Budapest University of Technology and Economics
Faculty of Transportation Engineering and Vehicle Engineering

Faculty's recommended elective subjects on the Master programmes

List and subject descriptions

Valid from February 2026

Faculty's recommended elective subjects on the Master programmes

Subject name	Subject code	Language
Accident and malicious intervention analysis in the automotive industry	BMEKOGJBsM8008-00	HU EN
Air Traffic Control	BMEKORHBsM8007-00	HU EN
Aircraft maintenance, repair, and overhaul	BMEKORHBsM8003-00	HU EN
Aircrafts	BMEKORHBsM8009-00	HU EN
Autonomous vehicle-based mobility services	BMEKOKKMsM8001-00	HU EN
Aviation incidents and their investigations	BMEKORHBsM8008-00	HU EN
Electromobility	BMEKOKKMsK2A02-00	HU EN
Engineering mathematics	BMEKOKJBsM8012-00	EN
Environmental awarness in aviation	BMEKORHBsM8002-00	HU EN
Innovation and Entrepreneurship in transportation	BMEKOKKBsM8006-00	EN
Intelligent logistics applications	BMEKOALMsM8002-00	HU EN
Introduction to Matlab programming	BMEKOKJBsM8019-00	HU EN
Machine vision	BMEKOALMsM8001-00	EN
Modern automotive products and development methods	BMEKOKJBsM8007-00	HU EN
Passenger transportation systems	BMEKOKKMSK1004-00	HU EN
Process planning	BMEKOALBsM8002-00	HU EN
Reinforcement learning in vehicle control	BMEKOKJBsM8011-00	HU EN
Selected topics from the advanced material sciences	BMEKOGJBsM8007-00	HU EN
Strategic policy instruments in transportation	BMEKOKKMSK2C03-00	HU EN
Sustainable aviation	BMEKORHBsM8006-00	HU EN
Synergy of Engineering and Business: The Disruptive Transformation of the Truck Industry as a case study 1.	BMEKOKKBsM8001-00	EN
Synergy of Engineering and Business: The Disruptive Transformation of the Truck Industry as a case study 2.	BMEKOKKBsM8002-00	EN
System techniqe and analysis	BMEKOVJMsM8002-00	HU EN
Transport Infrastructure and Regional Development	BMEKOKKBsM8003-00	EN
Transport infrastructure management	BMEKOKKMSK2C01-00	HU EN
Vehice operation, reliability, and diagnositcs	BMEKOVJMsM8001-00	HU EN
Vehicle maintenance	BMEKOGJBsM8009-00	HU EN

Subject description explanation

1. Subject name	official name of the subject
2. Subject name in Hungarian	official name of the subject in Hungarian
3. Programme	related programmes: k – transportation eng., j – vehicle engineering, l – logistics engineering, p – professional pilot
4. Subject code	Neptun code of the subject
5. Restrictions	special subject registration rules for selected study programmes
6. Credits	credit value of the subject
7. Evaluation type	type of academic performance assessment, e - exam grade; m - mid-term grade; s - signature
8. Nature	nature of teaching
9. Weekly contact hours	number of lessons for students by lecture, practice and lab
10. Language	language of teaching
11. SDG	learning outcomes' contribution to the EU/UN sustainable development goals
12. Working hours for fulfilling the requirements of the subject	contact hours – personal appearance at classes in a university preparation for seminars – preparation at home for the classes homework – preparation of homework and other assignments for the classes reading written materials – reviewing and understanding the taken lessons at home midterm preparation – recommended preparation time at home for the midterm test during the semester exam preparation – recommended preparation time at home for the exam
13. Organisational unit in charge	name of the organisational unit in charge of the subject
14. Subject coordinator and its position	name and position of the subject coordinator
15. Email address	email address of the subject coordinator
16. … organisational unit	name of the organisational unit for the subject coordinator
17. Instructors	name of the subject's instructor(s)
18. Indicative prerequisites	predefined criteria for registering the subject
19. Purpose	subject's role and purpose in the training programme
20. Programme of lectures	detailed content of the lecture course
21. Programme of practices	detailed content of the practice course
22. Programme of laboratories	detailed content of the laboratory course
23. Learning outcomes	results to achieve at the end of the learning process, grouped by competences (lower case), furthermore their link to the training programme's learning outcomes (upper case)
24. Midterm assessments	name and code of assessments in the study period, their share in the final grade, and the evaluated learning outcomes
25. Exams	a name and code of assessments in the exam period, their share in the final grade, and the evaluated learning outcomes
26. Criteria to obtain a signature / midterm grade	criteria that shall be met to obtain the signature / midterm grade from the subject
27. Grading rules	rules of grading in share (%) of the summarised results of assessments
28. Attendance and participation requirements	derogations from the main rule laid down by the Code of Studies
29. Retake and delayed completion	requirements for passing the subject, aspects of performance evaluation, way to determine a grade (obtain a signature)
30. Consultation	consultation oppportunities offered by the instructor(s)
31. Learning materials	notes, textbooks, suggested literature, recommended learning support materials in printed or electronic form
32. Start of validity for the subject decription	start of vailidy for the information laid down by the subject decription

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Accident and malicious intervention analysis in the automotive industry**				
2. Subject name in Hungarian	Balesetek és rosszindulatú beavatkozások elemzése a járműiparban			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOGJBsM8008-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	10 hours	**Homework**	0 hours
Reading written materials	20 hours	**Midterm preparation**	32 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Automotive Technologies		
14. Subject coordinator and its position	Dr. Török Árpád senior research fellow	**15. Email address**	torok.arpad@kjk.bme.hu
16. …organisational unit	Department of Automotive Technologies		
17. Instructor(s)	Dr. Török Árpád		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Understanding the factors affecting the safety and security of automotive systems and reviewing the design and testing considerations

20. Programme of lectures

1. Introduction of safety and security theory in the automotive industry
2. System architecture of the state of the art road transport system
3. Risk factors, attack and perpetrator profiles
4. System of protection, passive and active safety I.
5. System of protection, passive and active safety II.
6. Standards and regulations
7. General models of testing
8. Evaluating safety and security risks
9. Popular safety and security models
10. Model evaluation
11. General strategies
12. Demonstration
13. Test.
14. Test retake.

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. has a basic understanding of the concepts used in the development and testing process and general safety/security principles.
2. knows the background of vehicle and functional safety: fundamentals and modern contexts, key subsystems and challenges in the field of safety/security.
3. understands the role of the forensic field in the analysis of incidents and events and knows the legal implications.
4. understands the behaviour of vehicles at theoretical and practical level in different circumstances.

5. knows the techniques of modelling attacks and accidental incidents, event chain construction using evidence and physics.
6. knows the basics of creating predictive or explanatory models of attack scenarios.
7. knows the importance of data recording and statistical analysis: proficiency in data collection techniques, interