. Luiza LLURI**

Program Coordinator: **Dr. Eng. Eli VYSHKA**

DURRËS, 2023-2024

Based on VKM no. 879 dated 18.12.2019

COURSE PROGRAM : **ELEMENTS OF VEHICLE CONSTRUCTION**

Subject holder / lecturer : Msc. Eng. Luiza Lluri

Load : 8 ECTS credits,

90 hours in the classroom, 110 hours outside the classroom independent student work (6 hours per week)

45 hours of Lecture (4 ECTS) + 21 hours of Seminar/Exercises (3 ECTS) + 24 hours of Subject Practice (1 ECTS)).

Subject typology : Interdisciplinary/integrative subject, C

Academic year / Semester when it takes place : 2023-2024 / Second semester, First year

Type of subject : Elective

Study program : 2-year Automotive Technology

Course code : AUTO 205

E-mail address of the subject holder/pedagogue : luizalluri@uamd.edu.al

CODE OF ETHICS

Students during this course must;

a. To implement the lesson schedule and adhere to the rules sanctioned in the Statute and Regulations of "Aleksandër Moisiu" Durrës University.
b. To present themselves in a serious and dignified manner in the premises of the institution, which means appropriate clothing.
c. They use appropriate vocabulary, with regular intonations according to the norms of ethics, morality and courtesy.
d. To respect the academic staff, academic support staff (laboratory) and administrative staff, friends and the rules of the lesson. To address the academic staff, academic assistant and administrative staff in the second person plural as well as with the relevant academic titles.
e. Not to perform provocative or harassing actions and gestures towards the academic staff in the premises of the institution.
f. Not to copy someone else's work, not to fabricate data and to respect the dignity and human and professional integrity of other students.
g. Not to consume alcoholic beverages or tobacco in the premises of the institution.
h. Not to use mobile phones or keep them switched off and out of sight during class or exam hours in the auditorium.
i. To use the textbook during the exam schedule, only if this action is approved by the faculty, (or) the relevant unit or the subject lecturer.

SUMMARY AND LEARNING OUTCOMES

- In this course, the basic concepts on: Elements of cars and the details from which they are formed will be given. Their computational bases. Selection from tables. Basic statements in the resistance of materials. Static characteristics of material solidity. Connections of details, Transmissions. Electric vehicles.

- The objective of this course is for the student to acquire essential knowledge about the design of machine elements in static and dynamic loads, the analysis of loading conditions as well as the influence of various factors on the resistance of machine elements, the calculation of element

resistance , the calculation of different connections: decomposable and non-decomposable, the calculation of screw transmissions; axles and axles, calculation of rolling bearings, knowledge of joints and their calculation, knowledge oncomponents of **e**lectric vehicle.

BASIC CONCEPTS:

1. Mechanical element
2. Static, dynamic load
3. Allowable strain
4. Safety coefficient
5. Transmission
6. Component of **e**lectric vehicle

COURSE TOPICS
Topic I - (3 hours) -Car details. The classification of cars details. **Meaning on the solid body and the material point. Strain- meaning and types.** **Lb1** page 1– 25 Lb2. page 4-24 Lb3 . pages 18-32 Lr3. pages 15-24 **Seminar** (2 hours) **Subject practice** (1 hour)
Topic II - (3 hours) **– Mechanical behavior of materials. Concepts of stress and deformation. Elastic deformation. Stress-strain behavior.Plastic deformation. Examples.** **Lb1** pages 26– 45 Lb2. pages 36-54 Lr2 page 25-36 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic III- (3 hours) **– Joints of details. Their types. Rivet joints. Types of riveted joints. Loads, stresses of rivets joints. Calculation of rivet joints.** **Lb1** pages 46– 72 Lb2. pages 57-78 Lb3. pages 47-58 Lr2. pages 45-67 **Seminar** (2 hours) **Subject practice** (1 hour)
Topic IV- (3 hours) **– Keys joints. Their types. Calculation of them. Splined joints.Their types. Calculation of splined joints.** **Lb1** pages 46– 72 Lb2. pages 83-98

Lb3 .pages 62-71 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic V- (3 hours) - **Threaded joints. Type and marking of thread. Geometric relations. Types of bolts and nuts. Calculation of threaded joints.** **Lb1** pages 73– 96 Lb2. pages 56-73 Lb3 pages 72-85 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic VI- (3 hours) - **Axles, shafts. Key concepts. Types of them. Their supports. Design calculations of axles and shafts.** **Lb1** pages 97– 123 Lb2. pages 86-103 Lb3. pages 92-112 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic VII- (3 hours) - **Bearings. Notion and division of bearings. Parts, materials and characteristics of bearings.** **Lb1** pages 124– 142 Lb2. pages 145-156 Lb3 . pages 124-131 **Seminar** (2 hours) **Subject practice** (1 hour) **Intermediate exam**
Topic VIII- (3 hours)- **Power transmitters. Task and classification of transmitters. Basic characteristics of transmitters. Friction transmitters. General knowledge, types, use.** **Lb1** pages 143-164 Lb2. pages 110-118 Lb3. pages 115-119 Lr4. pages 14-26 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic IX- (3 hours)- **Gear transmissions. General knowledge, types, use. Transmission ratio. The law of gearing.** **Lb1** pages 165-187 Lb2. pages 119-125 Lb3. pages 120-125 Lr4. pages 28-43 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic X- (3 hours)- **Worm gear transmissions. Classification. Characteristics of them.** Lb1 pages 188– 206 Lb2. pages 132-143

Lb3. pages 198-209 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic XI- (3 hours) **– Bevel gears. Cylindrical Transmissions. Cycloidal gears.** **Lb1** page 207– 225 Lb3. pages 135-147 Lr3. pages 47-68 **Seminar** (1 hour0 **Subject practice** (2 hours)
Theme XII - (3 hours) **– Electric motor for converting electrical energy into mechanical energy for driving the vehicle. Common types. AC induction motors and permanent magnet synchronous motors.** **Lb1** pages 226– 248 Lb3. pages 227-238 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic XIII- (3 hours) **– Power electronics. Inverters and converters that control the flow of electricity between the battery, electric motor and other components for efficient power transfer and motor control.** **Lb1** pages 235– 256 Lb3. pages 153-172 **Seminar** (1 hour) **Subject practice** (2 hours)
Topic XIV - (3 hours) - **Transmission system in electric cars. The components that transmit power from the electric motor to the wheels (gears, differentials, and axles).** **Lb1** pages 257– 282 Lb2. pages 162-174 Lb3. . pages 185-207 **Seminar** (2 hours) **Subject practice** (1 hour)
Topic XV- (3 hours) **–Repetition of acquired knowledge. Acceptance and defense of course assignments.** **Lb1** pages 283– 286 Lb2. pages 175-187 Lb3. pages 210-217 **Seminar** (2 hours) **Project / course assignment** (1 hour)
Final exam

Lb-Basic literature./ Lr-Recommended literature.

LITERATURE

a. **Mandatory basic literature** :

1. Lectures printed by the lecturer of the school
2. Emrush Iseni, "Details of cars with mechanics"
3. Elizabeta Trajkovska, Petar Boshkovski "Details of mechanical cars"
4.Theodore Wildi " Electrical machines ,drives and power systems"

b. **Recommended literature** :

1. Dr. sc. Hysni Osmani: "Mechanical materials"
2. M. Gjonaj "Permitted tensions" Tirana,
3. Prof.K.Subhas "Electrical Machines"

KNOWLEDGE CHECK FORM:

In writing and orally.
Intermediate exam and final written exam; defense of the oral course assignment (reference before the lecturer/s of the subject and the teaching group of students)

ATTENDANCE :
Obligated.

- A student who misses 25% of the course hours is automatically graded 4 and must attend the course again during the following year.
- Students who copy in the exam or commit plagiarism by appropriating the academic work of their colleagues or different authors of the discipline in question will be subject to the same punitive measure.
- Active and passive corruption is prohibited and extreme measures are taken against them.

CONTINUOUS CONTROL :

The evaluation method is with two exams, the first exam (there are 400 possible points) and the final exam (there are 500 points) and the course assignments (including the student's participation and activation throughout the semester which have 100 possible points). In total, the student can get 1000 possible points. The final exam includes questions from the entire subject (questions about the material given during the 15 weeks of the lesson). The final exam material will include 20% of the material of the first 7 weeks previously developed and 80% of the material of the last 8 weeks.
The minimum to pass is 505 points.

Description	Evaluation system	percent	Fonts	MARKS
EXCELLENT – Great performance with minor glitches	**10**	**94 - 100**	**or**	**935-1000**
VERY GOOD – Above average standard, but with some faults	**9**	**85 - 93**	**B**	**845-934**
GOOD – Overall good performance with a number of glaring errors	**8**	**76 - 84**	**C +**	**755-844**
GOOD - Overall good performance with a number of glaring bugs	**7**	**67 - 75**	**C**	**665-754**
SATISFACTORY – Fair, but with obvious shortcomings	**6**	**58 - 66**	**D**	**575-664**
SUFFICIENT – Performance meets minimum criteria	**5**	**51 - 57**	**E**	**505-574**
NGEL – More work is required to achieve the desired result	**4**	**≤ 50**	**FX**	**0-504**

FINAL REMARKS FROM THE COURSE TEACHER:

The course assignment is prepared in writing and defended by the student in front of the lecturer(s) of the subject (or the auditor if it is organized in the form of a reference in the auditory). The defense of the course assignment by the student takes place during the final submission of the course assignment. The course assignment contains the solution to the course assignment given by the subject lecturer/s. The course assignment is presented written (printed) in A4 format, bound and submitted also in electronic form (with CD) or by mail to the address of the lecturer/s of the subject.

Final Exam:

This exam includes questions from the entire subject (i.e. questions about the material taught during the 15 weeks of class). The final exam will take place on a day and time to be approved in the 15th or 16th week. The final exam material will include 20% of the previously developed first 7 weeks course material and 80% of the last 7 weeks material.

2. CURRICULUM OF THE STUDY PROGRAM OF THE PROFESSIONAL STUDIES – MODULE ROAD TRAFFIC AND SAFETY

The curriculum of the professional studies of the Road Traffic and Safety Module is shown in Table 3. In the Table 3 the courses that are being modernized and the new courses are marked.

Table 3. *Curriculum by semesters and years of professional studies for the Module "Road Traffic and Safety", with emphasized modernized subjects*

"ALEKSANDR MOISIU" UNIVERSITY, DURĂŠ
FACULTY OF PROFESSIONAL STUDIES
DEPARTMENT OF ENGINEERING AND NAVAL SCIENCES
2-YEAR STUDY PROGRAM Professional Diploma
STUDY PROGRAM: AUTOMOBILE TECHNOLOGY
PROFILE: MECHANICS
CURRICULUM FOR v.2023-2024
YEAR I

No.		type*	activity	Code	Subject / module + Activity	Prerequisite course	Sem	Credits / ECTS
1	First semester	D	or	MATH 200	Mathematics		I	6
2		D	B	AUTO 210	Engineering drawing and CAD		I	8
3		D	B	AUTO 220	Vehicle mechanics		I	8
4		Mr.	C	LANG 150	Communication techniques**(Module I)**		I	4
				LANG 130	English**(Module I)**			4
				AUTO 245	Techniques of measurements and controls			**8**
								30
5	The second semester	D	or	PHYS 190	Technical physics		II	6
6		D	B	AUTO 250	Power transmission and steering systems		II	8
7		D	B	AUTO 260	**Professional practice I**		II	8
8		Mr.	C	AUTO 215	Material technology **OR**		II	8

				AUTO 205	Vehicle construction elements	modernize		
								30
								60

YEAR II

No.		type*	activity	Code	Subject / module + Activity	Prerequisite course	Sem	Credits / ECTS
1	First semester	D	**or**	AUTO 285	Alternative food plants in vehicles	new course	III	6
2		D	**B**	AUTO 230	Internal combustion engines		III	8
3		D	**B**	AUTO 270	Food and diagnostic systems		III	8
4		D	**D**	CAR 280	**Professional practice II**		III	8
								30
5	The second semester	D	**B**	AUTO 275	Air conditioning systems and accessories		IV	8
6		D	**B**	AUTO 255	Services and technical control		IV	8
7		D	**D**	AUTO 240	Electrical and electronic system		IV	8
8		D	**E**	CAR 290	**Defense Diploma**		IV	6
								30
								60
							Total	**120**

*D - Compulsory Subjects

Z- Elective Subject

"ALEKSANDR MOISIU" UNIVERSITY, DURRES

FACULTY OF PROFESSIONAL STUDIES

DEPARTMENT OF ENGINEERING AND NAVAL SCIENCES

2-YEAR STUDY PROGRAM Professional Diploma

STUDY PROGRAM: MARINE/LAND TRANSPORT MANAGEMENT

PROFILE: TRANSPORT

CURRICULUM FOR v.2022-2023

YEAR I

No.		type*	activity	Code	Subject / module + Activity	Sem	Credits / ECTS
1	First semester	D	**or**	PHYS 190	Technical physics	I	6
2		D	**B**	TRAN 210	Simultaneous transport systems	I	8
3		D	**B**	AUTO 220	Means of transport	I	8
4		Mr.	**C**	LANG 150	Communication techniques**(Module I)**	I	4

				LANG 130	AND English**(Module I)**		4
				TRAN 240	**OR** Operation of transport systems- modernise		**8**
							30
5	**The second semester**	D	**or**	MATH 200	Mathematics	II	6
6		D	**B**	ECON 230	Transport economics	II	8
7		D	**D**	TRAN 260	**Professional practice I**	II	8
8		Mr.	**C**	TRAN 215	Environment and transport - modernise	II	8
				TRAN 222	**OR** Transport conventions		
							30
							60

YEAR II

No.		type*	activity	Code	Subject / module + Activity	Sem	Credits / ECTS
1	**First semester**	D	**or**	MANG 177	Basics of management	III	6
2		D	**B**	TRAN 205	Management of transport terminals- new	III	8
3		D	**B**	TRAN 218	Public transport	III	8
4		D	**B**	TRAN 235	Territory planning and management	III	8
							30
5	**The second semester**	D	**B**	TRAN 275	Vehicle parks and road safety - new	IV	8
6		D	**B**	TRAN 250	Transport modeling	IV	8
7		D	**D**	TRAN 280	**Professional practice II**	IV	8
8		D	**E**	TRAN 290	**Defense Diploma**	IV	6
							30
							60
						Total	**120**

*D - Obligatory Subjects

Z- Elective Subject

PELMOB

Funded by the European Union

Catalogue of Courses

International Business College Mitrovica (IBCM)

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be."

University of Pristina Kosovska Mitrovica

Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Call: ERASMUS-EDU-2022-CBHE-STRAND-2
Project Number: 101082860

PROJECT INFO

Project title	Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Project acronym	PELMOB
Project reference number	101082860/ERASMUS-EDU-2022-CBHE-STRAND-2
Funding scheme	Capacity Building in the field of Higher Education: Strand 2
Web address	www.pelmob.pr.ac.rs
Coordination institution	University of Mitrovica
Project duration	01 Dcember 2022 – 30 November 2025

DOCUMENT CONTROL SHEET

Work package	WP3: Development of EM curricula and labs
Ref. no and title of activity	T3.3: Designing of EM courses
Title of deliverable	D3.3: Catalogue of courses
Lead institution	Óbudai Egyetem (OE)
Author(s)	Mihone Kerolli, Jelena Djokic, Flamur Abazaj
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Dissemination level	Internal

VERSIONING AND CONTRIBUTION HISTORY

Version	Date	Revision description	Partner responsible
v.01	12/04/2023	Final	IBCM

Contents

1. STUDY PROGRAMME – Master of Science INTERNATIONAL MANAGEMENT AND LEADERSHIP

With specializations in:
Business management
Environmental management
The Master in International Management and Leadership programme

- science and management master programmes
- strong and advanced foundation in management
- opportunity to specialize in business management and environmental management specific specializations.
- Promotes critical thinking for responsible future leader,
- The application of new innovations, technologies and associated know-how, including the transfer of technology knowledge through new courses and training will be a powerful driver of economic growth and sustainable development in the Western Balkans.

1.1. Career prospects

The current education market in Kosovo and Western Balkans is lacking programmes that enable students to learn about the effects of business and other economic and social activities and their effects on the environment. This programme aims to provide the market with potential managers and administrators that will enable businesses and other entities to contribute towards a higher efficiency of the work processes within their sectors, thus contributing to an overall increase of sustainable development.

1.2. Enrollment requirements

In order to be considered for admission at the master program students must prove the completion of a Bachelor degree in the relevance with the program of at least 3 years or 180 ECTS is mandatory.

In addition, applicants to the study programmes need to fulfill the criteria below:

- Minimum average grade of 7.5 or 7 (IBC-M Scale)
- Advanced English language skills;
- TOEFL iBT: minimum 82 points, no less than 20 in each category
- IELTS: 6.0, with a minimum of 5.5 in writing. For students with no standardized test scores:
- IBC-M Written Entry Exam for English Assessment
- Interview with IBC-M English Lecturer
- Passed IBC-M admission interview; and
- Working experience or internship completed is preferable.

As per legal instructions in Kosovo, working experience includes volunteering, internships, as well as other professional engagements. Students applying from abroad also need to demonstrate their English language as part of the admissions process. They need to provide:

- A letter of motivation, written in English;
- An official transcript of the grades from their completed Bachelor Degree.
- Proof from previous HEI if programme completed was in English. Diploma Supplement should state language the programme was completed in.
- A certificate of English Language proficiency from an internationally recognized assessor (IELTS, TOEFL, Cambridge, etc), with minimum level of B2 or equivalent, in line with the Common European Framework Reference. More detailed information about international standardized English exams can be found below at the admission section for local students.
- An interview, conducted in English, over Skype.

1.3. Programme outcomes

Students in the International Management and Leadership Master's programme, will:

- develop a new type of interdisciplinary professional profile at a Western Balkans level;
- gain the knowledge and skills to engage with international management practices and help them become more sustainable;
- acquire an understand about how to manage a business whilst considering the implications that decisions will have on the business and environment;
- learn to connect environment with business management approaches in order to develop integrative and long-term solutions to national and international market, environment, and social challenges;
- demonstrate understanding and ethical responsibility about the impact of professional activities on environment and society;
- gain ability to assess and analyze the business environment in the local and international markets.

The graduate profile is framed in the following learning outcomes, articulated as knowledge, skills and competences, in accordance with level 7 of National/European Qualifications Framework

1.4. Master specialization Environmental Management

The master specialization update aims to provide students with the skills to handle and master all aspects of the Electric Mobility. Students will be equipped with knowledge of the most current regulations, instruction methodologies and the expertise they need to prepare the organization for an audit or inspection.

1.5 Competences

Intrapersonal competence

1.1. Self-directed, Lifelong Learning

The following competences are useful within this topic:

- ✓ The ability to analyze complex problems and develop rational solutions.
- ✓ The capacity to take initiative in one's own learning, including identifying learning objectives and seeking out resources independently.

1.2. Ability to follow new standards

- ✓ The willingness and ability to adapt to new situations and learn from new experiences.
- ✓ Skills in reflecting on one's own learning processes and understanding one's learning strengths and weaknesses.
- ✓ The ability to follow-up on industry wide innovation and adjusting to standards imposed by macro-level entities.

1.3. Intellectual, Innovative, Critical Thinking

- ✓ The ability to think creatively, including generating innovative solutions and approaching problems from different angles.
- ✓ The ability to conduct research, including identifying relevant sources, synthesizing information, and drawing reasoned conclusions.

1.4. Ethical

- ✓ The ability to make decisions based on ethical principles and engage in moral reasoning.

1.5. Conscientiousness

- ✓ Competency in using a range of technological tools and platforms and keeping up with emerging technologies.
- ✓ The willingness and ability to adapt to new situations and learn from new experiences.

Engineering competence

2.1. Technical, Analytical

- ✓ Knowledge of EV components such as battery systems, electric motors, and power electronics.
- ✓ Understanding of charging technologies including different types of charging stations and methods.
- ✓ Ability to manage projects efficiently, including resource management and budgeting.

- ✓ Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.
- ✓ Ability to manage projects efficiently, including resource management and budgeting.
- ✓ Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.
- ✓ Ability to manage projects efficiently, including resource management and budgeting.
- ✓ Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.

1.6. Scientific

- ✓ Understanding of the environmental benefits of electric mobility, including reduced greenhouse gas emissions and decreased air pollution.
- ✓ Skills in life cycle analysis to assess the environmental impact of electric vehicles and their components.
- ✓ Ability to manage projects efficiently, including resource management and budgeting.
- ✓ Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.

1.7. Mathematical

- ✓ Ability to manage projects efficiently, including resource management and budgeting.
- ✓ Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.

1.8. Innovative, Creative, Design Thinking

- ✓ Skills in identifying business opportunities in the electric mobility sector.
- ✓ Ability to innovate and develop new solutions in the field of electric mobility.
- ✓ Ability to manage projects efficiently, including resource management and budgeting.
- ✓ Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.

Interpersonal competence

3.1 Communication

- ✓ Ability to communicate effectively with various stakeholders, including policymakers, industry players, and the public.

1.9. Teamwork

- ✓ Skills in interacting effectively with others, including empathy, active listening, and negotiation skills.
- ✓ Understanding and respecting diverse perspectives and cultures, and the ability to work effectively in diverse teams.
- ✓ The ability to understand and manage one's own emotions and to understand the emotions of others.

1.10. Leadership, Project Management

- ✓ Ability to manage projects efficiently, including resource management and budgeting.
- ✓ Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.
- ✓ The willingness to take initiative and the ability to identify and act upon opportunities.

1.11. Social, Intercultural

- ✓ Networking skills to build partnerships and collaborations in the electric mobility sector.
- ✓ Group dynamic among professionals and expert groups.

2. List of Courses

The Study program for Master of International Management and Leadership, Specialization in Environmental management, module Electric mobility, will be applied from the winter semester of the 2024/2025 school year.

The subjects that are going to be modernized are shown in Table 1.

	Courses	S	Course Status.	Hours			ECTS
				L	E	Oth.	
SECOND/YEAR							
1.	Environmental Law and EU Policies (EM Regulations and Policies included)	3	C	2	2	-	5
2.	Electric Mobility Management Systems (New Course)	3	E	2	2	-	5
3.	Applied Natural Resources Management (Modernized)	3	C	2	2	-	5
4.	Interdisciplinary project (New Course)	3	C	2	2		10
5.	Environmental Science and Technology Updated course	3	C	2	2	-	5
						Total ECTS=	**30**

NOTE: designations: S=semester; lectures; E=exercises; Oth.=other types of lectures; ECTS=number of ECTS credits; **Status of the course:** C=Compulsory: E=elective**; Elective courses:** the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.

2.1. Competences related to courses

Competencies		1	2	3	4	5
Generic competencies	Capacity for analysis and synthesis	X	X	X	X	X
	Capacity to apply knowledge in	X	X	X	X	X

	practice					
	Oral and written communication	X	X	X	X	X
	Development of computer skills	X	X			X
	Development of research skills	X	X			X
	Information management skills		X	X		
	Critical and self-critical abilities	X		X		X
	Capacity to adapt to new situations	X	X		X	
	Capacity to generate new ideas (creativity)	X	X	X	X	X
	Troubleshooting	X		X	X	X
	Teamwork	X	X	X	X	X
	Leadership				X	
	Ability to work in a multidisciplinary team	X	X	X	X	X
	Ability to communicate with people in the field	X	X		X	
	Initiative and entrepreneurial spirit					
	Integrity and ethical commitment	X	X	X	X	X
	Making decisions	X	X	X	X	
	Synthesis of information to determine viewpoints, perspectives, problems or trends in traffic safety			X	X	X
	A holistic and proactive approach	X	X	X	X	X
	Appreciation of differences					
	Awareness of own scope of work and limitations			X		X
	Awareness of professional responsibility	X	X	X	X	X
Specific subject competencies	Acquiring knowledge and skills for training in a comprehensive understanding of responses at the output of the automation systems	X				
	Ability to apply acquired knowledge in real situations.	X				
	Acquiring knowledge to independently determine stability of automation system	X				
	Acquiring knowledge to reduce multi-block diagram system to one block diagram	X				
	Acquiring knowledge and skills to understand mechatronics systems		X			
	Acquiring knowledge and skills to understand sensors, converters, actuators and mechanical drive systems		X			
	Acquiring knowledge and skills for a comprehensive understanding of microprocessors, programmable logic controllers, modules		X			
	Acquiring knowledge for the identification and analysis			X		

	problems in the field of applied fluid mechanics					
	Acquiring knowledge about the pumps, fluid motors, friction, valves, fittings, power required by pumps and pump efficiency			X		
	Acquiring knowledge about the fans, blowers, compressors, and the flow of gases			X		
	Acquiring knowledge about analysing simple oscilations of particle, solid and flexible body				X	
	Identifying and solving problems of motion and oscilations of solid body and system of particles using the laws of motion				X	
	Understanding natural frequencies of the mechanical structures				X	
	Acquiring knowledge about impact of the different harmonic and non-harmonic forces (unbalance, missalignment bending force, bump forces) on the structures				X	
	Acquisition of knowledge and skills for the ability to comprehensively understand the concept of e vehicles and also develop the concept of E engineering					X
	Gaining knowledge of the application of safety standards and regulations in E vehicles.					X
	Practical application of acquired knowledge in real situations.					X
	Development of initiatives, e vehicles, and e mobility in engineering					X
	Gaining knowledge about identification, analysis, and evaluation of negative emissions					
	Acquiring skills and basic knowledge to for the implementation of measures to mitigate and prevent negative emissions into the environment					
	Acquiring knowledge about the principles of sustainable development and assess the carbon footprint				X	
	Acquiring knowledge and skills in the development and planning of space and mobility for people with reduced mobility.				X	

2.1. Course name: Environmental Law and EU Policies

Semester	ECTS	Number of lessons	Student Workload
3rd semester	5	16	125 Hours
Programme	**International Management and Leadership**	**Academic Year**	**2023/2024**
Specialization	**Environmental Management**	**Course type**	**Compulsory**

Course Description

This course integrates the principles of environmental law with a specialized focus on environmental management. The course will review the ways and regulations of the interaction of individuals, communities, businesses, and governments with environmental systems. Students will gain a deep understanding of the legal frameworks governing environmental protection, natural resource management, and sustainable development. The course emphasizes the intersection of legal principles with practical strategies for effective environmental management. Students discuss and evaluate the harmonization of EU directives with Kosovo Directives. In addition, through assignments and class projects, course will cover the legal research, writing, and argument that are critical for the practice of law. Most of the lectures will be available for online viewing, leaving more class time for discussions, and other activities. The European Green Deal sets clear targets to reduce greenhouse gas emissions from transport. In this context, electric vehicles and electrification of road transport will play a key role in reducing greenhouse gas emissions from transport, and road transport in particular.

Learning Outcomes

The student shall know and understand:

- Show a comprehensive understanding of foundational environmental law principles, including national and international regulations, treaties, and frameworks.
- Critically evaluate environmental policies, considering their development, implementation, and impact on ecological sustainability and social welfare.
- Analyze and interpret case studies related to environmental law, identifying key legal issues, precedents, and potential solutions.
- Contribute to the development of environmental policies by identifying legal gaps, proposing improvements.
- Collaborate with various stakeholders, including government agencies, NGOs, industry representatives, and communities, to address environmental challenges through effective engagement and cooperation.
- The international and EU regulations governing electric mobility.
- The key legal requirements and standards for the safe use of electric mobility.

The student shall have skills in:

- Develop critical thinking skills to assess and evaluate the legal implications of environmental policies, regulations, and cases, and propose well-reasoned solutions.
- Cultivate problem-solving skills to address complex environmental challenges, applying legal frameworks and proposing effective solutions in compliance with environmental laws.
- Enhance oral and written communication skills to effectively communicate legal analyses, present arguments, and articulate recommendations to diverse audiences.

- Develop skills in analyzing environmental policies, identifying areas for improvement, and contributing to the development of effective and sustainable environmental policies.
- Enhance teamwork and collaboration skills by working on group projects, participating in discussions, and engaging in collaborative efforts to address complex environmental law challenges.

The student shall acquire competencies to:

- Analyze complex problems and develop rational solutions;
- Think creatively, including generating innovative solutions and approaching problems from different angles;
- Maintain and upgrade capacity for adapting to new situations, solving problems, and teamwork;
- Be aware of responsibility for the environment protection, people, and property in the process of transporting dangerous goods and sensitive items;
- Be aware of professional responsibility;
- Be aware of workload and limitations;
- Adapt to new situations and learn from new experiences;
- Communicate effectively with various stakeholders, including policymakers, SMEs, logistics companies, and the public;
- Take initiative and the ability to identify and act upon opportunities and make decision(s);
- Maintain the confidentiality of the information and act in accordance with prescribed rules and procedures**;**
- Apply knowledge in practice;
- Extend computer, oral and written competencies;
- Develop research skills;
- Extend capacity for adapting to new situations;
- Extend capacity for generating new ideas (creativity);
- Work in a multidisciplinary team;
- - Understand the relationship between activity and the public;

Examination and Assessment

Students will be graded through a mix of examinations and class work. Class participation will also be taken into account.

Grades will be based on:

- Take home Mid-term exam 25%
- Take home Final exam (cumulative) 25%
- Paper assignments (750 - 1,000 words) 20%
- Legal Brief (2,000 - 2,500 words) 20%
- Class participation & class discussions 10%

Content of Teaching (subjects and themes)

- Overview of the EU legal system and institutions
- Evolution and development of EU environmental law
- Principles and objectives of EU environmental policy
- Relationship between EU and national environmental laws
- Key directives and regulations addressing air, water, and soil quality
- Linkages between environmental law and other EU policies (e.g., agriculture, energy, transport)
- Environmental Impact assessments and the integration of environmental concerns
- Cross-sectoral approaches to sustainable development
- The European Green Deal and its implications for environmental governance
- Collaboration with non-governmental organizations and industry stakeholders

- Development and analysis of environmental policies
- Integration of environmental considerations into planning processes
- Role of environmental impact assessments in policy development
- Collaboration between legal and policy frameworks for effective outcomes
- Policy ambitions and policy instruments for electric mobility

Learning Materials

The following are the recommended readings for this course. The required reading for each class will be posted on Google classroom one week before lectures.

- James Salzman and Barton H. Thompson Jr. *2021). Environmental Law and Policy, Fourth Edition;
- COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Sustainable and Smart Mobility Strategy – putting European transport on track for the future
- COM/2020/789 final
- Robert V. Percival, Christopher H. Schroeder, Alan S. Miller, and James P. Leape. Environmental Regulation: Law, Science, and Policy 8th Edition
- Zygmunt J.B. Plater, Robert H. Abrams, William Goldfarb, and Daniel Nagin (2016). Environmental Law and Policy: Nature, Law, and Society" Aspen Publishing
- Maria Lee and Dr. Emma Lees. 2014. "EU Environmental Law, Governance and Decision-Making: 2nd Edition"
- Ludvig Kramer, Jannike Klint Ahrens, and Ulf Bjornstad (2018). "Principles of European Environmental Law
- Thijs F.M. Etty and Han Somsen. Yearbook "Environmental Law in the European Union: The EU and Its Member States
- Petrauskiene, K.; Dvarioniene, J.; Kaveckis, G.; Kliaugaite, D.; Chenadec, J.; Hehn, L.; Pérez, B.; Bordi, C.; Scavino, G.; Vignoli, A.; et al. Situation Analysis of Policies for Electric Mobility Development: Experience from Five European Regions. Sustainability 2020, 12, 2935. https://doi.org/10.3390/su12072935William H. Rodgers; Elizabeth Burleson (2016). Environmental Law, Second edition , Eagan, Thomsen Reuters
- James Salzman, Barton H. Thompson Jr (2006).Environmental Law and Policy, Foundation Pr
- Alexandra B. Klass, J. B. Ruhl, James Salzman, and John Copeland Nagle (2008). The Practice and Policy of
- Environmental Law, Foundation Press.
- https://europa.eu/european-union/law_en
- http://www.assembly-kosova.org/common/docs/ligjet/2009_03-L-025_en.pdf

2.2. Course name: Electric Mobility Management Systems

Semester	ECTS	Number of lessons	Student Workload
3rd semester	5	15	125 Hours
Programme	**International Management and Leadership**	**Academic Year**	**2023/2024**
Specialization	**Environmental Management**	**Course type**	**Elective**

Course Description

Electric vehicles are the future of transportation. Electric mobility has become an essential part of the energy transition, and will imply significant changes for vehicle manufacturers, governments, companies and individuals. This course will delve into electric mobility, unpacking the basic concepts of e-mobility, which kind benefits e-mobility can bring, how to plan and implement a e-transition in mobility and why it is important for a city to have a SUMP, Sustainable Urban Mobility Plan. This is the course in the Environmental Management programme, which aims to close the knowledge gap around renewable and smart energy solutions. The course aims to provide a simple yet technical basis for those interested in learning more about smart and green energy solutions in transport.

Learning Outcomes

- Assess the environmental technologies and techniques with a strong focus on multidisciplinary and problem-based technologies;
- Ability to manage projects efficiently, including resource management and budgeting.
- Group dynamic among professionals and expert groups.
- Ability to innovate and develop new solutions in the field of electric mobility Leadership skills to lead multidisciplinary teams in the development of electric mobility solutions.

Examination and Assessment

Students will be graded through a mix of examinations and class work. Class participation will also be taken into account.

The assessment will be divided in two parts:

1) The final examination will count for 50% of students' grades.
2) The remaining 50% of the grade will be based on the term paper (seminar), oral presentations (term paper topic), class participation and, if judged necessary, group work.

The focus will be on electric mobility and its evolution over time, which will allow students to analyze the changes induced by the electric vehicle on the mobility system.

- Introduction to E-mobility. E-mobility in the sustainable development paradigm
- E-mobility Planning and Implementation
- Productive use cases in EV Rural and Urban context
- Retrofitting of fuel-based vehicles to EV and other

- Maintenance and Safety of Evs and batteries
- Cost-effective and suitable EV charging management
- Electric Mobility Business Models and Exploitation Pathways

Learning Materials

The following are the recommended readings for this course. The required reading for each class will be posted on Google classroom one week before lectures.

- VanLoon, W. Gary; Duffy, J. Stephen (2000). Environmental Chemistry, Oxford University Press.
- Wringh, T. Richard; Boorse, F. Dorthy (2011). Environmental Science, Pearson.
- Lennart Nilsson, Per Olof Persson Lars Rydén, Siarhei Darozhka; Audrone Zaliauskiene (2007). Cleaner Production Technologies and Tools for Resource Efficient Production, The Baltic University Press.
- Misra K.B. (2000). Clean Production-Environmental and Economic Perspectives, Springer.

2.3. Course name: Applied Natural Resources Management

Semester	ECTS	Number of lessons	Student Workload
1st semester	5	15	125 Hours
Programme	**International Management and Leadership**	**Academic Year**	**2023/2024**
Specialization	**Environmental Management**	**Course type**	**Compulsory**

Course Description

This course covers key issues associated with managing natural resources in a sustainable way and balancing human demand with the need to maintain ecological integrity. The course will review basic ecological principles that underpin natural resource management 1) problems associated with the use/misuse of our natural resources and 2) current management practices associated with the conservation of natural resources.

- Acquire the main technical competencies of the mobility manager.
- Understand the technology and city planning issues involved in the shift from internal combustion traction to electric traction and from traditional logistics to sustainable logistics.
- Know the main technologies underlying sustainable logistics.
- Understand the strategic role of urban and non-urban infrastructures and define the elements necessary for a shift of the mobility system.
- Obtain the competencies to understand the peculiar aspects of this transition (new traction technologies, new industrial models, sustainable planning of the production processes and of the products, social awareness and informing people, training management, Human resource management, administrators, and politicians).A study project approach will be employed to demonstrate theory in practice.

Learning Outcomes

On successful completion of the course students will have the knowledge to:

- Understand the key ecological principals that underlie natural resource management;
- Understand the roles of various stakeholders as they relate to natural resource management;
- Understand the role of natural resource management in the broader context of sustainability, climate change, and ecosystem health.

The student shall have skills to:

- Apply key concepts in the field of natural resource management for problem solving across a range of contexts;
- Synthesize and critically analyze information from the primary literature and other sources and to communicate this information through written or oral modes;
- Skills in reflecting on one's own learning processes and understanding one's learning strengths and weaknesses.

The students will have the following competencies:

- Holistic understanding of the concepts of sustainability and resilience,
- Ability to independently research the sustainability and resilience of the environment at different levels, to conduct analyzes, experiments, assessments and evaluations, as well as the ability to synthesize and interpret results, formulate conclusions, and present the research in written and oral form,
- Ability to develop projects which sustain good quality and rationally uses natural resources (energy, raw materials, water and land),
- The willingness and ability to adapt to new situations and learn from new experiences.
- The ability to follow-up on industry wide innovation and adjusting to standards imposed by macro-level entities.

Examination and Assessment

Students will be graded through a mix of examinations and class work. Class participation will also be taken into account. The assessment will be divided in two parts:

- 10% Attendance
- 50% Interdisciplinary semester project
- 40% Oral exam

- European natural resource management: historical/current issues and practices
- Spatial analysis/Key resources and tools used in natural resource management.
- Basic ecological principles & their application to natural resource management
- Ecological use of soil and water
- Wildlife ecology and management
- Forest ecology and management
- Mineral resources and environment
- Global change biology (climate change, land-use change, etc.) as related to natural resource management
- Ecosystem goods and services

Learning Materials
The following are the recommended readings for this course. The required reading for each class will be posted on Google classroom one week before lectures. - Mike Alexander, Management Planning for Nature Conservation, Springer, 2008 - Malcolm Ausden, Habitat Management for Conservation, Oxford University Press, 2007 - Wright, Richard T.: Environmental Science, Toward a Sustainable Future.

2.4. Course name: Interdisciplinary project

Semester	ECTS	Number of lessons	Student Workload
3rd semester	10	15	250 Hours
Programme	International Management and Leadership	Academic Year	2023/2024
Specialization	Environmental Management	Course type	Elective - Lectures (2L) + Exercises (2E)

Course Description

The Interdisciplinary project aims to connect learning goals in courses Environmental Law and EU Policies, Applied Natural Resources Management, Environmental Science and Technology, Electric mobility management systems. In this regard, to participants (candidates) well well-defined topic is to be delegated with a mission to meet the requirements of the project. Besides the appropriate topic(s), the questions and desirable methodology scope will be shared among the groups by the respective teaching staff.
All candidates dedicate themselves to the Study Development (group work) and to the Project Retrospective Report (individual work). Therefore, all activities in the project refer to both, individual and teamwork, and the final output implies the desk study that should be presented to respective professors by all group members.
Working in groups and dedicating themselves to the study answers, the participants create and develop the study structure, which in the final instance will represent the learning output of all group members. An interdisciplinary project in this regard envelops the multiple learning objectives from different courses, extended knowledge, and multi-corner application of the research methods.

Learning Outcomes

The student shall know and understand:

- The fundamental principles of environmental law and EU policies related to the sustainable mobility
- Key EU directives and regulations governing the Green Deal
- Distinguishing between different policy perspectives and different levels of government pertaining to electric vehicles
- Understanding of the environmental benefits of electric mobility, including reduced greenhouse gas emissions and decreased air pollution.
- Understand the technology and city planning issues involved in the shift from internal combustion traction to electric traction and from traditional logistics to sustainable logistics.
- Know the main technologies underlying sustainable logistics.
- Understand the strategic role of urban and non-urban infrastructures and define the elements necessary for a shift of the mobility system.

The student shall have skills in:

- Interpret and apply relevant environmental laws and EU policies to real-world scenarios involving the electric mobility
- Skills in life cycle analysis to assess the environmental impact of electric vehicles and their components
- Obtain the competencies to understand the peculiar aspects of this transition (new traction technologies, new industrial models, sustainable planning of the production processes and of the products, social awareness and informing people, training management, Human resource management, administrators, and politicians)
- Networking skills to build partnerships and collaborations in the electric mobility sector.
- The ability to follow-up on industry wide innovation and adjusting to standards imposed by macro-level entities.

The student shall acquire competencies to:

- Networking skills to build partnerships and collaborations in the electric mobility sector.
- Group dynamic among professionals and expert groups.
- Advising organizations on compliance with environmental laws and policies.
- Leading risk management initiatives and making informed decisions to minimize risks in the transportation of hazardous goods.
- Communicating effectively about risks to stakeholders.
- Ensuring the safe and compliant transportation of hazardous materials across different modes of transport.
- Responding appropriately to emergencies involving hazardous goods.
- Implementing sustainable and efficient supply chain practices.
- Innovating and adapting supply chain strategies to meet evolving environmental and safety regulations.
- Competency in using a range of technological tools and platforms and keeping up with emerging technologies.
- The willingness and ability to adapt to new situations and learn from new experiences.
- The willingness to take initiative and the ability to identify and act upon opportunities.
- The ability to make decisions based on ethical principles and engage in moral reasoning.
- The ability to follow-up on industry wide innovation and adjusting to standards imposed by macro-level entities.

Examination and Assessment

The assessment will be divided in two parts:

- The written part will count for 60% of students' grades.
- The oral part will be graded with 40% .

2.5. Course name: Environmental Science and Technology

Semester	ECTS	Number of lessons	Student Workload
3rd semester	5	16	125 Hours
Programme	**International Management and Leadership**	**Academic Year**	**2023/2024**
Specialization	**Environmental Management**	**Course type**	**Compulsory**

Course Description

The aim of the course is to prepare the professionals with an interest in the environmental sciences and maintain environmental integrity based on multidisciplinary and problem-based technology development. The course addresses the technology assessment, carbon management and policy making and analysis with governmental agencies, environmental consultancies and private companies.
The course presents the theories of the environmental problems we face, and gives practical information how to analyze them and how to approach and solve impact on the environment using advanced technological tools. In the focus of Electric Mobility and Environmental Impact Reduction the issues of climate change and then conduct a prospective analysis of the evolution of greenhouse gases emissions throughout the 21st century, will be analyzed, as well as the role of transport in terms of local air pollution and noise. To determine the environmental performance of different types of vehicles, there will be presented life-cycle analysis and then mobilize this method to compare the performance of thermal and electric vehicles in terms of preservation of the local and global environment.

Learning Outcomes

Knowledge

The student will:

- Be able to utilize advances in environmental issues and technology to resolve problems and anticipate implications;
- Be able, on a scientific basis, to analyse and reflect over the knowledge in the above-mentioned areas and to identify scientific problems using the analysis from advance environmental technology;
- Understanding of the environmental benefits of electric mobility, including reduced greenhouse gas emissions and decreased air pollution.
- Be able to develop methods and models for environmental management issues, and evaluate and solve assignments concerning environmental and management issues in private and public enterprises;
- Explain the wider policy context of Green Deal
- Manages work and development situations that are complex, unpredictable and require new technological solutions.

Skills

The student will:

- Seeks answers or solutions to scientific or technological problems;
- Makes the most of his/her knowledge of science and technology ;
- Communicates in the languages used in science and technology solutions individually or in a group.

Competencies The student will:

- Assess the environmental technologies and techniques with a strong focus on multidisciplinary and problem-based technologies;
- Plan and manage projects which might include the management, risk assessment, problem-solving, and analysis.

Examination and Assessment

Students will be graded through a mix of examinations and class work. Class participation will also be taken into account.

The assessment will be divided in two parts:

1) The final examination will count for 50% of students' grades.

2) The remaining 50% of the grade will be based on the term paper (seminar), oral presentations (term paper topic), class participation and, if judged necessary, group work.

Content of Teaching (subjects and themes)

- Strategic Technological Pathways for Sustainable Development
- Pollution and prevention
- Emerging Technologies in Environmental Sciences
- Basic Concepts of Cleaner Technologies
- Formal Methods for Designing Clean Processes
- Cleaner Production Case Studies
- Environmental Impact Statement
- Environmental Technology and Industrial Development in EU
- Environmental Life-Cycle Assessment and Cost Analysis
- Waste Minimization / Elimination: A Key to Successful Business
- Reducing Risk by Controlling the Environment
- Education and Manpower Development for Cleaner Production
- Energy technology
- Experimental part: Introduction to Sustainability and team work
- Collaboration between legal and policy frameworks for effective outcomes
- Policy ambitions and policy instruments for electric mobility.

Learning Materials

The following are the recommended readings for this course. The required reading for each class will be posted on Google classroom one week before lectures.

- VanLoon, W. Gary; Duffy, J. Stephen (2000). Environmental Chemistry, Oxford University Press.
- Wringh, T. Richard; Boorse, F. Dorthy (2011). Environmental Science, Pearson.
- Lennart Nilsson, Per Olof Persson Lars Rydén, Siarhei Darozhka; Audrone Zaliauskiene (2007). Cleaner
- Production Technologies and Tools for Resource Efficient Production, The Baltic University Press.
- Misra K.B. (2000). Clean Production-Environmental and Economic Perspectives, Springer.

PELMOB

Funded by the European Union

Catalogue of Courses

Adriatic University Bar (AUB)

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be."

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CONTENTS:

1. INTRODUCTION

1.1. About HEI Adriatic University Bar-AUB, Faculty for traffic, communication and logistic, Budva

Faculty for Traffic, Communication and Logistics, Budva (FSKL) is established 2008. In Berane, Montenegro, and now is seated in Budva, Montenegro. The FSKL signed the Agreement on Association with the Adriatic University Bar-AUB on 2017, changing its name to the Adriatic University, Bar - Faculty for Traffic, Communications and Logistics, Budva-FSKL.

The main goal of the FSKL, as a member of the AUB, is the education of graduate engineers in traffic, communications and logistics based on the most modern knowledge (theory and practice) in the field of railway, road and safety, air and postal transport, communications and logistics. The Faculty is accredited and licensed for 3+2 study program, “Traffic, communication and logistic” and accredited for doctorial study.

For Montenegro, as an ecological country with strategic directions of development "tourism and eco-economy", traffic is determined as a basic factor in the realization of those strategic directions. The evident lack of professionals in the field of traffic, communications and logistics defined the mission of the Faculty as "education of engineers (BSc, master, doctor) in the field of railway, road, air and postal traffics, communications and logistics, based on modern knowledge (theory and practice), which will to be able to develop the transport system of Montenegro and to effectively include it in the European and world transport system".

1.2. Study program

The study program of master's studies is called "Transport, communication and logistics". Within this Study program, the following modules are formed: Road traffic and safety, Postal traffic, Air traffic, Railway traffic. Electronic Communications, Logistics and Management. Study program is based on the latest scientific knowledge and practice

and enable the education of engineers who will be able to plan, design, manage and control processes and systems in various areas of traffic, communications and logistics. In doing so, special attention is paid to the fact that engineers acquire knowledge that will represent a good basis for practical work and/or continuing their education at doctoral studies, but also applied knowledge and skills that enable them to be successfully included in traffic, communication and logistics companies.

In the implementation of the Study program, the contemporary literature is used and leading teaching staff in the field of traffic, communications and logistics from the country and the region are engaged, with the aim of continuous improvement of the teaching programs of each of the Modules. Just looking at the aforementioned scientific disciplines indicates that at FSKL, future engineers get a wide range of general and specialized knowledge, which comprehensively educates them and makes them desirable high-quality personnel in the field of road traffic.

1.3. Improvement of the study program

Based on the EEA report on electric vehicles[1], it was found that electric vehicles emit approximately 17-30% less greenhouse gases compared to petrol and diesel vehicles. Furthermore, as the production processes for electric vehicles continue to improve and the generation of electricity becomes cleaner, it is projected that the overall emissions of a typical electric vehicle throughout its lifespan could be reduced by at least 73% by the year 2050[2].

However, many governments have announced that their original goals will not be met for a variety of reasons, amongst which one of the most important is the lack of skilled and trained personnel with sufficient level of knowledge in this area.

The PELMOB Project has as a goal of the modernization of WB HEIs study programs through introduction of new electric vehicles related courses at the bachelor and master levels of education in WB HEIs. Montenegro is the country on the way to EU and try to follow the EU path related to EM. It will require adaptation and modernization of HIEs stady program. The AUB as a partner in PELMOB project takes the steps towards this goal. It will modernized the Master Study program. It will be done through creation of

[1] https://www.eea.europa.eu/publications/electric-vehicles-from-life-cycle
[2] https://www.eea.europa.eu/en/topics/in-depth/electric-vehicles

new or modernization of existing study programs at master levels, in order to create new professionals in the field of EM.

In this sense, the Faculty Council made a decision on 1.12.2023. to modernize the courses shown in Table 1 and to introduce the new couses as it is shown in Table 2.

Table 1. *Overview of courses being moderniyed on the master study being introduced for PELMOB in Module Raad traffic and safety*

No.	Courses	S	Course Status	Hours			ECTS
				L	E	Oth.	
FIRST/SECOND YEAR							
1.	Intelligent transport systems	1	O	2	2	-	6
2.	Management of the quality of services in road traffic	3	E	2	2		6
3.	Ecological and sustainable design in road traffic	3	O	2	2	-	6
						Total ECTS=	**18**
NOTE: designations: S= semester; L= lectures; E= exercises; Oth.= other types of lectures; ECTS= number of ECTS credits; Status of the course: O= obligatory: E= elective; Elective courses: the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.							

Table 2. *Overview of courses on the master study being introduced for PELMOB in Module Raad traffic and safety*

No.	Courses	S	Course Status	Hours			ECTS
				L	E	Oth.	
FIRST/SECOND YEAR							
1.	Internet of Things for EV	1	E	2	2	-	6
2.	Electric vehicles for public urban passenger transport	3	E	2	2	-	6
3.	Organization and exploitation of EV	3	E	2	2	-	6
						Total ECTS=	**18**
NOTE: designations: S= semester; L= lectures; E= exercises; Oth.= other types of lectures; ECTS= number of ECTS credits; Status of the course: O= obligatory: E= elective; Elective courses: the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.							

1.4. Competences

The requirements for the competences of EV experts in transport sector are very broad. Skills for integral management of the EM, technical knowledge for dealing with EV, management of everyday problems, challenges and risks, are important elements in the scoupe of modernized and new couses require set of competences. In addition, soft skills are necessary, including appropriate manners during communication and presentation, as well as experience in project management. Based on the Developed Catalogue of Competencies, competences for the modernized and new courses of the Module "Road Traffic and Safety" are defined, and shown in Table 3.

Tabele 3. *Competence of modernize and new PELMOB courses*

Competencies		Mandatory MS/Elective subjects ES					
		IP1	IP2	IP3	IP4	IP5	IP6
Generic competencies	Capacity for analyses and synthesis	X	X	X	X	X	X
	Capacity for applying knowledge in practice	X	X	X	X	X	X
	Oral and written competencies	X	X	X	X	X	X
	Development of computer competencies	X	X				
	Development research skills	X	X	X	X	X	X
	Managing information skills	X	X	X	X	X	X
	Critical and self-critical abilities	X	X	X	X	X	X
	Capacity for adopting to new situations	X	X	X	X	X	X
	Capacity for generating new ideas (creativity)	X	X	X	X	X	X
	Solving problems	X	X	X	X	X	X
	Teamwork	X	X	X	X	X	X
	Leadership				X		X
	Ability to work in a multidisciplinary team	X	X	X	X	X	X
	Ability to communicate with people in the field				X		
	Initiative and entrepreneurial spirit				X		X
	Integrity and ethical commitment	X	X	X	X	X	X
	Making Decisions	X	X	X	X	X	X
	Synthesis of information to determine the perspective of a problem or trend in traffic safety				X	X	X
	Holistic and proactive approach	X	X	X	X	X	X
	Recognizing differences	X	X	X	X	X	X
	Awareness of workload and limitations	X	X	X	X	X	X

	Awareness of professional responsibilty	X	X	X	X	X	X
Subject-specific competencies	Awareness of the importance of traffic safety of the EM for development of society	X	X	X	X	X	X
	Understanding of the principals of traffic safety systems and defining activities as their response			X	X	X	X
	Understanding requirements and needs of safety systems	X	X	X	X	X	X
	Understanding of traffic safety systems for EV as well as systems components			X	X	X	X
	Understanding the relationship between EM activity and the public	X				X	X
	Understanding the role of regulatory bodies in road safety for EM	X	X				
	Recognizing traffic safety management as a key factor to sustainability of the EM				X		

1.5. Quality, modernity and principles

The master study program of the Road Traffic and Safety Module is in accordance with European trends and the status of the profession and science in the corresponding educational and scientific field and is comparable to similar programs in foreign and higher education institutions. Harmonization of the modernized Study program for the EM student acquires knowledge, skills and abilities that enable the achievement of competences and learning outcomes required in the Pelmob.

The study program is aligned with the goals of the ERASMUS+ Project Pelmob.

Also, the principles from the Reaccreditation of the Study Program for the period 2020-2025 were applied, that each course lasts one semester, has a credit system, electives and does not require new accreditation.

2. SYLLABUSES OF MODERNIZED COURSES AND WORK PROGRAM

In the following text, syllabuses of modernized and new courses at the master studies of the Road Traffic and Safety are presented, in the form of the template required by the Agency for Quality Control of Higher Education, Montenegro. In the template, the changed parts and work program by week with the introduction of the EM aspect are emphasized. The new couses are created in accordance with HEI principals by respective professors and associators and discussed with industries. The modernized and new courses were confirmed by the Decision of the Faculty Council on 04.09.2023. and will be implemented in Curriculum for the Module Road traffic and safety in 2024/2025 school years.

1.1. Intelligent transport systems

Course title: Intelligent transport systems				
Subject code	***Course status***	***Semester***	***Number of ECTS credits***	***Lesson fund***
	Mandatory	I	6	60

Study program is organized in the following way:

At the Faculty of Transport, Communications and Logistics, the master's study program lasts two years (IV semesters) and includes 120 ECTS.

Prerequisites for other courses: *There are no requirements for registering and taking the course*

Objectives of studying the course:

Acquiring knowledge that enables the design, development, simulation and evaluation of traffic management systems with the help of intelligent traffic systems on the city network, at intersections, roads.

Course outcome: *Upon completion of the course, students will be able to:*

- Manage traffic with the help of ITS;
- They design adaptable light signal operation systems, as well as elements of the ITS system;
- Evaluate system effects, write technical reports including EV;
- Manage EV congestion.

Name and surname of teachers and associates: Prof. Dr. Zoran Avramović, MSc Ivana Buzdovan

Method of teaching and mastering the material: Theoretical lectures, practical examples, interactive work.

Course content:

Preparatory weeks	
I week	– The concept of ITS. Basic definition of ITS (IEEE); Other definitions.
II week	– Development of ITS; European ITS projects; Standards, norms, directives, legal bases.
III week	– Traffic management. Crowds. Accidents. An accident. Emission of harmful gases.
IV week	– Traffic management strategy. Adaptive systems; Network capabilities.
V week	– Architecture of ITS; Theoretical foundations; Possible applications of ITS.
VI week	– ICT and ITS. 5G and ITS. Autonomous driving.
VII week	– V2V. V2I. V2L. V2P. V2N. Integration of ICT and IoT.
VIII week	– Detectors and sensors; Converters. Givers. Simulation program.
IX week	– Ad hoc networks. Computer networks in general and in the E vehicle.
X week	– ITS as part of smart cities. Variable signaling;
XI week	– Technical prerequisites for the application of ITS. Development of electric vehicles.
XII week	– Evaluating the effects of EV.
XIII week	– EV traffic management on highways in urban areas, congestion management and application of ITS in solving congestion.
XIV week	– GIS and ITS; ITS and GNSS; Vehicle tracking. Informing road users. Smart stops.
XV week	– Human factor; Improving the passenger experience. Internet and ITS. Ride sharing. Personalized routes. Defense of the seminar paper.
Final week XVIII - XXI week	– Final exam.

STUDENT LOAD	
Per week	**In the semester**
6 credits X 40/30 = 8 hours Structure:	**Classes and final exam:** 8 hours x 16 = **128 hours**

- 2 hours of lectures - 2 hours of practice - 4 hours for consultations and independent work	**Necessary preparations:** before the beginning of the semester (administration, registration, certification) 2 x 8 hours = **16 hours** **Total workload for the subject** 6 x 30 = **180 hours** **Supplementary work:** for exam preparation in the make-up exam period, including taking the make-up exam **31.2 hours** **Load structure:** **120 hours** (Teaching) + **16 hours** (Preparation) + **44 hours** (Additional work)
Students are required to attend classes	
Literature: 1. Vukanović Smiljan, Traffic management - ITS, material on CD, November 2010. 2. Intelligent transport systems , APEIRON Pan-European University, Banja Luka, 2016. 3. Bošnjak , Ivan, Intelligent transport systems 1, Faculty traffic of Science , Zagreb , 2006	
Forms of knowledge verification and assessment: Seminar paper and final exam	
Special indication for the subject	
Name and surname of the teacher who prepared the data: Prof. Dr. Zoran Z. Avramović	
Note:	

2.2. Internet of Things for electric vehicles (new course)

Course name : Internet of Things for electric vehicles				
Subject code:	***Course status:***	***Semester:***	***Number of ECTS credits:***	***Class fund:***
	Mandatory	IV	6	60

Study program is organized in the following way:

At the Faculty of Transport, Communications and Logistics, the master's study program lasts two years (IV semesters) and includes 120 ECTS.

Prerequisites for other courses: There are no requirements for registering and taking courses

Objectives of studying the course:

To provide students with knowledge and understanding of the role of Internet of Things (IoT) technology in the industry and electric vehicles.

Mastery of knowledge of the latest developments in IoT and cloud computing concepts introduced to improve Vehicular Ad-Hoc Networks (VANET) with advanced cellular networks, such as 5G networks.

Course outcome:

- An understanding of the electric vehicle industry, including the challenges these vehicles face and the electric vehicle market.
- Mastering the characteristics of different IoT technologies and how these technologies are applied in the context of electric vehicles.
- Understanding the use of sensors to monitor and improve the performance of electric vehicles, using IoT technologies.
- Mastering how to analyze sensor data to identify problems and improve electric vehicle performance.
- Acquiring knowledge about the use of solutions for the purpose of connecting electric vehicles with smart charging infrastructure
- Learning about the principles of battery management and using IoT data to optimize battery life.
- Acquiring knowledge about methods of data analysis for the purpose of improving the safety of electric vehicles.

Gaining knowledge about future trends in the development of IoT technologies and their impact on the electric vehicle industry.

Name and surname of teachers and associates: Assoc. prof. Dr Oliver Popović

Method of teaching and mastering the material:

The course will use a combination of multimedia presentations with discussion, case studies and practical exercises:

- lectures, consultations, discussions, individualized self-study, projects, presentations, case studies.

The format used in the course will include a combination of in-person and online environments with other Internet resources for lectures, presentations and student interaction.

Course content:

Preparatory weeks	
I week	- Basics of the electric vehicle industry and the role of IoT technologies.
II week	- Sensors and performance monitoring of electric vehicles through IoT.
III week	- Remote control and diagnostics of electric vehicles using IoT.
IV week	- Connecting vehicles with smart charging infrastructure.
V week	- IoT solutions for optimizing battery life in electric vehicles.
Y week	- Analyzing data from IoT devices to improve electric vehicle design.
OU week	- Integration of smart cities and electric vehicles through IoT.
VII week	- First colloquium .
VIII week	- The role of 5G networks in supporting IoT applications in electric vehicles.
IX week	- Cloud computing and IoT based VANET networks .
X week	- Security challenges in the application of VANET networks .
XI	- Future trends: State-of-the-art IoT technologies and their impact on the electric vehicle industry.

week XII week XIII week XIV week XV **Final week** **XVIII - XXI week**	- Future trends: Modeling IoT-based VANET networks for the future generation of transportation system through 5G and future 6G networks. - Monitoring the environmental performance of electric vehicles using IoT technologies. - Second colloquium. Final exam. Supplementary teaching and remedial exam period

STUDENT LOAD

Per week	**In the semester**
6 credits X 40/30 = 8 hours Structure: - 2 hours of lectures - 2 hours of practice - 4 hours for consultations and independent work	**Classes and final exam:** 8 hours x 16 = **128 hours** **Necessary preparations:** before the beginning of the semester (administration, registration, certification) 2 x 8 hours = **16 hours** **Total workload for the subject** 6 x 30 = **180 hours** **Supplementary work:** for exam preparation in the make-up exam period, including taking the make-up exam **36 hours** **Load structure:** **120 hours** (Teaching) + **16 hours** (Preparation) + **36 hours** (Additional work)

Students are required to attend classes

Literature

1. Lecture presentations
2. Fadi Al-Turjman, "Multimedia-Enabled Sensors in IoT - Data Delivery and Traffic Modeling" - CRC Press, 2018.
3. Gurinder Singh, Vishal Jain, Jyotir Moy Chatterjee, Loveleen Gaur, “CLOUD AND IOT-BASED VEHICULAR AD HOC NETWORKS”, Wiley-Scrivener, 2021.
4. Souvik Pal, Supriyo Roy "IoT Solutions in Smart Cities: Technologies, Platforms, and Applications", CRC Press, 2023

Forms of knowledge testing and assessment: 10 points for activity in class, 10 points for homework, 20 points for seminar work, 30 points for colloquiums and 30 points for the exam.

Special indication for the subject

Name and surname of the teacher who prepared the data: Assoc prof. Dr Oliver Popović

Note:

2.3. Ecological and sustainable design

Course name : Ecological and sustainable design				
Subject code:	***Course status:***	***Semester:***	***Number of ECTS credits:***	***Class fund:***
	Mandatory	III	6	60

Study program is organized in the following way:

At the Faculty of Transport, Communications and Logistics, the master's study program lasts two years (IV semesters) and includes 120 ECTS.

Prerequisites for other courses: There are no requirements for registering and taking courses

Course outcome: upon completion of studies, the student will be able to:

- has knowledge in the creation and application of procedures in redesigning and remodeling of settlements and cities according to the principles of human engineering and new trends in traffic (hybrid and EV),
- prepares and participates in the preparation of appropriate traffic-technical documentation in settlements and cities,
- creates, evaluates and optimizes traffic solutions according to the principles of human engineering and EV application;

Name and surname of teachers and associates: Prof. Dr. Branimir Stanić, M.Sc. Desanka Vlačić

Method of teaching and mastering the material: lectures, seminar work, consultations

Course content:

Preparatory weeks	
I week	- Introductory lectures
II week	- Historical heritage and development of settlements and cities
III week	- The impact of the development of transport and traffic on the morphology of the city
IV week	- The impact of the car and the emergence of the problem of the "technical" city, ECO-politics, EV
V week	- Environmental protection and human engineering, the problem of defining the "handicapped" and the impact of EVs
VI week	- The emergence of the phenomenon of sustainable development and its definition
VII week	- Traffic design and human engineering - footpaths
VIII week	- The emergence of human engineering and its definition
IX week	- Legal basis - European concept of accessibility
X week	- ADA standards, "green" design, ACCESSIBILITY model for all users,
XI week	- Classifications of settlements, cities and traffic networks, a new approach with a focus on electric vehicles
XII week	- Physical structures of settlements and cities - the problem of redevelopment of settlements and cities
XIII week	- New elements of design and support in the application of human engineering
XIV week	- Possibilities of applying human engineering in the process of planning new cities , with special reference to the impact of electric vehicles
XV week	- SMART cities and the problem of human engineering - controversies , Settlements and cities of the future with electric vehicles, Closing lectures
Final week	- Final exam.
XVIII - XXI week	- Supplementary teaching and remedial exam period.

STUDENT LOAD

Per week	**In the semester**
6 credits X 40/30 = 8 hours Structure: - 2 hours of lectures - 2 hours of practice - 4 hours for consultations and independent work	**Classes and final exam:** 8 hours x 16 = **128 hours** **Necessary preparations:** before the beginning of the semester (administration, registration, certification) 2 x 8 hours = **16 hours** **Total workload for the subject** 6 x 30 = **180 hours** **Supplementary work:** for exam preparation in the

	make-up exam period, including taking the make-up exam **36 hours** **Load structure:** **120 hours** (Teaching) + **16 hours** (Preparation) + **36 hours** (Additional work)
Students are required to attend classes	
Literature 1. Law on Spatial Planning and Building Construction, Sl. Gazette of the Republic of Croatia, No. 51/10 2. HUMAN CITIES 2014-2018 FINAL BOOK: CHALLENGING THE CITY SCALE, 2018. 3. ADA Standards, 1994. 4. REGULATION ON TECHNICAL STANDARDS FOR PLANNING, DESIGNING AND CONSTRUCTION OF FACILITIES, WHICH ENSURE UNINTERRUPTED MOVEMENT AND ACCESS FOR PEOPLE WITH DISABILITIES, CHILDREN AND ELDERLY PEOPLE ("Official Gazette of RS", no. 22/159) 5. Aragall, Francesk et al. (2007). The European concept of accessibility (translated by Vera Knežević). Novi Sad: "Living Upright" Center; 6. EIDD: Design for All Europe EIDD, Stockholm Declaration on Design for All, Stockholm, 2004.	
Forms of knowledge testing and assessment: knowledge test 50 + activity 10 + term paper 30 + colloquium 10 = 100	
Special indication for the subject:	
Name and surname of the teacher who prepared the data: Prof. Dr. Branimir Stanić	
Note: **all lectures (presentations) are available in electronic form;**	

2.4. Management of the quality of services in road traffic

Course name : Management of the quality of services in road traffic				
Subject code:	***Course status:***	***Semester:***	***Number of ECTS credits:***	***Class fund:***
	Mandatory	III	6	60

Study program is organized in the following way:

At the Faculty of Transport, Communications and Logistics, the master's study program lasts two years (IV semesters) and includes 120 ECTS.

Prerequisites for other courses: There are no requirements for registering and taking courses

Objectives of studying the course:

The aim of the course is for students to gain insight into basic and modern knowledge in the field of quality and its management through theoretical and practical teaching, with a special focus on application in the field of electric vehicles and their integration in traffic and transport. Students will explore the latest trends and standards related to quality, with a special emphasis on the environmental aspects and performance of electric vehicles in traffic.

Outcome of the course : After completing the course, students will be able to :

- Identify and optimize the quality of services in road transport;
- They integrate the quality of services into electric vehicles;
- They evaluate the sustainability and economic aspects of electric vehicles.

Name and surname of teachers and associates: Prof. Ph.D. Branimir Stanić, MSc Marijana Prelević

Method of teaching and mastering the material: Theoretical lectures, practical examples, interactive work

Course content:

Preparatory weeks	
I week	- Introduction to the quality of transport services and electric mobility in road traffic.
II week	- Elements of the quality of transport services in passenger traffic and goods transport.
III week	- The quality of traffic functioning and indicators of the quality of transport in road traffic.
IV week	- Standardization, quality management and electric mobility.
V week	- Defining quality properties in road traffic and electric vehicles.
VI week	- Criteria and dimensions of quality in traffic and transport; Quality awards.
VII week	- Tools for quality management in traffic and transport, with special reference to electric vehicles.
VIII week	- Quality costs in traffic and transport with a focus on electric vehicles.
IX week	- Planning and quality control in traffic and transport (quality loop), with application to electric vehicles.
X week	- Continuous improvement of the quality of traffic and transport services; Human resources, teamwork and learning;
XI week	- Quality culture, with aspects of electric mobility.
XII week	- Quality management systems in the context of electric mobility.
XIII week	- Total Quality Management (TQM) and its application in road transport, including electric vehicles.
XIV week	- Stages in the implementation of TQM in road traffic and transport; ISO quality standards in road traffic with special emphasis on electric vehicles.
XV week	- Defense of the seminar paper.
Final week	
XVIII – XXI week	- Final exam.

STUDENT LOAD	
Per week	**In the semester**

6 credits X 40/30 = 8 hours Structure: - 2 hours of lectures - 2 hours of practice - 4 hours for consultations and independent work	**Classes and final exam:** 8 hours x 16 = **128 hours** **Necessary preparations :** before the beginning of the semester (administration, registration, certification) 2 x 8 hours = **16 hours** **Total workload for the subject** 6 x 30 = **180 hours** **Supplementary work:** for exam preparation in the make-up exam period, including taking the make-up exam **36 hours** **Load structure :** **120 hours** (Teaching) + **16 hours** (Preparation) + **44 hours** (Additional work)
Students are required to attend classes	

Literature

1. Perišić R., Service quality system, logistics and informatics, Institute of Technical Sciences, Sanu, Belgrade, 2002.
2. Heleta M., „TQM – Model of excellence: integrated management systems and model of excellence“, Educta, Belgrade, 2004.
3. Zakić N., Quality management – study material, International Higher Vocational School for Entrepreneurs, Belgrade, 2006.
4. Nikolić Z., Electric vehicles in the world and here, Institut Goša, Belgrade, 2015.
5. Quality Management for Organizational Excellence“ – David L. Goetsch and Stanley Davis
6. „Electric and Hybrid Vehicles: Design Fundamentals“ – Iqbal Husain
7. „ISO 9001:2015 Explained“ – Charles A. Cianfrani and John E. „Jack“ West
8. „Electric Vehicle Technology Explained“ – James Larminie and John Lowry
9. „Sustainable Transportation and Smart Mobility“ – Matjaž Novak

Forms of knowledge testing and assessment: Seminar paper and final exam

Special indication for the subject:

Name and surname of the teacher who prepared the data: Prof. Dr. Branimir Stanić

Note: **all lectures (presentations) are available in electronic form;**

2.5 Electric vehicles for public urban passenger transport (new course)

Course name : Electric vehicles for public urban passenger transport				
Subject code:	***Course status:***	***Semester:***	***Number of ECTS credits:***	***Class fund:***
	Mandatory	III	6	60

Study program is organized in the following way:

At the Faculty of Transport, Communications and Logistics, the master's study program lasts two years (IV semesters) and includes 120 ECTS.

Prerequisites for other courses: There are no requirements for registering and taking courses

Objectives of studying the course:

The aim of this course is to prepare students for the understanding , planning and implementation of electric vehicles in public urban transport with the aim of improving the quality of services and sustainable mobility. We also want to promote awareness of the ecological and economic advantages of using electric vehicles in urban transport.

Outcome of the course : After completing the course, students will be able to :

- Identify and optimize the quality of services in road transport;
- They integrate the quality of services into electric vehicles
- They evaluate the sustainability and economic aspects of electric vehicles

Name and surname of teachers and associates: Prof. Ph.D. Branimir Stanić, MSc Marijana Prelević

Method of teaching and mastering the material: Theoretical lectures, practical examples, interactive work

Course content:

Preparatory weeks	
I week	- An introduction to the field of electric vehicles for public urban transport
II week	- Basics of electric vehicles
III week	- Technical structure of electric vehicles
IV week	- Concepts of public urban transport
V week	- Environmental impact of electric vehicles in urban transport
VI week	- Economic aspects of electric vehicles in urban transport
VII week	- Charging infrastructure for electric vehicles
VIII week	- Charging technology and challenges
IX week	- Strategies for the introduction of electric vehicles in urban transport
X week	- Criteria and standards of service quality in urban transport with electric vehicles
XI week	- Risks in the application of EVs in public urban passenger transport
XII week	- Availability and reliability of electric vehicles in urban transport
XIII week	- Current trends in the use of electric vehicles for urban transport
XIV week	- Future directions of development of electric vehicles in urban transport
XV week	- Defense of the seminar paper.
Final week	
XVIII - XXI week	- Final exam.

STUDENT LOAD

Per week	**In the semester**
6 credits X 40/30 = 8 hours Structure: - 2 hours of lectures - 2 hours of practice	**Classes and final exam:** 8 hours x 16 = **128 hours** **Necessary preparations:** before the beginning of the semester (administration, registration, certification) 2 x 8 hours = **16 hours**

- 4 hours for consultations and independent work	**Total workload for the subject** 6 x 30 = **<u>180 hours</u>** **Supplementary work:** for exam preparation in the make-up exam period, including taking the make-up exam **<u>36 hours</u>** **Load structure:** **120 hours** (Teaching) + **16 hours** (Preparation) + **44 hours** (Supplementary work)
Students are required to attend classes	
Literature: 1. Nikolić, Z. Electric vehicles in the world and here, Institut Goša, 2010. 2. Stevic , Z. (ed) New generation of electric vehicles, InTech, Rijeka, 2012. 3. Tica, Slaven , M. , Bajčetic , Stank o A. , Ž ivanovic, Predrag V. , Passenger Transport Technology, Faculty of Transportation, Belgrade, 2021 . 4. Tica, Slaven, M. Public passenger transport systems: elements of technology, organization and management , Faculty of Transportation, Belgrade, 2019.	
Forms of knowledge testing and assessment: Seminar paper and final exam	
Special indication for the subject:	
Name and surname of the teacher who prepared the data: Prof. Dr. Branimir Stanić	
Note: **all lectures (presentations) are available in electronic form;**	

2.6 Organization and exploitation of electric vehicles (new course)

Course name : Organization and exploitation of electric vehicles				
Subject code:	***Course status:***	***Semester:***	***Number of ECTS credits:***	***Class fund:***
	Mandatory	III	6	60

Study program is organized in the following way:

At the Faculty of Transport, Communications and Logistics, the master's study program lasts two years (IV semesters) and includes 120 ECTS..

Prerequisites for other courses: There are no requirements for registering and taking courses

Objectives of studying the course:

basic concepts and definitions, familiarization with the history of the development of cars and fleets, familiarization with the contemporary problems of settlements and cities, the history of the appearance of EVs and hybrid vehicles, basic concepts of the organization and exploitation of vehicles, future assessments and the transformation of settlements and cities.

Outcome of the course: After completing the course, students will be able to :

- participates in the creation and implementation of tasks of organization and exploitation of EVs
- participates in the preparation and production of study and traffic-technical documentation in settlements and cities as support for the use of EVs,
- creates, evaluates and optimizes solutions to support the use of EVs

Name and surname of teachers and associates: Prof. Ph.D. Branimir Stanić, MSc Desanka Vlačić

Method of teaching and mastering the material: lectures, seminar work, consultations

Course content:

Preparatory weeks	
I week	- Introductory lectures
II week	- The appearance of the car and the appearance of the problem of the "technical" city
III week	- Development of transport and traffic
IV week	- Environmental protection and human engineering
V week	- Emergence of EVs and their development – typology of EVs - Legal basis
VI week	- Physical structures of settlements and cities - the problem of
VII week	redevelopment of settlements and cities - Basic terms of organization and use of EV
VIII week	- Basic concepts of EV exploitation
IX week	- Environmental problems of EV exploitation
X week	- Assessment of development trends in the EV industry
XI week	- Elements of street and road design and EV support
XII week	- SMART cities, autonomous vehicles
XIII week	- Settlements and cities of the future
XIV week	- Closing lectures
XV week	
Final week	
XVIII - XXI week	- Final exam. Verification of the semester and registration of grades - Supplementary teaching and remedial exam period

STUDENT LOAD

Per week	**In the semester**
6 credits X 40/30 = 8 hours	**Classes and final exam:** 8 hours x 16 = **128 hours**
Structure:	**Necessary preparations:** before the beginning of the

- 2 hours of lectures - 2 hours of practice - 4 hours for consultations and independent work	semester (administration, registration, certification) 2 x 8 hours = **16 hours** **Total workload for the subject** 6 x 30 = **180 hours** **Supplementary work:** for exam preparation in the make-up exam period, including taking the make-up exam **36 hours** **Load structure:** **120 hours** (Teaching) + **16 hours** (Preparation) + **36 hours** (Additional work)
Students are required to attend classes	
Literature: 1. Law on Spatial Planning and Building Construction, Sl. Gazette of the Republic of Croatia, No. 51/10 2. HUMAN CITIES 2014-2018 FINAL BOOK : CHALLENGING THE CITY SCALE, 2018. 3. Matthew N. Eisler : Age of Auto Electric: Environment, Energy, and the Quest for the Sustainable Car (Transformations: Studies in the History of Science and Technology) Paperback – December 6, 2022. 4. Prof Philip M. Parker Ph.D : The 2023-2028 World Outlook for Hybrid Electric Cars Paperback – May 10, 2022 ICON Group International, Inc. 5. EIDD: Design for All Europe EIDD, Stockholm Declaration on Design for All, Stockholm, 2004.	
Forms of knowledge testing and assessment: knowledge test 50 + activity 10 + term paper 30 + colloquium 10 = 100	
Special indication for the subject:	
Name and surname of the teacher who prepared the data: Prof. Dr. Branimir Stanić	
Note: **all lectures (presentations) are available in electronic form;**	

3. CURRICULUM OF THE STUDY PROGRAM OF THE MASTER STUDIES – MODULE ROAD TRAFFIC AND SAFETY

The curriculum of the master studies of the Road Traffic and Safety Module is shown in Table 3. In the Table 3 the courses that are being modernized and the new courses are marked.

Table 3. *Curriculum by semesters and years of master studies for the Module "Road Traffic and Safety", with emphasized modernized subjects*

No.	Courses	S	Course Status	Hours			ECTS
				L	E	Oth.	
FIRST YEAR							
1.	**Intelligent transport systems (modernized)**	**1**	**O**	**2**	**2**	**-**	**6**
2.	Management in traffic and communications	1	O	2	2	-	6
3.	Modeling of the organization in traffic and communications	1	O	2	2	-	6
4.	Elective course 1						
5	Elective course 2						
6.	Road quality management	2	O	2	2	-	6
7.	Valuation in road traffic	2	O	2	2	-	6
8.	Systems for Goods Transport	2	O	2	2	-	6
9.	Elective course 3						
10.	Elective course 4						
Elective courses 1 and 2 (elect 2 out of 5)							
11.	Modern information technologies in road traffic	1	E	2	2	-	6
12.	Traffic planning	1	E	2	2	-	6
13.	Geographic information systems	1	E	2	2		6
14.	Findings and opinion of the expert	1	E	2	2		6
15.	**Internet of Things for electric vehicles (new)**	**1**	**E**	**2**	**2**		**6**
16.	Education and training for traffic	1	O	2	2		6
Elective courses 3 and 4 (elect 2 out of 4)							
17.	Traffic regulation	2	E	2	2	-	6
18.	International financing	2	E	2	2	-	6
19.	Computer Simulation on traffic accidents	2	E	2	2	-	6
20.	Expertise of traffic accident	2	E	2	2	-	6
						Total ECTS=	**60**
SECOND YEAR							
1.	Strategic management	3	O	2	2	-	6

2.	Methodology of scientific research work	3	O	2	2	-	6
3.	**Environmental and sustainable design (modernized)**	**3**	**O**	**2**	**2**	**-**	**6**
4.	Elective course 5						
5.	Elective course 6						
Elective courses 5 and 6 (elect 2 out of 6)							
6.	Organization and management in road traffic	3	E	2	2	-	6
7.	**Management of the quality of services in road traffic (modernized)**	**3**	**E**	**2**	**2**	**-**	**6**
8.	Road traffic safety management	3	E	2	2	-	6
9.	Campaign to increase traffic safety and public opinion research	3	E	2	2	-	6
10.	**Electric vehicles for public urban passenger transport (new)**	**3**	**E**	**2**	**2**	**-**	**6**
11.	**Organization and exploitation of electric vehicles (new)**	**3**	**E**	**2**	**2**	**-**	**6**
12.	Access work	4	O	3	3	-	8
13.	Student Internship	4	O				4
14.	Final paper	4	O	2	2	-	18
						Total ECTS=	**60**

NOTE: designations: S= semester; L= lectures; E= exercises; Oth.= other types of lectures; ECTS= number of ECTS credits; Status of the course: O= obligatory: E= elective; Elective courses: the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.

PELMOB

Funded by the European Union

Catalogue of Courses

University of Montenegro (UOM)

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be."

PROJECT INFO

Project title	Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Project acronym	PELMOB
Project reference number	101082860/ERASMUS-EDU-2022-CBHE-STRAND-2
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DOCUMENT CONTROL SHEET

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Ref. no and title of activity	T3.3: Designing of EM courses
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Author(s)	Milanko Damjanović, Boško Matović, Radoje Vujadinović, Sreten Simović, Boško Matović, Vladimir Ilić, Borjanka Dragović, Rada Ljepavić, Duška Ćetković
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Contents

1) Introduction

1.1) A brief information about University of Montenegro

The University of Montenegro (UoM) is an intellectual development of Montenegro - the center of scientific research, cultural, artistic and innovative creativity. It is the oldest and at the same time the only state university in Montenegro. It is the most comprehensive higher education institution that provides education in the fields of social sciences, humanities, as well as technological, natural and medical sciences. Classes are organized in accordance with the curricula of reputable universities in the European Higher Education Area, which, along with numerous agreements and programs, enables unhindered mobility for students, teachers and administrative staff. The studies are realized in three cycles, undergraduate, master and doctoral studies. The model according to which they are realized is 3 + 2 + 3, which means that basic studies last for three academic years, with the exception of regulated professions and teacher education that lasts for five or six years. Postgraduate master studies last two, and doctoral three academic years. In undergraduate and master studies, candidates are enrolled at the expense of the State Budget. The UoM is also a leading scientific research institution in the country, which strengthens its position through international cooperation and project activities aimed at supporting scientific research capacities. In addition to a very strong research activity in organizational units, the University also has three scientific institutes, the Institute of History, the Institute of Marine Biology and the Institute of Advanced Studies. As a central institution of science, culture and art, it continuously strengthens ties with the economic, social and international environment, through productive cooperation with business and the public sector. The UoM is a member of prestigious international organizations such as: European University Association, Magna Charta Universitatum, Francophone University Association, University Network of the Adriatic Ionian Initiative, Network of Universities of Small Countries and Territories and Balkan University Association.

Today, the University strives to have a large network of partners in the field of education, research, public sector and industry from around the world. The first international agreement was signed in 1975 with the State University of Florida, and today the UoM has more than 80 bilateral agreements with universities in Europe and Asia and more than 150 inter-institutional agreements for credit mobility within the ERASMUS + program. Within the mobility programs Erasmus +, CEEPUS, Mevlana and bilateral cooperation programs,

students, researchers and academic staff have the opportunity to exchange knowledge and skills at international level. Following both global trends in higher education and the needs of the labor market, the UoM seeks to modernize the institutional and functional settings of the University, as well as to continuously improve curriculum, technical resources and spatial capacity of the institution.

1.2) Study programmes

Teaching process at Faculty of Mechanical Engineering at the academic bachelor, master and doctoral studies is realized by the study model 3+2+3. Bachelor academic studies carry 180 ECTS, master academic 120 ECTS, and doctoral studies 180 ECTS credits.

At Faculty of Mechanical Engineering at the University of Montenegro there are three undergraduate study programmes, five academic master study programmes and one doctoral programme. The study programme which is essential for objectives of the PELMOB project is master study programme Road Traffic. This study programme belongs to the field of technical and technological sciences, and it is harmonized with modern world trends at the level of master studies in terms of its structure and content, and above all its purpose, goals and outcomes, as well as the competencies of the graduated students.

The teaching process on the master level academic studies of the study program Road Traffic is organized in accordance with the Statute of the University of Montenegro. Furthermore, it is organized and realized in accordance with the European Transfer Credit System (ECTS). Duration of this study programme is two years. Each subject is assigned a certain number of ECTS credits, according to the obligations of the students. Each semester consists of 30 ECTS credits, which means that, master's degree studies are equivalent to 120 ECTS credits. Studies at the academic master's degree of the study programme Road Traffic are considered completed when the student passes all the exams given in the curriculum of the study programme, completes the master's thesis and fulfills all other obligations prescribed by the Statute of the University, and thus collects at least 120 ECTS credits.

The method of determining credits by subjects and years of study is aligned with teaching and learning activities, i.e.: the number of hours of lectures and exercises, consultations, seminars, projects, exams, professional practice, research work, graduate work, master's work, individual student work, etc. One ECTS credit refers to 30 hours of student work required for one or more of the following activities: contact teaching, learning, practical work, preparation

and presentation of independent works, taking colloquiums and exams. The number of credits for a particular subject (course) is determined according to the number of teaching hours (theoretical and/or practical, lectures, exercises, practicums, seminars, practical teaching, field teaching, etc.), the time spent by the student on independent work (homework, projects, seminar papers and so on) and study time in preparation for knowledge testing and evaluation (tests, colloquiums, preparation of final papers, final exam, professional practice) and other forms of engagement in accordance with the specific study program.

The first year of the Road Traffic study program includes eight compulsory courses (four courses per semester) and two elective courses (one course per semester). Elective courses offer two options each. The second year of the study programme is divided into two modules: (1) Traffic, (2) Transportation. The third semester incorporates six courses, among which there are three obligatory courses same for both modules, including professional practice. The modules consist of three courses each, which become obligatory when the student opts for the module. The fourth semester comprises two courses related to the application and defense of the master's thesis, which correspond to 30 ECTS credits.

2) Syllabuses table of planed courses of TDG curricula

The analysis of the curriculum of master's academic studies indicates that there is an absence of content that deals with the electric mobility. In the first semester, there is a course called Alternative road vehicle drives, which deals partly with the batteries for electric vehicles. However, it is necessary to focus attention on various aspects, such as charging infrastructure, environmental issues, legislation, transport demands, design and safety of electric vehicles. Therefore, it is necessary to modernize an existing curricula and/or establish new courses. Taking into account master study program at the UoM, it is decided to modernize four courses and develop two new courses. Master study programme innovated in this way, should provide students with adequate competences and skills, with possibilities or further advancements as well as with possibilities for employment. New EM laboratory will help students to observe, practice, and conduct different experiments in terms of electric mobility. Table 1 presents a list of new and modified courses at the University of Montenegro.

Table 1. Preliminary list of new courses – UoM.

No.	Courses	S	Course Status	Hours			ECTS
				L	E	Oth.	
FIRST / SECOND YEAR							
1.	Operating and technological properties of vehicles **(course will be modernized)**	1	O	2	2	-	6
2.	Alternative road vehicle drives **(course will be modernized)**	1	O	2	2	-	6
3.	Environmental Impact of Electric Vehicles **(new course)**	1	E	2	2	-	6
4.	Energy efficiency in traffic **(course will be modernized)**	2	O	2	2	-	6
5.	Advanced technologies in road traffic **(course will be modernized)**	3	E	3	2	-	6
6.	Electric vehicle safety **(new course)**	3	E	2	2	-	5
						Total ECTS=	**35**

NOTE: designations: S=semester; L=lectures; E=exercises; Oth.=other types of lectures; ECTS=number of ECTS credits; **Status of the course:** O=obligatory: E=elective**; Elective courses:** the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.

2.1) Competencies

The requirements for the competencies of experts working in electric mobility sector are very broad. Skills related to sustainable mobility, global environment, economic sustainability, transport system implementation; electric vehicles, sustainable mobility practices, active transport modes, sustainable mobility indicators and evaluation of sustainable mobility are important elements in the catalogue of competencies of experts and their further development in the EM sector. Also, soft skills are necessary, including appropriate manners during communication and presentation, as well as experience in project management. Based on the Developed Catalogue of Competencies, competencies for the modernized courses of the Study Programme "Road Traffic" are defined and depicted in Table 2.

Table 2. Competencies required for improved PELMOB courses

Competency		Compulsory MS/Elective course ES					
		C1	C2	C3	C4	C5	C6
Generic competencies	Capacity for analysis and synthesis	X	X	X	X	X	X
	Capacity to apply knowledge in practice	X	X	X	X	X	X
	Oral and written competences	X	X	X	X	X	X
	Development of computer competences		X	X	X	X	X
	Development of research skills			X	X	X	X
	Management of information skills		X	X		X	X
	Critical and self-critical abilities	X	X	X	X	X	X
	Ability to adapt to new situations	X	X	X	X	X	X
	Capacity to generate new ideas (creativity)	X	X	X	X	X	X
	Solving problems	X	X	X	X	X	X

	Teamwork	X	X	X	X	X	X
	Leadership			X	X	X	X
	Ability to work in a multidisciplinary team	X	X	X	X	X	X
	Ability to communicate with people in the field	X	X	X		X	X
	Initiative and entrepreneurial spirit		X		X	X	X
	Integrity and ethical commitment	X	X	X	X	X	X
	Making decisions		X		X	X	X
	Synthesis of information to determine the perspective of a problem or trend in EM security		X	X		X	X
	A holistic and proactive approach	X	X	X	X	X	X
	Recognizing the differences of EM	X	X	X	X	X	X
	Awareness of workload and limitations	X	X	X	X	X	X
	Awareness of professional responsibility	X	X	X	X	X	X
Subject-specific competencies	Awareness of the importance of EM safety for the development of society	X	X	X	X	X	X
	Understanding the principles of the EM security system and defining activities as their response	X	X	X	X	X	X
	Creation of new technological solutions and improvements that improve safety and sustainability in EM	X	X	X	X	X	X
	Understanding the relationship between the activities of EM and the public	X				X	X
	Understanding the role of EM regulatory bodies	X	X	X	X	X	X
	Understanding the importance of EM on roads for sustainable development		X	X	X	X	X
	Recognition of EM safety management as a key factor of sustainability	X	X	X	X	X	X
	Ability to participate in all stages of planning, organization of EM process.			X		X	X
	Ability to apply theoretical and practical knowledge in the execution of electric mobility.		X	X		X	X

2.2) Quality management

The Faculty of Mechanical Engineering creates and implements quality and innovative study programs at all levels study, with clearly defined and internationally comparable learning outcomes in the European area of higher education, adapted to the modern needs of society and the market. For this purpose, the following activities are performed:

- Analysis of the success of study programs with a proposal to improve the structure and quality study programs, including revision of the connection of all curriculum elements (load of students, examination and evaluation method, teaching organization, learning outcomes).
- Analysis of the alignment of learning outcomes of study programs with the needs of the labor market.

In order to ensure the quality of teaching, the following is done:

- Teams were formed to analyze the success of study programs;
- A self-evaluation report on study programs was prepared;
- Proposals are given for improving the structure of study programs;
- Proposals are made to change the structure of the subject curricula and align them with the criteria in within the European Higher Education Area EHEA;

- Identifying the needs of the labor market for learning outcomes (through surveys, interviews, etc.)
- A proposal for changes in learning outcomes is given in accordance with the identified needs of the labor market (at least 1 time during implementation).

Those responsible for the quality of teaching at the faculty are: Dean's College, Faculty Council, teams for analysis of the success of study programs.

Once a year, in accordance with university acts, at the level of the entire UCG, and therefore of the Faculty of Mechanical Engineering, conducts a student survey procedure in order to receive feedback on subject but also about the quality of teaching. Students evaluate the quality of teaching through student surveys teachers and associates, but the subject itself, with which they express their opinion. Grades obtained through surveys, are processed and presented in accordance with the Law on Higher Education and the same discussed at the Council session. Teacher and associate for all elements in which they were graded with with grades ≥3 and ≤4, they must implement measures to improve the organization and teaching performance. Monitoring of the implementation of the planned measures is carried out through periodic analyzes of feedback from the parties students, and verification is based on comparing the obtained grades with the grades from the previous ones year, if the mean grade of teachers and associates and subjects is in the interval ≥2 and ≤3, teacher and teaching assistants are required to prepare special measures to improve the organization and performance of classes. This measures include the development of a plan of specific actions and a program for monitoring the teaching process in accordance with the recommendations for the organization of learning. The effectiveness of the measures is monitored during classes, by comparing with the results of successive checks, and verification is done by comparing the grades at the end classes. To all teachers and associates who were rated overall by students average grade ≤4, at the Council meetings and through direct contacts, it is suggested that they start with activities in fulfilling the recommendations of the Senate of the University in order to improve the teaching process. This statement also applies to teachers and associates who have a grade of ≤4 on certain questions. The Faculty of Mechanical Engineering provides all information about student satisfaction with the study program, through the Snike portal in the Results section (http://snike.cis.ac.me/nastavnik/kvalitet-vrednovanje.aspx). In this part, among other things, you can clearly see the evaluations related to the level of achievement of the defined goals subjects, used literature, method of teaching,

method of examination, evaluations for the teacher, evaluations for collaborators, comments and more. Other forms of surveying are planned according to the activities of the Center for studies and quality control. It can be concluded that at the Faculty of Mechanical Engineering, and accordingly strategies and activities at UoM, special attention is paid to the development of quality in accordance with ESG. Namely, through the quality infrastructure at UoM, under the special influence and action of the Center for studies and quality control, all study programs, including those at the Faculty of Mechanical Engineering develop and implement in accordance with all standards and guidelines defined in ESG. The quality assurance committee, which is in charge of monitoring, analyzing, evaluating and improving quality in all aspects. Through various mechanisms, especially student surveys, but also others, on a framework of trust in quality is created for the faculty and inputs are given for the development of the overall culture of quality. All of programs, but also teaching methods and recommended literature are based on the best international practice. During the development and improvement of study programs, special attention is paid comparability of study programs with those from prestigious faculties from the European area of higher education of education, which provides prerequisites for student mobility. In the very development of quality and culture of quality, students and all interested parties actively participate.

2.3) Instruments, methods and results

Methods and instruments are used to maintain the quality of the study program. They are documented and regularly controlled using: mechanisms quality assurance (self-evaluation and self-evaluation analysis and assessment), and quality assurance instruments (standards and indicators). The obtained data is evaluated as part of the quality assurance system. They provide the necessary information and allow conclusions to be drawn. If the study program was successfully completed, regardless of whether the controls were active during the course of studies, the assessment of graduated students on the study program is checked and their employment after studies. Those conclusions allow weaknesses to be recognized and corrected.

The Faculty of Mechanical Engineering conducts a self-evaluation once a year with the monitoring of quality standards and indicators, analyzes reports on self-evaluation with previous ones, evaluates and draws conclusions. Also students evaluate the work of individual teachers and associates, which leads to the improvement of teaching performance. Ratings graduate students on the study program and employment after studies is carried out at on an

informal basis, but still, due to the size of the population, it gives good results and feedback, which serve to improve study programs. Reports on the institution's self-evaluation are adopted by the institution's management body. In addition to the annual self-evaluation, UoM also implemented an external evaluation. External evaluation The EUA-Institutional Evaluation Program is carried out by the University of Montenegro. Management and institutional decision-making, Quality culture, Teaching and learning, Research, Provision service to society, and Internationalization.

2.4) Modernized Course Schedules and Syllabi

In the following text, syllabuses of modernized and new courses at the Master study programme Road Traffic are presented, in the template required by the Agency for Quality Control of Higher Education, Montenegro. In the template, the changed parts and work program by week with the introduction of the EM aspect are emphasized.

2.4.1) Operating and technological properties of vehicles

Course title:	Road freight transport			
Course code	**Course status**	**Semester**	**ECTS credits**	**Hours/week**
	Obligatory	**I**	**6,0**	**2L+2T**

Study programs for which it is organized:
Academic master studies in Road Traffic Engineering (studies last 4 semesters, 120 ECTS credits)

Aims: The aim of studying the subject is to acquire the knowledge necessary for understanding, managing and analysing the process of exploitation of road vehicles

Learning outcomes: After passing the exam in this course, students will be able to:

1. Manage the exploitation of the vehicle;
2. Understand the exploitation and technical properties of new vehicles and with the change of properties as a result of the use of the vehicle;
3. Determine the moment of acquisition and write-off of the vehicle;
4. Take care of the requirements for the vehicle as a result of use in the conditions necessary for the economical functioning of the fleet;
5. Apply knowledge about the latest regulations that vehicles must meet in order to be included in public transport in relation to environmental conditions and in relation to other technical norms.

Lecturer / Teaching assistant: Assoc. Prof. Sreten Simović / MSc Marko Lučić

Method of teaching and learning: Lectures and auditory exercises; consultations through a combined/digital approach to learning based on the synergy between educational technology and real/virtual environment (video case studies, critical analysis of presented material, audio-visual support, etc), individual projects, individual and team presentations, consultations).

PLAN:

I	Introduction to the subject and method of teaching; Introduction to the subject; Historical development of road vehicles and their components; Classification, categorization and identification of vehicles
II	Requirements placed on vehicles; Regulations and legislation in the field of road vehicles
III	Operational and technological characteristics of vehicles; Seminar paper
IV	Operational and technological characteristics of vehicles (vehicles equipped with SUS engines and vehicles with alternative drive)

V	Significant exploitation factors that affect individual vehicle properties and measures to mitigate these impacts (influence of applied vehicle drive)
VI	Goals and tasks of technical exploitation of vehicles (characteristics according to the performance of the drive system)
VII	Theoretical and methodological bases of technical exploitation of vehicles
VIII	Colloquium I
IX	Vehicle life cycle, life cycle costs and vehicle condition (traditional and alternative vehicle drive)
X	Determining the useful life of vehicles according to technical and economic criteria
XI	Technical exploitation of the transport system subsystem
XII	Resources of technical exploitation and management of technical exploitation
XIII	Resource quantification models
XIV	Renewal of the vehicle fleet and development perspectives
XV	Final exam

Responsibilities of students during semester: Students are required to attend lectures and tutorials and do both midterm exams (live or online).

Office hours:

Student occupation in hours:

Weekly	During semester
6 ECTS x 40/30 = 7 hours **Structure:** 2 hours of lectures 2 hours of tutorials 4 hours of self-learning	**Lectures and final exam:(7** hours) x 16 weeks = 112 hours **Necessary preparations before semester beginning:** (administration, enrollment, validation) 2x6 hours=12 hours **Total hours of the course:** 6x30=180 hours **Additional work:** preparation for makeup exam and makeup exam **56 hours** **Load structure**: 112 hours (Schooling)+12 hours (preparation)+56 hours (additional work)

Literature:

1. Bunčić S. D.: Tehnička eksploatacija motornih vozila I, Faculty of Transport and Traffic Engineering, Belgrade, 2001.
2. Krstić B.: Tehnička ekspolatacija motornih vozila i motora, Faculty of Mechanical Engineering, Kragujevac, 2009.
3. Lowe D.: A transport operator's and manager's handbook, Kogan Page, London, 2006.
4. Guzzella L., Sciarretta A.: Vehicle propulsion systems, Intorduction to modeling and optimization, Third edition, Springer, 2013.
5. Larminie J., Lowry J.: Electric vehicle technology explained, Second edition, Wiley, 2012.
6. Chau K.T.: Energy systems for electric and hybrid vehicles, The institution of engineering and technology, London, 2016.

Assessment and grading:

- Midterm exams: 2x35 points
- Final exam: 30points

Grading Scale: 100% - 90% A; 89% - 80% B; 79% - 70% C; 69% - 60% D; 59% - 50% E; 49% - 0% F

Special notes for the course:

The name of the lecturer who provided the information: Assoc. Prof. Sreten Simović

Remark:

2.4.2) Alternative road vehicle drives

Course title:	Alternative road vehicle drives			
Course code	**Course status**	**Semester**	**ECTS credits**	**Hours/week**
	Obligatory	**I**	**6,0**	**2L+2T**

Study programs for which it is organized:
Academic master studies in Road Traffic Engineering (studies last 4 semesters, 120 ECTS credits)

Aims: The aim of the course is to give the theoretical and practical knowledge in terms of alternative alternative fuels and alternative drives of road vehicles

Learning outcomes: After passing the exam in this course, students will be able to:

1. Interpret the energy and ecological effects of the application of alternative fuels in road transport;
2. Analyze serial, parallel and combined configurations of hybrid vehicles;
3. Analyze the concept of electric vehicles and powertrains of those vehicles;
4. Recognize the perspective of the application of vehicles with an alternative drive.

Lecturer / Teaching assistant: Prof. Vladimir Pajković

Method of teaching and learning: Lectures and auditory exercises; consultations through a combined/digital approach to learning based on the synergy between educational technology and real/virtual environment (video case studies, critical analysis of presented material, audio-visual support, etc), individual projects, individual and team presentations, consultations).

PLAN:

I	Alternative fuels for vehicles/Renewable energy.
II	Biofuels.
III	Natural gas fuel – compressed/liquefied.
IV	Flexible fuel vehicles. LPG.
V	Hydrogen.
VI	Colloquium 1
VII	Electric drive vehicles.
VIII	Electric energy storage systems. Inverters/converters. Seminar paper – topic.
IX	Hybrid electric vehicles.
X	Plug-in hybrid electric vehicles. Chargers.
XI	Range-Extended Electric Vehicles. Regenerative breaking.
XII	Fuel cell electric vehicles.
XIII	Correctional Colloquium
XIV	Other alternative drives. Perspectives.
XV	Defense of seminar papers.

Responsibilities of students during semester: Students are required to attend lectures and tutorials and do both midterm exams.

Office hours:

Student occupation in hours:

Weekly	During semester
6 ECTS x 40/30 = 8 hours **Structure:** 2 hours of lectures 2 hours of tutorials 4 hours of self-learning + consultations	**Lectures and final exam:(8** hours) x 16 weeks = 128. **Necessary preparations before semester beginning:** (administration, enrollment, validation) 2x5 hours and 30 minutes=11 hours. **Total hours of the course:** 6x30=180 hours **Additional work:** preparation for makeup exam and makeup exam **41 hours** **Load structure**: 128 hours (Schooling)+11 hours (preparation)+41 hours (additional work)

Literature:

1. Stojiljković, D. (ed.): Alternativna goriva za pogon motora SUS u XXI veku – monografija, Beograd, 2008.
2. Reijnders, L., Huijbregts, M.: Biofuels for Road Transport, Springer, 2009.
3. Ehsani, M., Gao, Y., Emadi, A.: Modern Electric, Hybrid Electric and Fuel Cell Vehicles, CRC Press, 2010.
4. Emadi, A.: Advanced Electric Drive Vehicles, CRC Press, 2015.

Assessment and grading: - Midterm exams: 2x25 points - Final exam: 50points **Grading Scale**: 100% - 90% A; 89% - 80% B; 79% - 70% C; 69% - 60% D; 59% - 50% E; 49% - 0% F
Special notes for the course:
The name of the lecturer who provided the information: Prof. Vladimir Pajković
Remark:

2.4.3) Environmental Impact of Electric Vehicles

Course title:	**Environmental Impact of Electric Vehicles**			
Course code	**Course status**	**Semester**	**ECTS credits**	**Hours/week**
	Elective	**I**	**6,0**	**2L+2T**

Study programs for which it is organized:
Academic master studies in Road Traffic Engineering (studies last 4 semesters, 120 ECTS credits)

Aims: Describe the sources and types of pollution associated with internal combustion engineS (ICE) with electric vehicles (EV) across their respective life cycles, as well as corresponding health and environmental effects. Introduction to alternative pathways for EV technology and how its deployment might influence the health and environmental benefits that are realized from the EV transition.

Learning outcomes: After passing the exam in this course, students will be able to:

1. Recognize the magnitude and scope of impacts of air pollution on human health and the environment;
2. Appreciate the types of evidence that link air pollution with health and environmental effects, from local to global scales;
3. Identify the sources of air pollution across the well-to-wheels life cycle of internal combustion engine vehicles and electric vehicles;
4. Recognize factors that will influence how the EV transition affects human health and the environment and consider how they could be addressed in EV research;
5. Recognize the systems associated with electrified transportation and their interdependencies
6. Understand the meaning of a systems of systems approach to considering the transition to electrified transportation;
7. Explain at the conceptual level how the interdependencies among the systems in electrified transportation may impact adoption, the environment, and society;
8. Understand the coupling of the two large infrastructure systems: power systems and transportation systems.

Lecturer / Teaching assistant: Prof. Radoje Vujadinović / MSc Vladimir Ilić

Method of teaching and learning: Lectures and auditory exercises; consultations through a combined/digital approach to learning based on the synergy between educational technology and real/virtual environment (video case studies, critical analysis of presented material, audio-visual support, etc), individual projects, individual and team presentations, consultations).

PLAN:

I	History and Introduction to Electric Vehicles
II	Relevance and Environmental Burdens of Vehicles
III	Components and Functioning of Electric Vehicles
IV	Energy Consumption of Electric Vehicles in Use Phase
V	Lightweight Design for Vehicle Engineering
VI	Environmental Impact of Lightweight Electric Vehicles
VII	State of Research on the Environmental Assessment of Electric and Lightweight Vehicles
VIII	Colloquium 1
IX	Concept for the Environmental Assessment of Lightweight Electric Vehicles
X	Comparison of Electric Vehicles and Conventional Vehicles
XI	Comparison of Lightweight Electric Vehicles with Reference Electric Vehicles
XII	Electric Vehicle Charging Infrastructure
XIII	Battery Requirements for HEVs, PHEVs, and EVs: An Overview

XIV	Battery Environmental Analysis
XV	Final exam

Responsibilities of students during semester: Students are required to attend lectures and tutorials and do both midterm exams.

Office hours:

Student occupation in hours:

Weekly	During semester
6 ECTS x 40/30 = 8 hours **Structure:** 2 hours of lectures 2 hours of tutorials 4 hours of self-learning	**Lectures and final exam:(8** hours) x 16 weeks = 128 hours **Necessary preparations before semester beginning:** (administration, enrollment, validation) 2x8 hours=16 hours **Total hours of the course:** 6x30=180 hours **Additional work:** preparation for makeup exam and makeup exam **36 hours** **Load structure**: 128 hours (Schooling)+16 hours (preparation)+36 hours (additional work)

Literature:

1. Husain, I. (2021). Electric and hybrid vehicles: design fundamentals. CRC press.
2. Egede, P. (2017). Environmental assessment of lightweight electric vehicles. Cham: Springer.
3. Choma, E. F., Evans, J. S., Hammitt, J. K., Gómez-Ibáñez, J. A., and Spengler, J. D. (2020). "Assessing the health impacts of electric vehicles through air pollution in the United States." Environment International, Elsevier, 144(February), 106015
4. Tessum, C. W., Hill, J. D., and Marshall, J. D. (2014), "Life cycle air quality impacts of conventional and alternative light-duty transportation in the United States." Proceedings of the National Academy of Sciences of the United States of America, 111(52), 18490–18495.
5. •Davidson, K., Fann, N., Zawacki, M., Fulcher, C., and Baker, K.R. (2020), "The recent and future health burden of the US mobile sector apportioned by source." Environmental Research Letters. IOP Publishing, 15(7), DOI:10.1088/1748-9326/ab83a8.

Assessment and grading:
- Midterm exams: 2x35 points
- Final exam: 30points

Grading Scale: 100% - 90% A; 89% - 80% B; 79% - 70% C; 69% - 60% D; 59% - 50% E; 49% - 0% F

Special notes for the course:

The name of the lecturer who provided the information: Prof. Radoje Vujadinović

Remark:

2.4.4) Energy efficiency in traffic

Course title:	**Energy efficiency in traffic**			
Course code	**Course status**	**Semester**	**ECTS credits**	**Hours/week**
	Obligatory	**II**	**6,0**	**2L+2T**

Study programs for which it is organized:
Academic master studies in Road Traffic Engineering (studies last 4 semesters, 120 ECTS credits)

Aims: The purpose of this subject is to introduce students to the importance of the topic of energy efficiency; familiarization with technological achievements, current measures and activities for improving energy efficiency in road traffic in the world with a review of the potential in Montenegro in this area.

Learning outcomes: After passing the exam in this course, students will be able to:
1. Identify and monitor energy efficiency indicators in traffic and utility systems;
2. Calculate CO_2 emissions based on energy consumption in traffic and utility systems;
3. Understand and apply measures to improve energy efficiency in traffic;
4. Understand the role and importance of energy efficiency of electric vehicles.

Lecturer / Teaching assistant: Prof. Radoje Vujadinović / MSc Marko Lučić

Method of teaching and learning: Lectures and auditory exercises; consultations through a combined/digital approach to learning based on the synergy between educational technology and real/virtual environment (video case studies, critical analysis of presented material, audio-visual support, etc), individual projects, individual and team presentations, consultations).

PLAN:

I	Energy efficiency in road traffic - basic definitions

II	Fuel consumption and energy efficiency
III	Energy Efficiency of Hybrid and Electric Vehicles
IV	CO2 emissions from road traffic and climate change
V	Kyoto Protocol and international obligations
VI	Trends in the automotive industry to improve the energy efficiency of road vehicles
VII	Improving the energy efficiency of new vehicles
VIII	Colloquium 1
IX	Measures to improve energy efficiency (traffic management, maintenance of vehicles, intelligent transport systems)
X	Measures to improve energy efficiency (use of alternative fuels, economic instruments)
XI	Measures to improve energy efficiency (energy optimization of driving conditions and techniques, traffic regulation)
XII	Measures to improve energy efficiency (changing the choice of means of transport, reducing the mobility demands)
XIII	EU programs for encouraging energy efficiency in road traffic
XIV	Possibilities of improving energy efficiency in road traffic in Montenegro
XV	Final exam

Responsibilities of students during semester: Students are required to attend lectures and tutorials and do both midterm exams.

Office hours:

Student occupation in hours:

Weekly	During semester
6 ECTS x 40/30 = 8 hours **Structure:** 2 hours of lectures 2 hours of tutorials 4 hours of self-learning with consultations	**Lectures and final exam:(8** hours) x 16 weeks = 128 hours **Necessary preparations before semester beginning:** (administration, enrollment, validation) 2x6 hours=12 hours **Total hours of the course:** 6x30=180 hours **Additional work:** preparation for makeup exam and makeup exam **40 hours** **Load structure**: 128 hours (Schooling)+12 hours (preparation)+40 hours (additional work)

Literature:

1. Radoje Vujadinović: Modeliranje emisije CO2 putničkih vozila u saobraćaju-Doktorska disertacija. Univerzitet u Beogradu, Mašinski fakultet, Beograd, 2005.
2. Bradbrook, Adrian John: Energy Efficiency in Road Transport-UNEP Handbook for Drafting Laws on Energy Efficiency and Renewable Energy Resources. United Nations Environment Programme, United Kingdom, 2007.
3. Pierre Advenier, Pierre Boisson, Claude Delarue, André Douaud, Claude Girard, Michel Legendre : Energy efficiency and CO2 emissions of road transportation: Comparative analysis of technologies and fuels, World Energy Council- 18th Congress, Buenos Aires, October 2001.
4. European Conference of Ministers of Transport-Council of Ministers: Monitoring Of CO2 Emissions From New Cars, CEMT/CM(2003)10, Mart 2003
5. Hickman J.: PROJECT REPORT SE/491/98 Methodology for calculating transport emissions and energy consumption, TRANSPORT RESEARCH LABORATORY, London,1999,
6. Midenet S., Boillot F., Pierrel_ee J.C.: Signalized intersection with real-time adaptive control: On-field assessment of CO2 and pollutant emission reduction, France, 2004
7. J. Foley, M. Fergusson: Putting the Brakes on Climate Change, A policy report on road transport and climate change, Institute for Public Policy Research, London, 2000.
8. Časopisi za oblasti automobilske industrije: ATZ, MTZ, AutoTechnology, Automotive Engineer, Trafic Technology International, Automotive Testing Technology International, Electric&Hybrid Vehicle Technology International…
9. Gautam, A., De, S., Dhar, A., Gupta, J. G., & Pandey, A. (2018). Sustainable Energy and Transportation. Springer.

Assessment and grading:
- Midterm exams: 2x15 points
- Final exam: 50 points
- Seminar paper: 20 points

Grading Scale: 100% - 90% A; 89% - 80% B; 79% - 70% C; 69% - 60% D; 59% - 50% E; 49% - 0% F

Special notes for the course:

The name of the lecturer who provided the information: Prof. Radoje Vujadinović

Remark:

2.4.5) Advanced technologies in road traffic

Course title:	Advanced technologies in road traffic

Course code	Course status	Semester	ECTS credits	Hours/week
	Elective	III	6,0	3L+2T

Study programs for which it is organized:
Academic master studies in Road Traffic Engineering (studies last 4 semesters, 120 ECTS credits)

Aims: Introduction of the role that technology will play in facilitating shared mobility, disrupting transportation markets, and reshaping multi-modal urban transportation systems; analyses of governance issues; the interaction between private markets and regulators; changes in the nature of infrastructure and urban planning required to accommodate the wired future of transportation.

Learning outcomes: After passing the exam in this course, students will be able to:

1. Understand the basic principles of autonomous, connected, electric and shared vehicles;
2. Recognize challenges and benefits coming from autonomous, connected, electric and shared vehicles;
3. Understand the technology innovations that are part of the Autonomous, Connected, Electric, and Shared (ACES) revolution;
4. Evaluate the impacts of transportation technology policy frameworks on urban sustainability, equity, and accessibility;
5. Present complex policies in a concise and compelling way to a range of audiences;
6. Develop proofs-of-concept and pilots for implementing ACES in an urban context;
7. Apply knowledge about of Smart Transportation Systems;
8. Collect and analyze data using modern systems.

Lecturer / Teaching assistant: Asst. Prof. Boško Matović / MSc Vladimir Ilić

Method of teaching and learning: Lectures and auditory exercises; consultations through a combined/digital approach to learning based on the synergy between educational technology and real/virtual environment (video case studies, critical analysis of presented material, audio-visual support, etc), individual projects, individual and team presentations, consultations).

PLAN:

I	Introduction to Autonomous, Connected, Electric, and Shared (ACES)
II	Autonomous Vehicles
III	Connected Vehicles
IV	Electric Vehicles
V	Shared Mobility
VI	Disruptions Caused by ACES Mobility
VII	Colloquium 1
VIII	Potential Challenges of ACES - Technical Challenges
IX	Potential Challenges of ACES - Legal, Industrial, and Workforce Challenges
X	Potential Benefits of ACES - Technological, Safety, and Security Benefits
XI	Potential Benefits of ACES - Societal and Sustainability Benefits
XII	Electric Vehicles and IoT in Smart Cities
XIII	Governance of Shared and Electric Mobility
XIV	Governance of Automated Mobility
XV	Final exam.

Responsibilities of students during semester: Students are required to attend lectures and tutorials and do both midterm exams.

Office hours:

Student occupation in hours:

Weekly	During semester
6 ECTS x 40/30 = 8 hours **Structure:** 3 hours of lectures 2 hours of tutorials 3 hours of self-learning	**Lectures and final exam:(8** hours) x 16 weeks = 128 hours **Necessary preparations before semester beginning:** (administration, enrollment, validation) 2x8 hours=16 hours **Total hours of the course:** 6x30=180 hours **Additional work:** preparation for makeup exam and makeup exam **36 hours** **Load structure**: 128 hours (Schooling)+16 hours (preparation)+36 hours (additional work)

Literature:

1. Meneguette, R. I., De Grande, R., & Loureiro, A. A. (2018). Intelligent transport system in smart cities. Cham: Springer International Publishing.
2. R. Gordon (2015), Intelligent Transportation Systems Functional Design for Effective Traffic Management - Second Edition, Springer
3. M. McDonald, et.al. (2006), Intelligent Transport Systems in Europe - Opportunities for Future Research, World Scientific Publishing Co. Pte. Ltd., Singapore
4. Hamid, U. Z. A. (2022). *Autonomous, Connected, Electric and Shared Vehicles: Disrupting the Automotive and Mobility Sectors*. SAE International.
5. Finger, M., & Audouin, M. (2019). The governance of smart transportation systems.

Assessment and grading:
- Midterm exams: 2x25 points
- Final exam: 50points

Grading Scale: 100% - 90% A; 89% - 80% B; 79% - 70% C; 69% - 60% D; 59% - 50% E; 49% - 0% F

Special notes for the course:

The name of the lecturer who provided the information: Asst. Prof. Boško Matović

Remark:

2.4.6) Electric vehicle safety

Course title:	**Electric vehicle safety**			
Course code	**Course status**	**Semester**	**ECTS credits**	**Hours/week**
	Elective	**III**	**5,0**	**2L+2T**

Study programs for which it is organized:
Academic master studies in Road Traffic Engineering (studies last 4 semesters, 120 ECTS credits)

Aims: The purpose of this subject is to introduce students to the basic aspects of electric vehicles and its impact on overall road safety.

Learning outcomes: After passing the exam in this course, students will be able to:
1. Identify and demonstrate knowledge of the major concepts, theoretical perspectives, and historical trends in road safety;
2. Identify and rank risk factors related to the vehicle safety.
3. Understand legal framework in vehicle tehnologies;
4. Understand impact of vehicle electrification on road safety;
5. Obtain the best practices of safer electric mobility.

Lecturer / Teaching assistant: Assoc. Prof. Milanko Damjanović / MSc Vladimir Ilić

Method of teaching and learning:

PLAN:

I	Introduction to road safety
II	Factors affecting the road safety
III	Vehicle design and road safety
IV	Vehicle safety assesment
V	Vehicle safety legislation – EU directives
VI	Vehicle safety legislation – National legislation
VII	Colloquium I
VIII	Electric and hybrid vehicles – design fundaments
IX	The impact of vehicle electrification on road safety
X	Design of electric vehicles and road safety
XI	Battery safety requirements for electric vehicles

XII	Electric mobility and road tunnel safety
XIII	Advanced vehicle technologies and road safety
XIV	The future of vehicle safety and sustainable transportation
XV	Final exam

Responsibilities of students during semester: Students are required to attend lectures and tutorials and do both midterm exams.

Office hours:

Student occupation in hours:

Weekly	During semester
5 ECTS x 40/30 = 8 hours **Structure:** 2 hours of lectures 2 hours of tutorials 2 hours and 40 minutes of self-learning	**Lectures and final exam:(6** hours and 40 minutes) x 16 weeks = 106 hours and 40 minutes. **Necessary preparations before semester beginning:** (administration, enrollment, validation) 2x5 hours and 10 minutes=10 hours and 20 minutes **Total hours of the course:** 5x30=150 hours **Additional work:** preparation for makeup exam and makeup exam **33 hours** **Load structure**: 106 hours and 40 minutes (Schooling)+10 hours and 20 minutes (preparation)+33 hours (additional work)

Literature:

1. Lipovac, K., Jovanović, D., & Vujanić, M. (2014). Osnove bezbednosti saobraćaja. *KPA, Beograd*.
2. Pistoia, G. (Ed.). (2010). Electric and hybrid vehicles: Power sources, models, sustainability, infrastructure and the market. Elsevier.
3. Husain, I. (2021). Electric and hybrid vehicles: design fundamentals. CRC press.
4. Hamid, U. Z. A. (2022). Autonomous, Connected, Electric and Shared Vehicles: Disrupting the Automotive and Mobility Sectors. SAE International.

Assessment and grading:
- Midterm exams: 2x25 points
- Final exam: 50points

Grading Scale: 100% - 90% A; 89% - 80% B; 79% - 70% C; 69% - 60% D; 59% - 50% E; 49% - 0% F

Special notes for the course:

The name of the lecturer who provided the information Assoc. Prof. Milanko Damjanović

Remark:

PELMOB

Funded by the European Union

Catalogue of Courses

University of Sarajevo (UNSA)

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be."

PROJECT INFO

Project title	Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
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DOCUMENT CONTROL SHEET

Work package	WP3: Development of EM curricula and labs
Ref. no and title of activity	T3.3: Designing of EM courses
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Lead institution	Óbudai Egyetem (OE)
Author(s)	Osman Lindov, Amel Kosovac, Drago Ezgeta, Belma Memić, Elma Avdagić-Golub, Adnan Omerhodžić, Aida Kalem, Edvin Šimić, Ajdin Džananović
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Contents

1. UNIVERSITY OF SARAJEVO - UNSA

1.1. Description of the study program

1.1.1. Name of study program and title

Referee program for the II cycle study

Title: Master of Traffic and Communications/Graduate Engineer of Traffic and Communications

1.2. The purpose of the study program

The purpose of the study program is to provide students with the education and expertise needed to understand, plan, design, manage and improve transportation systems. This study program is designed to ensure the acquisition of competencies and qualifications that are socially justifiable and useful. This master's program provides an interdisciplinary and multidisciplinary approach to understanding traffic problems with a special focus on the problem of electric mobility, regulations, safety factors and technical solutions. It is based on a modern curriculum and modern teaching programs that follow the trends and guidelines on electric mobility. The study program is based on the adopted principles of the framework policy and strategy in the field of traffic, international, European and national regulations and standards and modern trends for the development of the transport system. In accordance with the university's mission, the study program provides accessible and modern, high-quality education that will meet the expectations of students and the demands of the public, private and civil sectors.

1.3. Objectives of the study program

The study of electric mobility at universities is important, because it contributes to more sustainable mobility, technological progress and reduction of emissions. This education supports innovation, business opportunities and improves the urban environment, while preparing professionals for leadership roles in the growing electric vehicle industry. Universities play a key role in shaping the future of mobility towards sustainable goals. This topic is complex and should provide knowledge and a deeper

understanding of risk while strengthening applied and practical skills. Electric mobility has a positive impact on traffic safety through the reduction of air and noise pollution and the use of advanced safety technologies. The low emission and quieter operation of electric vehicles contribute to better air quality and reduced traffic stress. Advanced safety features and driving assistance systems in electric vehicles help prevent accidents. Also, education and awareness of the ecological aspects of electric mobility encourage a traffic culture focused on safety. As the University of Sarajevo has a common basis for all departments, with a deep knowledge of mathematics, physics, mechanics and educational engineers, emphasis will be placed on a holistic and interdisciplinary approach of using engineering in the improvement of electric mobility and all aspects that promote it.

1.4. Competences of graduate students

The program of the second study cycle introduces students to a wide range of technical, professional and practical skills necessary for understanding, designing, developing and managing electric vehicles and related technologies. Students will be able to recognize the problem, understand the basis of the problem, define the mechanisms for implementing the process, propose a strategy for solving the problem and develop the necessary protocols and methods for implementing the strategy, in order to achieve the goal. Master's degree graduates will have the following knowledge:

- Students will develop a deep technical understanding of electric vehicles, including electric drives, battery technology, power electronics and control systems;
- have knowledge of social communication, consulting and project management models;
- have knowledge and understanding of the relationship between consulting, management, leadership, communication in general and teaching;
- be able to think about analyses, methods and theories related to electric mobility management;
- have knowledge of relevant legislation and legal practice related to electric mobility and other segments of the transport system.

Master's degree graduates will have the following skills and competencies:

- be able to collect and process data as a basis for choosing the best methods or tools for solving tasks and problems related to electric mobility;
- be able to manage projects and control resources within the course;
- be able to analyze and evaluate theoretical and practical problems related to planning, strategy and development, and present a proposal for future strategy and solutions;

- be able to communicate knowledge and carry out consultations in relation to partners and other interested parties;
- be able to use mathematical and statistical methods for analytical results and refer to results in practice;
- be able to turn practical experience, knowledge and research results into solutions;
- be able to form part of multidisciplinary teams and to independently plan and implement tasks related to electric mobility;
- be able to identify the personal need for competence development and for further education;
- be able to develop independence, the ability to cooperate and the ability to create new models;
- be able to develop interest and ability to actively cooperate in a democratic society.

1.5 Quality, modernity and international compliance

The study program is in accordance with European trends and the status of the profession and science in the corresponding educational and scientific field and is comparable to similar programs in foreign and higher education institutions. Harmonization of the study program, the student acquires knowledge, skills and abilities that enable the realization of competencies and learning outcomes that society as a whole wants. The study program is aligned with contemporary and current professional knowledge and is comparable to study programs on electric mobility that exist at faculties in the region. The basic principles of coordination are: each course lasts one semester, credit system, optional subjects, independent semester project.

1.6. Subjects for innovation-modernize and new subjects UNSA - FSK

1.6.1 Existing Subjects for modernize - innovation UNSA-FSK

No	Obligatory (O) Elective (E)	Name of the subject Bachelor's degree	Number of classes P+V+L	ESPB
Fifth and sixth semester (5 and 6)				
1.	Obligatory	Electrical systems in traffic and communications	3+2+1	6
2.	Obligatory	Diagnostic and maintenance of vehicles	3+2+1	6
3.	Obligatory	Electric and autonomous road vehicles	3+2+1	6
4.	Obligatory	Communication technologies and the environment	3+2+1	6
5.	Obligatory	Public Urban Transport	3+2+1	6
6.	Elective	Transport and Environment		

1.6.2 New subjects UNSA-FSK_PELMOB

No	Mandatory (O) Elective (I)	Name of the subject	Number of classes P+V+L	ESPB
Second semester (2)				
1	Elective (I)	E VEHICLE IN PUBLIC TRANSPORT AND E-CAR SHARING	3+2+1	6
2	Elective (I)	ELECTRIC VEHICLE SAFETY	3+2+1	6
Third semester (3)				
3	Elective (I)	SUSTAINABLE URBAN MOBILITY	3+2+1	6
4	Elective (I)	E LOGISTICS AND EV INFRASTRUCTURE	3+2+1	6
5	Elective (I)	IoT SOLUTIONS FOR THE ELECTRIC VEHICLE INDUSTRY	3+2+1	6

1.7. The connection between competences and subjects

Competencies		Mandatory OP/Elective subjects IP				
		IP1	IP2	IP3	IP4	IP5
Generic competencies	Capacity for analysis and synthesis	X		X	X	X
	Capacity to apply knowledge in practice	X		X	X	X
	Oral and written communication	X	X	X	X	X
	Development of computer skills	X		X	X	X
	Development of research skills	X				X
	Information management skills		X	X		
	Critical and self-critical abilities			X		X
	Capacity to adapt to new situations	X			X	
	Capacity to generate new ideas (creativity)	X	X	X	X	X
	Troubleshooting	X		X	X	X
	Teamwork	X	X	X	X	X
	Leadership		X			X
	Ability to work in a multidisciplinary team	X	X	X	X	X
	Ability to communicate with people in the field				X	X
	Initiative and entrepreneurial spirit		X	X	X	
	Integrity and ethical commitment	X	X	X	X	X
	Making decisions	X		X	X	X
	Synthesis of information to determine viewpoints, perspectives, problems or trends in traffic safety	X	X	X	X	X
	A holistic and proactive approach	X	X	X	X	X
	Appreciation of differences				X	
	Awareness of own scope of work and limitations			X		X
	Awareness of professional responsibility	X	X	X	X	X
Specific subject	Acquiring knowledge and skills for training in a comprehensive understanding of the concept of	X				

competencies	electromobility and E-car sharing in public transport,					
	Ability to apply acquired knowledge in real situations.	X				
	Development of initiatives, electromobility and E-car sharing in public transport.	X				
	Acquiring knowledge to implement and manage the concept of electromobility and E-car sharing	X				
	Acquiring knowledge for Smart Grid technologies in public transport and E-car sharing system	X				
	Acquiring knowledge about the application of safety standards and regulations.		X			
	Acquiring knowledge and skills for a comprehensive understanding of the concept of electric vehicle safety		X			
	Acquiring knowledge for the identification and analysis of traffic accidents involving electric vehicles		X			
	Acquiring knowledge about risk management in practical application		X			
	Acquiring knowledge about the safety elements of electric vehicles		X			
	Understanding the principles of the electric vehicle industry and the key challenges in it			X		
	Identifying different IoT technology and understanding its role in electric vehicles			X		
	Learning about sensor technologies for monitoring the performance of electric vehicles through IoT technologies.			X		
	Acquiring knowledge about analyzing data obtained from sensors to diagnose defects and optimize the performance of electric vehicles.			X		
	Gaining knowledge on ways to connect electric vehicles with smart charging infrastructure using IoT solutions.			X		
	Gaining knowledge of battery management principles and using IoT data to optimize battery life.			X		
	Gaining knowledge on data analysis from IoT devices for the purpose of improving the design and performance of electric vehicles.			X		
	Acquiring knowledge about the integration of practical solutions for the application of IoT solutions in real situations of electric vehicles.			X		
	Gaining knowledge about future trends in the development of IoT technologies and their impact on the electric vehicle industry.			X		
	Acquiring skills and knowledge to develop abilities, understanding and practical application of innovative ways of urban mobility planning				X	
	Acquiring knowledge about planning and designing spaces with accessibility and availability of destinations and services,				X	
	Acquiring knowledge about increasing safety and protection in movement and mobility, reducing greenhouse gas emissions				X	
	Acquiring knowledge about reducing the consumption of fossil fuels, attractiveness of urban areas, increasing the quality of life, healthier environment and reduced harmful impact on citizens' health.				X	
	Acquiring knowledge and skills in the development and planning of space and mobility for people with reduced				X	

	mobility.					
	Acquiring knowledge in the field of city logistics, planning and organization of logistics operations of city logistics,					X
	Acquiring knowledge about the sustainable development of city logistics and the impact of city logistics on the environment, Acquiring knowledge about the application of new smart logistics technologies.					X
	Abilities of independent understanding, problem recognition,					X
	Ability to participate in all phases of planning, organization of logistics operations in city logistics					X
	The ability to apply theoretical and practical knowledge in the execution of logistics operations in city logistics					X
	Acquiring knowledge in the optimization of logistics processes and the application of digital technologies and environmentally friendly vehicles in logistics operations.					X

IP1 - E VEHICLE IN PUBLIC TRANSPORT AND E-CAR SHARING
IP2 - ELECTRIC VEHICLE SAFETY
IP3 - SUSTAINABLE URBAN MOBILITY
IP4 - E LOGISTICS AND EV INFRASTRUCTURE
IP5 - IoT SOLUTIONS FOR THE ELECTRIC VEHICLE INDUSTRY

2. LIST EXISTING COURSES FOR MODERNIZE AND LIST OF NEW COURSES UNSA_FSK_ PELMOB

2.1. List of existing courses modernization – innovation of UNSA-FSK_PELMOB

No	Obligatory (O) Elective (E)	Name of the subject Bachelor's degree	Number of classes P+V+L	ESPB
Fifth and sixth semester (5 and 6)				
1.	Obligatory	ELECTRICAL SYSTEMS IN TRAFFIC AND COMMUNICATIONS	3+2+1	6
2.	Obligatory	DIAGNOSTIC AND MAINTENANCE OF VEHICLES	3+2+1	6
3.	Obligatory	ELECTRIC AND AUTONOMOUS ROAD VEHICLES	3+2+1	6
4.	Obligatory	COMMUNICATION TECHNOLOGIES AND THE ENVIRONMENT	3+2+1	6
5.	Obligatory	PUBLIC URBAN TRANSPORT	3+2+1	6
6.	Elective	TRANSPORT AND ENVIRONMENT		

2.1. List of new courses UNSA-FSK_PELMOB

No	Mandatory (O) Elective (I)	Name of the subject	Number of classes P+V+L	ESPB
Second semester (2)				
1.	Elective (I)	E VEHICLE IN PUBLIC TRANSPORT AND E-CAR SHARING	3+2+1	6
2.	Elective (I)	ELECTRIC VEHICLE SAFETY	3+2+1	6
Third semester (3)				
3.	Elective (I)	SUSTAINABLE URBAN MOBILITY	3+2+1	6
4.	Elective (I)	E LOGISTICS AND EV INFRASTRUCTURE	3+2+1	6
5.	Elective (I)	IoT SOLUTIONS FOR THE ELECTRIC VEHICLE INDUSTRY	3+2+1	6

2.3. Syllabuses new courses UNSA-FSK_PELMOB

Subject Name:	**E VEHICLE IN PUBLIC TRANSPORT AND E-CAR SHARING**
Number of ECTS:	
Teacher:	
Contributor:	
Case Status:	Elective Course
Requirement:	

Course objective:

To enable students to acquire basic professional knowledge and skills about the application of electric vehicles in public transport, as well as the E-car sharing system. The aim of the course is to train students to understand, analyze and apply the concept of electromobility to public transport in order to develop and promote the concept of sustainable urban mobility.

Outcome /Competences:

- ✓ Acquisition of knowledge and skills for the ability to comprehensively understand the concept of electromobility and E-car sharing in public transport.
- ✓ Competence for practical application of acquired knowledge in real situations.
- ✓ Development of initiatives, electromobility and E-car sharing in public transport.
- ✓ Acquisition of knowledge for the implementation and management of the concept of electromobility and E-car sharing.
- ✓ Gaining knowledge for Smart Grid technology in public transport and E-car sharing system.

Course content:

1. Overview of legal regulations related to E-vehicles and E-car sharing systems.
2. Electric vehicles in public transport, use and comparative analysis.
3. Batteries for electric vehicles with a focus on electric buses and trucks.
4. Charging stations for electric vehicles, classification, performance and risks.
5. Safety aspect of electric vehicles.
6. Transport performance parameters of electric vehicles.
7. Devices for testing electronic systems in the vehicle.
8. The efficiency of changing the conventional vehicle fleet to electric.
9. Analysis of devices and applications that enable the application of the e-car sharing system.
10. Determining the efficiency and profitability of the e-car sharing system.
11. Organization and determination of locations for e-car sharing systems.
12. Ownership of the e-car sharing system, insurance and liability.
13. Management and organization of the E-car sharing system.
14. Regulation and support for the integration of E-car sharing into the public transport system.
15. The role and importance of Smart Grid technologies in public transport and the E-car sharing system.

Literature:

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Number of hours of active classes (weekly):				
Lectures:	Exercises:	Other forms of teaching:	Study research paper:	Other classes:
3	3	0	0	0

Teaching methods:

- Lectures accompanied by multimedia presentations
- Practical exercises with analysis of concrete examples from practice

Knowledge assessment (maximum number of points: 100)			
Pre-examination obligations	points	Final test	points

Activity during the lecture	-	Written exam	50
Practical classes	-	Oral examination	-
Colloquiums	35		
Seminar work	15		
In total		In total	100

Subject Name:	**ELECTRIC VEHICLE SAFETY**
Number of ECTS:	
Teacher:	
Contributor:	
Case Status:	Elective
Requirement:	

Course objective:

To enable students to acquire basic professional knowledge about basic concepts, principles and practices related to the safety of electric vehicles. The aim of the course is to train students to understand and analyze the basic components and systems of electric vehicles, as well as to understand and manage potential risks and safety challenges.

Outcome / Competences:

- ✓ Knowledge of the application of safety standards and regulations.
- ✓ Acquiring knowledge and skills to comprehensively understand the concept of electric vehicle safety.
- ✓ Acquisition of knowledge for the identification and analysis of traffic accidents with the participation of electric vehicles.
- ✓ Knowledge of risk management in practical application.
- ✓ Gaining knowledge about the safety of electric vehicles.

Course content:

1. An introduction to electric vehicle safety.
2. Regulatory framework, standards, regulations in EU countries.
3. Initiatives for the development and promotion of E-mobility.
4. Drive system of E vehicles.
5. Risks and dangers when using and charging electric vehicles.
6. Education on the safety of the movement of E vehicles in traffic.
7. Safety aspects in case of traffic accidents with electric vehicles.
8. Safety aspects of electric vehicle charging infrastructure.
9. Safety elements of E vehicles.
10. Safety of passengers in E vehicles.
11. Analysis of traffic safety parameters of E vehicles.
12. Parameters of calculation of safety elements in case of traffic delinquency with E vehicles.
13. E-vehicles and the environment, the safety aspect of maintenance and disposal of batteries.
14. Safety aspects when servicing and maintaining electric vehicles.
15. E vehicles in industrial plants.

Literature:

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Number of hours of active classes (weekly):				
Lectures:	Exercises:	Other forms of teaching:	Study research paper:	Other classes:
3	3	0	0	0

Teaching methods:

- Lectures accompanied by multimedia presentations
- Practical exercises with analysis of concrete examples from practice

Knowledge assessment (maximum number of points: 100)			
Pre-examination obligations	points	Final test	points
Activity during the lecture	-	Written exam	50
Practical classes	-	Oral examination	-
Colloquiums	35		
Seminar work	15		
In total		In total	100

Subject Name:	**SUSTAINABLE URBAN MOBILITY**
Number of ECTS: 6	
Teacher:	
Contributor:	
Case Status:	Elective course
Requirement:	

Course objective:

Acquiring knowledge and skills in creating sustainable urban mobility plans, including all segments of planning, design, implementation and evaluation and monitoring of sustainable development in urban areas.

Outcome/Competences:

- ✓ Acquisition of skills and knowledge on developing capabilities, understanding and practical application of innovative ways of planning urban mobility
- ✓ Acquiring knowledge of planning and designing spaces with accessibility and availability of destinations and services,
- ✓ Gaining knowledge on increasing safety and security in movement and mobility, reducing greenhouse gas emissions
- ✓ Gaining knowledge about reducing fossil fuel consumption, attractiveness of urban spaces, increasing the quality of life, healthier environment and reduced adverse impact on the health of citizens.
- ✓ Acquiring knowledge and skills in the development and planning of space and mobility for people with reduced mobility.

Course content:

1. The concept of sustainable urban mobility
2. Strategic planning of sustainable urban mobility
3. Indicators of sustainable urban mobility
4. SUMP sustainable urban mobility plans
5. Steps of SUMP development
6. Infrastructure design as a function of sustainable urban mobility.
7. E mobility infrastructure
8. The concept of Carpooling and Ridesharing in the function of sustainable urban mobility
9. Smart cities, digitization and mobility
10. Sustainable logistics in urban areas
11. Air and noise quality and sustainable urban mobility
12. Smart mobility and sustainable urban mobility
13. Energy efficiency and sustainable urban mobility
14. EU standards and policies in the field of sustainable urban mobility
15. Assessment and methods of measuring the effectiveness of sustainable urban mobility measures

Literature:

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- Zietsman J., Rilett LR: Sustainable Transportation: Conceptualization and Performance Measures, Report No. SWUTC/02/167403-1, Texas Transportation Institute, The Texas A&M University System College Station, Texas 2002.

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Number of hours of active classes (weekly):				
Lectures:	Exercises:	Other forms of teaching:	Study research paper:	Other classes:
3	3	0	0	0

Teaching methods:

– Lectures in the function of analysis of sustainable urban mobility plans in cities
– Development of a sustainable urban mobility plan for the urban environment

Knowledge assessment (maximum number of points: 100)			
Pre-examination obligations	points	Final test	points
Activity during the lecture	-	Written exam	50
Practical classes	-	Oral examination	-
Colloquiums	35		
Seminar work	15		
In total		In total	100

The name of the course:	**E LOGISTICS AND EV INFRASTRUCTURE**
Number of ECTS: 6	
Lecturer:	
Lecturer associate:	
Course status:	Elective course
Prerequisites:	

Course objectives:

Acquiring knowledge about process basics, technologies, planning and management of logistics operations in city logistics with the goal of ecologically sustainable development of city logistics.

Outcomes /Competences:

- ✓ Acquisition of knowledge in the field of city logistics, planning and organization of logistics operations of city logistics.
- ✓ Acquiring knowledge about the sustainable development of city logistics and the impact of city logistics on the environment, Acquiring knowledge on the application of new smart logistics technologies.
- ✓ Ability to understand independently, identify problems.
- ✓ Ability to participate in all stages of planning, organization of logistics operations in city logistics.
- ✓ Ability to apply theoretical and practical knowledge in the execution of logistics operations in city logistics.
- ✓ Acquisition of knowledge in optimization of logistics processes and application of digital technologies and environmentally friendly vehicles in logistics operations.

Subject outline:

Theoretical teaching:

1. Concept of city logistics.
2. The future of city logistics – A smart system with zero emissions.
3. E-commerce.
4. City logistics and freight transport.
5. Electric vehicles.
6. Electric trucks.
7. Development of infrastructure for charging electric vehicles.
8. Sustainable urban distribution.
9. Effects of land use policies on city logistics.
10. Reduction of the carbon footprint of city logistics.
11. Trends and development in city logistics.
12. Pressure to reduce greenhouse gas emissions.
13. Use of electric vehicles for last mile e-commerce logistics.
14. Long-term effects of innovative city logistics measures.
15. Vision for energy-efficient, CO2-free city logistics.

Practical teaching:

The practical part of the course will be organized in laboratories and field visits through the use of appropriate measuring equipment and software packages to apply

the knowledge gained from the theoretical part of the course.

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Number of classes of active teaching (per week):				
Lectures:	Exercises:	Other form of lect:	Study and research work:	Other:
3	3	0	0	0

Teaching methods:

- Lecture with multimedia presentation
- Auditorium and laboratory exercise

Grade (maximum number of credits 100)			
Pre-exam requirements	credits	Final exam	credits
Activity during lectures		Written exam	50
Practical teaching		Oral exam	
Colloquia	35		
Seminar paper/project	15		
Total credits		Total credits	100

The name of the course:	**IoT SOLUTIONS FOR THE ELECTRIC VEHICLE INDUSTRY**
Number of ECTS: 6	
Lecturer:	
Lecturer associate:	
Course status:	Elective course
Prerequisites:	NO

Course objectives:

The objective of the course is to provide students with a thorough understanding of the role of Internet of Things (IoT) technologies in the context of the electric vehicle industry.

Course outcomes:

- ✓ Understanding the principles of the electric vehicle industry and the key challenges in it.
- ✓ Identifying different IoT technologies and understanding the role in electric vehicles.
- ✓ Gaining knowledge about sensor technologies for monitoring the performance of electric vehicles through IoT technologies.
- ✓ Acquiring knowledge of the analysis of data obtained from sensors for diagnosing defects and optimizing the performance of electric vehicles.
- ✓ Gaining knowledge on how to connect electric vehicles to smart charging infrastructure using IoT solutions.
- ✓ Gain knowledge of the principles of battery management and use IoT data to optimize battery life.
- ✓ Acquiring knowledge of analyzing data from IoT devices to improve the design and performance of electric vehicles.
- ✓ Gaining knowledge on integrating practical solutions for the application of IoT solutions in real-life situations of electric vehicles.
- ✓ Gaining knowledge about future trends in the development of IoT technologies and their impact on the electric vehicle industry.

Subject outline:

Theoretical teaching:

1. Fundamentals of Electric Vehicle Industry and the Role of IoT Technologies.
2. Sensors and Performance Monitoring for Electric Vehicles using IoT.
3. Remote Control and Diagnostics of Electric Vehicles via IoT.
4. Connecting Vehicles to Smart Charging Infrastructure through IoT.
5. IoT Solutions for Battery Life Optimization in Electric Vehicles.
6. Security Challenges and Solutions for Protecting IoT Networks in Electric Vehicles.
7. Data Analysis from IoT Devices for Improving Electric Vehicle Design.
8. Benefits and Challenges of Implementing Autonomous Driving in Electric Vehicles through IoT.
9. Role of 5G Networks in Supporting IoT Applications in Electric Vehicles.
10. Monitoring Environmental Impact of Electric Vehicles using IoT.
11. Integration of Smart Cities and Electric Vehicles through IoT.
12. IoT Technologies for Optimizing Logistics and Fleet Management in Electric Vehicles.

13. Managing Energy Consumption in Electric Vehicles through IoT Sensors.
14. Economic Aspects and Business Models related to IoT Solutions in the Electric Vehicle Industry.
15. Future Trends: Advancements in IoT Technologies and their Impact on the Electric Vehicle Industry.

Practical teaching:
The practical part of the course will be organized in laboratories and field visits through the use of appropriate measuring equipment and software packages to apply the knowledge gained from the theoretical part of the course.

References:

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- Souvik Pal, Supriyo Roy "IoT Solutions in Smart Cities: Technologies, Platforms, and Applications" 2023 by CRC Press

Number of classes of active teaching (per week):				
Lectures:	Exercises:	Other form of lect:	Study and research work:	Other:
3	3	0	0	0

Teaching methods:

- Lecture with multimedia presentation
- Auditorium and laboratory exercise

Grade (maximum number of credits 100)			
Pre-exam requirements	credits	Final exam	credits
Activity during lectures		Written exam	50
Practical teaching		Oral exam	
Colloquia	35		
Seminar paper/project	15		
Total credits		Total credits	100

PELMOB

Funded by the European Union

Catalogue of Courses

Academy of Applied Studies of Kosovo and Metohija (AASKM)

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be."

University of Pristina Kosovska Mitrovica

Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Call: ERASMUS-EDU-2022-CBHE-STRAND-2
Project Number: 101082860

PROJECT INFO

Project title	Partnership for Promotion and Popularization of Electrical Mobility through Transformation and Modernization of WB HEIs Study Programs
Project acronym	PELMOB
Project reference number	101082860/ERASMUS-EDU-2022-CBHE-STRAND-2
Funding scheme	Capacity Building in the field of Higher Education: Strand 2
Web address	www.pelmob.pr.ac.rs
Coordination institution	University of Mitrovica
Project duration	01 December 2022 – 30 November 2025

DOCUMENT CONTROL SHEET

Work package	WP3: Development of EM curricula and labs
Ref. no and title of activity	T3.3: Designing of EM courses
Title of deliverable	D3.3: Catalogue of courses
Lead institution	Óbudai Egyetem (OE)
Author(s)	Jelena Rajovic, Predrag Stanojevic, Milana Misic
Document status	Final
Document version and date	V01., 30/11/2023
Dissemination level	Internal

VERSIONING AND CONTRIBUTION HISTORY

Version	Date	Revision description	Partner responsible
v.01	11/30/2023	Final	AASKM

Content

1) Introducing HEI AASKM

The Academy of Applied Studies of Kosovo and Metohija (AASKM), was established by the merging of three Colleges of professional studies from the territory of Kosovo and Metohija- High School of Economics and professional Studies in Peć in Leposavic, Technical College of Applied Studies from Zvečan and Technical College of Applied Studies in Uroševac - Leposavić. The Academy has a rich history of providing career-focused education and training that support economic and workforce development in our community. Applied studies are intended for students who have a clear idea of what career or field they want to study and develop in that direction. The studies include theoretical, practical teaching and obligatory practice, and the focus is on technical and practical knowledge. Applied studies include professional study programs that prepares students to apply the knowledge and skills needed for inclusion in the work process.

AASKM has three Departments: Department Uroševac - Leposavić, Department Peć - Leposavić and Department Zvečan.

AASKM conducts its core activities at two levels of study:

First level: The first degree professional studies – 6 semesters/3 years (180 ECTS)

Specialist professional studies – 2 semesters/1 year (60 ECTS), and

Second level :

Master professional studies – 4 semesters/ 2 years (120 ECTS)

AASKM has 14 study programmes at the first degree professional studies; 10 study programmes at Specialist professional studies and 4 study programmes at Master professional studies. All study programmes are in the field of electrotechnics, mechanical engineering, occupational health and safety, traffic safety and economics.

Currently, AASKM has in total 69 teachers and associates, of of which 41 professors of professional studies, 4 senior lecturers, 8 lecturers, 4 foreign language teachers, 6 skills teachers and 6 assistants.

2) General description of the study programme

2.1 Title of the study programme

ROAD TRAFFIC AND TRANSPORT

2.2 Structure of the study programme

The study programme prepares students for the use of modern technologies in the transportation of passengers and freight, as well as the application of modern solutions in the field of traffic safety, planning, logistics, traffic flow management and information technologies.

The study programme consists of nine obligatory courses (five courses in the first semester, four courses in the second semester), including two professional practices (Professional practice 1 in the second semester, Professional practice 2 in the third semester), as well as study research work/paper that is realized in fourth semester. Within the study programme, in addition to the obligatory courses, there are also four elective courses through which students can obtain knowledge adapted to their future professional preferences. All elective courses are implemented in the third semester, where the student chooses four courses out of the eight courses offered. The prerequisites for enrolling individual courses or groups of courses are defined in the course book. All courses are one-semester and carry the appropriate number of ECTS, whereby one ECTS point corresponds to approximately 30 hours of student activity. At the end of the studies, the student prepares and defends a master's thesis before an expert committee. The master's thesis carries 10 ECTS.

Active teaching is carried out through lectures, exercises and studio research work, a total of 1200 hours of active teaching for two years of study. The average number of hours of active teaching per week is 20, while in the first semester the average number of hours of active teaching per week is 21, in the second 19, and in the third and fourth 20 each. During the exercises, which follow the lectures, specific tasks are solved and examples are presented that additionally illustrate the teaching material. In the exercises, additional explanations of the material covered in the lectures are given. Exercises can be auditory, laboratory, computer or computational. Part of the exercises can also take place in companies or other institutions.

Studies are theoretically and practically oriented. Thus, in addition to theoretical lectures and exercises where modern literature from the field of road traffic and transport is used, the contents of the course include preparation of seminar papers related to concrete problems from practice. Consequently, two professional internships

in the second and third semesters are mandatory, lasting 90 hours, and can be implemented in traffic and transport organizations.

Methods used in teaching include: lectures, discussions, demonstrations, exercises, reporting, practical work, work diary, as well as independent works. The number of points earned is expressed on the basis of a unique methodology and reflects the workload of the student. Each subject is evaluated according to European standards by the time it takes to master the entire course material expressed by the number of ESCTS points, and the entire studies are considered completed when the student fulfils all obligations prescribed by the study programme and at the same time collects at least 120 ECTS.

2.3 Objectives of the study programme

The goal of the study programme is for students to acquire the knowledge needed for the proper and efficient use of modern technologies in the transportation of passengers and freight, the application of modern solutions in the field of traffic safety, maintenance of traffic and transport vehicles, parking management, traffic planning, logistics, traffic flow management, information technologies, as well as the organization of the work of transport companies. In addition, the goal of the study programme is directed towards the development of students' creative abilities in considering problems, analysis and critical thinking, as well as training them to work in diverse conditions and a dynamic environment in the field of traffic engineering.

One of the important goals of the study programme is to develop students' awareness of the need for continuous education. Students are trained to see the role and place of a professional master traffic engineer within teamwork, but also develop skills and abilities for the preparation of professional works and reports, communication and public presentation of the results of professional work.

The main goal of the Road Traffic and Transport master's study programme is to train professional master road traffic engineers in a high-quality, modern and affordable way, through theoretical and practical teaching. The goals of the study programme are clearly defined and are aligned with the educational goals and social mission of the School.

2.4 The outcome of the study programme

By completing the Master's study programme Road traffic and transport, students will be able to:

- correctly and efficiently solve problems in conditions of uncertainty in the field of road traffic;
- organize the transport of cargo and passengers in domestic and international traffic;
- carry out traffic accident expertise;
- apply the principles, systems and procedures of preventive action in the maintenance of traffic and transport means;
- critically assess the available data, draw conclusions and come to new knowledge;
- convey their ideas, opinions and attitudes to the professional and social environment;
- apply the principles of teamwork;
- communicate verbally and in writing with the professional and social environment in the field of traffic and transport;
- independently search professional literature;
- analyse, evaluate and explain national and international regulations, technical regulations and standards in the field of traffic and transportation.

2.5 Other issues of relevance to the performance of the study programme

The study programme of the master professional studies Road Traffic and Transport is in line with modern world scientific trends and the state of the profession and is comparable to similar programmes at foreign higher education institutions, especially within the European educational space. The study programme enables students to acquire modern scientific and professional knowledge needed for the education of master professional engineers in the field of road traffic and transport. In addition, by completing the study programme, students acquire modern skills and abilities that will enable them to have value and uniqueness in their future work.

The study programme is aligned with modern and current scientific and professional knowledge, and is comparable to study programmes in the field of road traffic and transport at universities and colleges in the country and abroad. The basic principles of conformity are reflected in the following:

- the knowledge and skills that the student acquires in the field of road traffic and transport after completing the studies are clearly defined,
- courses are one-semester,
- there is a credit system,
- there are elective subjects,
- there is practical work of students.

3) Structure of the Curriculum

3.1 The structure of the study programme of master professional studies

The curriculum of the Road Traffic and Transport masters study programme contains a list and structure of compulsory and optional subjects and their description. The curriculum of the study programme is designed to satisfy all the set goals of the study programme me, the expected competences of graduated students and the outcomes of the learning process and educational standards.

The Study program consists of 17 courses, of which 9 are obligatory courses and 8 elective courses, of which the student chooses 4 courses. Obligatory courses offer a detailed and modern approach to solving problems in the field of road traffic and transport, while through elective courses students can gain knowledge adapted to their future professional aspirations.

3.1.1 A list of compulsory and elective courses

The list of courses at master study programme is provided in Table 1.

Table 1. Curriculum by semesters and the years of study for the study program of the master level of studies – AASKM

No.	Courses	S	Course Status.	Hours			ECTS
				L	E	Oth.	
FIRST YEAR							
1.	English language	1	O	2	2	-	6
2.	Traffic psychology	1	O	2	2	-	6
3.	Information systems in Traffic	1	O	2	2	-	6
4.	Research methods and scientific communication	1	E	2	2	-	6
5.	Traffic safety management	1	E	3	2	-	6
6.	Technology of freight transportation	2	E	3	2	-	6
7.	Technology of passengers'' transportation	2	E	3	2	-	6
8.	Regulation and management of traffic flows	2	O	2	3	-	6
9.	Logistics centres	2	O	2	2	-	6
10.	Professional practice 1	2	O			6	6
Total ECTS =							**60**
SECOND YEAR							
Elective courses (elect 4 out of 10)							
1.	Maintenance of traffic and transport means	3	E	3	2	-	6

2.	Transport of dangerous goods	3	E	3	2	-	6
3.	Parking management	3	E	3	2	-	6
4.	Traffic accident expertise	3	E	3	2	-	6
5.	Modern systems on motor vehicles	3	E	3	2	-	6
6.	Quality systems and standardization	3	E	3	2	-	6
7.	Organization of transport companies	3	E	3	2	-	6
8.	Regulation and management of traffic flows Intelligent transport systems	3	E	3	2	-	6
9.	E urban mobility	3	E	3	2	-	6
10.	Sustainable development of transport in road traffic	3	E	3	2	-	6
11.	Professional practice 2	3	O	-	-	6	6
12.	Study research paper	4	O	-	-	20	15
13.	Master final paper	4	O	-	-	-	15
						Total ECTS =	**60**

NOTE: designations: S= semester; L= lectures; E= exercises; Oth.= other types of lectures; ECTS= number of ECTS credits; **Status of the course:** O= obligatory: E=elective**; Elective courses:** the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.

All courses are one-semester and carry the appropriate number of ECTS credits, whereby one ECTS credit corresponds to approximately 30 hours of student activity. In the course specifications, a description of each course is defined, which contains the name of the course, type of course, course code, year and semester of study, number of ECTS credits, name of the teacher, objective of the course with expected outcomes, knowledge and competences, prerequisites for attending the course, content of the course, recommended literature, teaching methods, methods of examination and evaluation and other data.

Student completes studies by preparing and publicly defending a master thesis that can be scientific-professional or professionally applied and evaluated with 15 ECTS. A master thesis is a project in which a practical problem in the field of road traffic and transport is solved and which has been accepted and approved by an economic or public institution. Accordingly, the student does a master thesis in a commercial or public institution with which the School has a contract. In addition to the teachers of the Academy, one member of the expert commission for the defence of the master thesis is a representative of the institution where the candidate realizes the master thesis. The expert commission for the defence of the master thesis must have at least three members.

3.1.2 The structure of the study programme of master academic studies

The structure of the study program ensured that elective courses were represented by 32.50% of the ECTS credits. The distribution of courses by type shows that the representation of

- academic-general education subjects is 4.17%,
- scientific-professional 41.67% and
- professional- applied 54.17%.

3.1.3 Professional practice and practical work for master studies

In addition to obligatory and elective courses, students are expected to complete 2 professional internships in the second and third semesters as well as a study research project that is realized in the fourth semester and which is evaluated with 15 ECTS. Professional internships last a total of 30 working days lasting 180 hours, i.e. the first and second professional practice for 15 working days each lasting 90 hours. Both professional practices are evaluated with 6 ECTS each. Finally, the students complete their studies by preparing and publicly defending their master thesis in front of an expert commission

3.1.4 Competencies

Upon the completition of the Road Traffic and Transport master's study program, the student acquires general and subject-specific abilities that are in the function of quality performance of professional, scientific and artistic activities.

General competencies include:

- the ability to collect, interpret and use relevant information in the field of road traffic;
- the ability to successfully solve complex problems in a partially new or unknown environment;
- the ability to apply acquired knowledge and principles in the field of road traffic in a professional manner;
- the ability to monitor and critically accept new professional knowledge;
- the ability to convey and communicate ideas, problems and solutions;
- respect for ethical norms and responsibility towards the wider social community;
- ability for team work

Subject-specific competencies include:

- the ability to properly and efficiently use modern technologies when transporting cargo and passengers;

- traffic accident expertise;
- management of traffic flows;
- ability to organize work in logistics centers and other transport organizations;
- the ability to efficiently maintain traffic and transport vehicles;
- use of modern information technologies in the field of traffic and transport;
- application of modern solutions in parking management;
- the ability for modern management and maintenance of vehicle fleets.

In addition, students will be able to:

- correctly and efficiently solve problems in conditions of uncertainty in the field of road traffic;
- organize the transport of cargo and passengers in domestic and international traffic;
- carry out traffic accident expertise;
- apply the principles, systems and procedures of preventive action in the maintenance of traffic and transport means;
- critically evaluate the available data, draw conclusions and come to new knowledge;
- convey their ideas, opinions and attitudes to the professional and social environment;
- apply the principles of teamwork;
- communicate verbally and in writing with the professional and social environment in the field of traffic and transport;
- independently search professional literature;
- analyze, evaluate and explain national and international regulations, technical regulations and standards in the field of traffic and transport.

Table 2. Link between competencies and subjects

Competencies	Mandatory MS/Elective subjects ES	MS1	ES1	ES2	ES3	ES4
Generic competencies	Capacity for analyses and synthesis	x		x	x	x
	Capacity for applying knowledge in practice	x	x	x	x	x
	Oral and written communication	x	x	x	x	x
	Development computer competencies	x				
	Development research skills	x	x			
	Managing information skills	x	x	x	x	x
	Critical and self-critical abilities	x	x	x	x	x
	Capacity for adopting to new situations	x	x	x	x	x
	Capacity for generating new ideas (creativity)	x	x	x	x	x
	Solving problems	x	x	x	x	x
	Team work				x	x
	Leadership				x	x
	Ability to work in a multidisciplinary team	x	x	x	x	x
	Ability to communicate with people in the field	x	x	x	x	x

	Initiative and entrepreneurial spirit	x	x	x	x	x
	Integrity and ethical commitment	x	x	x	x	x
	Making decisions	x	x	x	x	x
	Synthesis of information to determine the perspective of a problem or trend in traffic safety	x	x	x	x	x
	Holistic and proactive approach	x	x	x	x	x
	Recognizing differences				x	x
	Awareness own workload and limitations	x	x	x	x	x
	Awareness of professional responsibility	x	x	x	x	x
Subject-specific competencies	Understanding of the principals of traffic safety regulations and standards				x	x
	Understanding of EM systems as well as the components of the system				x	x
	Understanding requirements and needs of EM systems and defining activities as their response					
	Understanding the role of regulatory bodies in the field of EM				x	x
	Understanding the importance of EM for sustainable development		x		x	x
	Consideration of EM issues at the local and global level					x
	Analysis of EM and EV relationship and traffic regulation				x	
	Technologies of transport processes and EM systems in the field of urban transport				x	
	Thorough knowledge and understanding of EV structure		x			
	Solving concrete problems with the use of scientific methods and procedures	x	x	x	x	x
	Connecting basic knowledge and skills from different fields and their application to environmental protection, as well as economical use of natural resources, in accordance with the principles of sustainable development					x
	Monitoring and application of novelties in EM	x	x	x	x	x
	Utilisation of information and communication technologies in mastering knowledge in the field of electric mobility	x	x			
	Projecting, organisation and traffic control in regard to EM				x	
	Development and implementation of strategic documents in the field of EM					x
	Skills and abilities for the preparation of professional papers and reports, communication and public presentation of the results of professional work	x	x	x	x	x
	Independent conducting of experiments, statistical processing of results, formulation and drawing of conclusions	x	x	x	x	x
	Independent search of professional literature	x	x	x	x	x
	Capacity for analysis and synthesis	x	x	x	x	x
	Capacity to apply knowledge in practice	x	x	x	x	x
	Understanding and comprehension of databases relevant to EM	x				
	Application of contemporary solutions within the scope of EM	x	x	x	x	x
	Ability to manage and maintain modern vehicle fleets, including EVs		x			
	Use of modern information technologies in the field of traffic and EM	x		x		

	Ability to apply acquired knowledge and principles in the field of EM in a professional manner	x	x	x	x	x
	Synthesis of information to determine viewpoints, perspectives, issues or trends within EM	x	x	x	x	x
	Recognition of electric mobility as a complex multidisciplinary system	x	x	x	x	x
	Understanding the response of society and institutional responsibility in the field of electric mobility				x	x
	Understanding the factors that influence the coordination and cooperation of the work of subjects in the field of electric mobility				x	x

3.1.5 Quality, contemporaneity and principles

The master study programme Road Traffic and Transport is harmonized with the modern world scientific trends and state of the art and is comparable with the similar programmes at international higher education institutions, especially within the European education framework. Therefore, the study programme offers the latest scientific and professional knowledge in the field of road traffic engineering.

The study programme is also harmonized with the European standards regarding the terms of admission, duration of studies, terms of admission to the following year, obtaining the diploma and study procedure.

The curriculum is defined for a two-year study regime and adapted to contemporary developments in the economy and society, and fully comply with the Bologna Declaration and the process of higher education reforms in Europe and in our country.

The content and formal structure of the study programme Road Traffic and Tranaport enabled the achievement of completeness and comprehensiveness of providing the basic theoretic, methodological and professional engineering knowledge. Appropriate exercises, assignments and practice included in certain courses enable active, research-based approach and practical orientation of students. In addition, by offering the elective courses in related scientific disciplines from other study programmes, the education has been broadened and more complete insight into how of the road traffic profession is positioned among other sciences.

4) Syllabuses table of upgraded/new courses of EM curricula

When analysing the curriculum of the study programme of the second level of study, Road traffic and transport, by semesters and the years of study, we came to the conclusion that it is necessary to enhance the current content of five courses with topics from the field of EM. The preliminary list of new courses is shown in table 2. The content of courses that need to be modernized is given in tables 3 and 4. Students will be informed about content of EM curricula, developed courses, gained competences and skills, with possibilities or further advancements as well as with possibilities for employment. New EM laboratory will enable the practical teaching methods.

Table 3. List of courses – AASKM.

No.	Courses	S	Course Status	Hours			ECTS
				L	E	Oth.	
FIRST / SECOND YEAR							
1.	Modern systems on motor vehicles **(course modernized)**	3	E	3	2	-	6
2.	Information systems in traffic **(course will be modernized)**	1	O	2	2	-	6
3.	Regulation and management of traffic flows-intelligent transport systems **(new course)**	3	E	2	2	-	6
4.	E urban mobility **(new course)**	3	E	2	2	-	6
5.	Sustainable development of transport in road traffic **(new course)**	3	E	2	2		6
						Total ECTS=	**30**
NOTE: designations: S=semester; L=lectures; E=exercises; Oth.=other types of lectures; ECTS=number of ECTS credits; **Status of the course:** O=obligatory: E=elective**; Elective courses:** the election of the courses is made at the enrolment of the school year in consultation with the Head of the study program and professor of the elective course.							

Table 4. Modern systems on motor vehicles

Course:	**MODERN SYSTEMS ON MOTOR VEHICLES**
Course code:	
ECTS: 6	
Teacher:	
Assistant:	
Status of the course:	Elective
Condition:	No pre-condition
Course objective:	
Mastering theoretical and practical knowledge of motor vehicle movement, motor vehicle braking, motor vehicle management, as well as modern systems on motor vehicles. Also, taking into account the increasing use of electric vehicles, students will get basic knowledge of electric vehicles.	
Course outcome:	
After passing the subject, the student acquires the necessary knowledge about the components of a motor and electric vehicle, get to know the laws of motion theory based on which he can describe, analyse and determine the character of the vehicle's movement in different conditions of exploitation. Furthermore, the student will be able to	

define the influence of tyre keying characteristics, the influence of the surface on grip, the characteristics of modern tyres, the reliability of the braking system, the reliability of the steering system, as well as the reliability of other modern systems on motor vehicles. The student will be able to analyse possible malfunctions of certain systems on motor and electric vehicles and their impact on traffic safety.

Content of the course:

Theoretical lectures:

Theory of movement of motor vehicles: kinematics and dynamics of the wheel. Wheel rolling and sliding. Adhesion on different surfaces. Characteristics of modern tyres. Factors affecting the realized adhesion, resistances during the movement of the motor vehicle and the power required to overcome them. Axle pressures, traction-speed characteristics of vehicles - limit possibilities, required engine power of vehicles, traction balance of vehicles, selection of engine and transmission parameters, vehicle stability, behaviour of vehicles on the road with laterally rigid and elastic wheels, braking of motor vehicles. Construction of modern braking systems. Reliability of the braking system. Construction of modern management systems. Reliability of the management system. Construction and reliability of other systems on motor vehicles. Fundamental knowledge of electric vehicles, EV configurations, Battery energy sources, Charging technique, Provide an overall picture of the current EV technology, Battery Management System, Power electronics, Brake system, Regenerative braking, Charging station, Electric motor, Generator.

Practical lectures:

Adhesion and hysteresis of tyres. Effects of surface and tyre characteristics on grip. Analysis of factors affecting adherence. Cancellation tree. Analysis of the impact of tyres on vehicle safety in traffic. Power transmission system, steering system, suspension system, braking system. Reliability of modern systems on motor vehicles. Traction characteristics of motor vehicles, stability and controllability, selection of technical characteristics of vehicles to perform the required transport task. Presentation of seminar papers.

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1. Lenasi, J., Žeželj, S., Danon, G. (1995). *Motorna vozila*, Saobraćajni fakultet, Univerzitet u Beogradu, Beograd.
2. Cao, Y., Zhang, Y., & Gu, C. (Eds.). (2023). Automated and Electric Vehicle: Design, Informatics and Sustainability. Springer.
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Number of active lectures (per week):				
Lectures:	**Practice:**	**Other forms of lecture:**	**Study research paper:**	**Other lectures:**
3	2	0	0	0

Teaching methods:

Lectures, auditory and computational exercises.

Knowledge assessment (maximum number of credits 100)			
Pre-exam obligations	**Credits**	**Final exam**	**Credits**
Activities during the lecture	10	Written exam	20
Practical teaching	10	Oral exam	30
Colloquiums	10		
Seminary paper	20		
In total	**50**	In total	**50**

Table 5. Information systems in traffic

Course	**INFORMATION SYSTEMS IN TRAFFIC - ADVANCED COURSE**
Course code:	
ECTS: 6	
Teacher:	
Assistant:	
Status of the course:	Mandatory
Condition:	No pre-condition
Course objective:	
Acquiring knowledge and mastering skills in the field of application of information technologies in traffic	

and transport, with the aim of increasing the efficiency and effectiveness of business. Within the course, the application of information technologies in the organization and management of road traffic is studied (through lectures, exercises and preparation of seminar papers), with the aim of more efficiently solving of various problems in the field of traffic. Through the principle of electric mobility, students will see in which direction the development of traffic will move, that is, in which way life and technology will change in the near future.

Course outcome:

The necessity of acquiring knowledge in the field of the most modern information and communication technologies guarantees a good basis for successful work in those fields of activity. Students will acquire knowledge of modern information and communication technologies in traffic and by applying then they will be qualified for concrete engineering jobs in the field of traffic, and also easily accept new knowledge in the IT field .

Content of the course:

Theoretical lectures

1. Basic concepts of information and communication technologies. Basics of the information system. 2. Information system components: hardware, software, databases, computer networks, human resources. 3. Modern software packages in road traffic and transport. 4. Information systems in traffic management. Information systems in transport management. 5. Logistics distribution centres and information technologies. Information technologies in certain types of traffic and transport. 6. Use of cameras in traffic. Cameras for automatic detection and registration of traffic violations. 7. Intelligent traffic control systems. Traffic monitoring system and automatic license plate recognition. Recognition of alphanumeric characters (OCR-Optical Character Recognition). Computer recognition of license plates (LPR-License Plate Recognition). 8. Electronic and satellite toll collection. RAID technologies in road traffic and transport. 9. Communication technologies in ITS-GSM, GPRS, UMTS. 10. Electric vehicles and sustainable mobility. 11. Electric vehicles. Hybrid vehicles. Electric vehicles on fuel cells. 12. Use of electric vehicles. Way of use. 13. Innovation, technology and services. Safety considerations related to natural gas engines and vehicles. 14. Eco mobility. 15. Presentation of electric vehicles in the Republic of Serbia and in the world.

Practical lectures:

Practical lectures include concrete practical examples of subject matter. Students are oblige to write term papers. Individual and group presentations on the given topics; discussion.

Bibliography:

1. Popović, B., Kuk, K. (2017). Informacioni sistemi - udžbenik, KPA, Beograd, ISBN: 978-86-7020-38.
2. Drašković, D. (2017). Inteligentni transportni sistemi, Travnik.
3. Kajtez, M. (2014). Autonomna vozila: početak i primena robotizovanih vozila u saobraćaju, Računarski fakultet, Univerzitet Union, Beograd.
4. Erasmus+, ELEKTROMOBILNOST, Učenje o elektromobilnosti u okviru projekta „Learning E-Mobility“, Škola za cestovni promet, Zagreb, Hrvatska, www.lemo-project.eu.
5. Litman, T. (2023). Autonomous Vehicle Implementation Predictions, Implications for Transport Planning, Victoria Transport Policy Institute.

Number of active lectures (per week):

Lectures:	Practice:	Other forms of lecture:	Study research paper:	Other lectures:
2	2	0	0	0

Teaching methods:

Lectures, auditory and computational exercises. Teaching is conducted in a combined and interactive manner with the use of modern audio-visual aids.

Knowledge assessment (maximum number of credits 100)

Pre-exam obligations	Credits	Final exam	Credits
Activities during the lecture	10	Written exam	-
Practical teaching	-	Oral exam	50

Colloquiums	20		
Seminary paper	20		
In total	**50**	In total	**50**

Table 6. E Urban mobility

Course:	**E URBAN MOBILITY**
Course code:	
ECTS: 6	
Teacher:	
Assistant:	
Status of the course:	Elective
Condition:	No pre-condition

Course objective:

Mastering the latest theoretical, practical knowledge and information about the development and design of public urban passenger transport systems with a special focus on e-urban mobility.

Course outcome:

Each student will understand the contemporary way of functioning of passenger transport in urban areas, and how they can be improved from the aspect of sustainability: accessibility and quality of life, economic viability, social equity, health and environmental quality.

Content of the course:

Theoretical lectures:

Sustainable Urban Mobility Plans. Transport Policy on Electromobility. Electromobility in Smart Cities. E mobility as a concept of public transport. Detereminants for the effective electromobility development in public transport. Technical issue related to electromobility in public transport. Electric buses: concepts, solutions and challenges. E-cars: concepts, solutions and challenges. Electric assistance for bicycles. Future of public transport.

Practical lectures:

The influence of the characteristics of the urban area on the mobility of public urban passenger transport. Elements of smart transport systems. The relationship between the city and the passenger transport system. Investigation of the characteristics of the urban area from the impact on the public urban passenger transport system. Definition of smart cities. Basic elements of the structure of smart cities. Characteristics of the concept of smart city development (advantages and disadvantages). Basic terms and platform of smart mobility as an element of the structure of smart cities.

Bibliography:

1. S.Vukanović (2013), Inteligentni Transportni Sistemi (ITS),CD izdanje, SF Beograd
2. S. Vukanović (2014), Inteligentni transportni sistemi i upravljanje saobraćajem, pisana predavanja, el. izvor, Saobraćajni fakultet, Beograd.
3. Tyagi, A. K., & Sreenath, N. (2022). Intelligent Transportation Systems: Theory and Practice. Springer Nature.

Number of active lectures (per week):

Lectures:	Practice:	Other forms of lecture:	Study research paper:	Other lectures:
2	2	0	0	0

Teaching methods:

Lectures, auditory and computational exercises.

Knowledge assessment (maximum number of credits 100)

Pre-exam obligations	Credits	Final exam	Credits
Activities during the lecture	10	Written exam	
Practical teaching	10	Oral exam	50
Colloquiums	10		
Seminary paper	20		

In total	**50**	In total	**50**

Table 7. Regulation and management of traffic flows-intelligent transport systems

Course	**REGULATION AND MANAGEMENT OF TRAFFIC FLOWS - INTELLIGENT TRANSPORT SYSTEMS**
Course code: MCT13	
ECTS: 6	
Teacher:	
Assistant:	
Status of the course:	Mandatory
Condition:	No pre-condition

Course objective:

Acquiring knowledge that enables optimization, simulation and evaluation of ITS systems for traffic management and control on the network of roads and streets.

Course outcome:

The student is trained for independent analysis and resolution of traffic situations through optimization, simulation and evaluation of traffic management and control systems based on ITS.

Content of the course:

Theoretical lectures:

Basic definitions of ITS, development of ITS in the world. The importance and role of ITS in traffic and transport. Standards, normative directives, legal bases, National ITS development strategies. Structure of ITS. Theoretical foundations, Possible applications in relation to the system and the network. Road network. ITS architecture. Applications: Access control, Speed management, lane traffic management, network traffic management, communication with drivers, traffic control, JMPP, Informing road users. Sensors, communication links. Simulation programs and simulation of system operation. Evaluation of effects. Equipment - variable signalling, standards, traffic management on highways in urban areas. GIS and ITS. ITS and GPS. The human factor, ITS in solving network congestion.

Practical lectures:

User requirements. System capabilities. Network guidance systems using appropriate equipment. Access control. Routing of vehicles on the network, analysis of sensor data (density models, follow the leader) technical characteristics of the equipment. European standards. Telecommunication network characteristics, congestion detection models, what national ISS structures look like.

Bibliography:

1. S. Vukanović (2013), Inteligentni Transportni Sistemi (ITS),CD izdanje, SF Beograd
2. S. Vukanović (2014), Inteligentni transportni sistemi i upravljanje saobraćajem, pisana predavanja, el. izvor, Saobraćajni fakultet, Beograd.
3. Tyagi, A. K., & Sreenath, N. (2022). Intelligent Transportation Systems: Theory and Practice. Springer Nature.

Number of active lectures (per week):

Lectures:	Practice:	Other forms of lecture:	Study research paper:	Other lectures:
2	2	0	0	0

Teaching methods:

Lectures, auditory and computational exercises.

Knowledge assessment (maximum number of credits 100)

Pre-exam obligations	Credits	Final exam	Credits
Activities during the lecture	10	Written exam	20
Practical teaching	10	Oral exam	30
Colloquiums	10		
Seminary paper	20		
In total	**50**	In total	**50**

Table 8. Sustainable development of transport in road traffic

Course:	**SUSTAINABLE DEVELOPMENT OF TRANSPORT IN ROAD TRAFFIC**
Course code:	
ECTS: 6	
Teacher:	
Assistant:	
Status of the course:	Elective
Condition:	No pre-condition

Course objective:

Mastering the latest theoretical, practical knowledge and information about the development and design of public urban passenger transport systems with a special focus on e-urban mobility.

Course outcome:

Each student will understand the way transportation processes work today, and how they can be improved from the perspective of sustainability: economics, environment and society, both today and in the future.

Content of the course:

Theoretical lectures:

The concept of sustainable development: principles, problems and challenges in traffic and transportation; Indicators of sustainable transport and methods of creating composite indices; Mobility management and transport demand management strategies; Transport policy measures for sustainable mobility; Urban mobility: typologies of cities, the concept of mobility culture, models for evaluating the sustainability of urban transport systems; New sustainable mobility solutions based on smart technologies; Sharing economy and sustainable transport development: business models and analysis of application effects; The concept of user-oriented transport service (MaaS) in the function of sustainable development of transport.

Practical lectures:

Practical lectures are organized through several tasks that encourage the application of theoretical knowledge. Students are trained to use databases on indicators of sustainable transport, to analyze indicators and trends, and to present results in practice classes. Acquaintance of students with web tools to support decision-making on transport policy measures (KonSult, Civitas, TDM encyclopedia, etc.) and application on concrete examples. Research and analysis of existing platforms and applications for new models of transport services (mobility sharing concepts, multimodal travel planners, etc.).

Bibliography:

1. Pejčić Tarle, S., Bojković, N. „Evropska politika održivog razvoja transporta“, Saobraćajni fakultet, Beograd, 2012.
2. Bojković, N. Petrović, M. „Odabrani modeli za politiku transporta i komunikacija“, Saobraćajni fakultet, Beograd, 2015
3. Attard, M., & Shiftan, Y. (Eds.). (2015). Sustainable urban transport. Emerald Group Publishing.
4. Curtis, C. (Ed.). (2020). Handbook of sustainable transport. Edward Elgar Publishing.

Number of active lectures (per week):				
Lectures:	**Practice:**	**Other forms of lecture:**	**Study research paper:**	**Other lectures:**
2	2	0	0	0

Teaching methods:

Lectures, auditory and computational exercises.

Knowledge assessment (maximum number of credits 100)			
Pre-exam obligations	**Credits**	**Final exam**	**Credits**
Activities during the lecture	10	Written exam	
Practical teaching	10	Oral exam	50
Colloquiums	10		
Seminary paper	20		
In total	**50**	In total	**50**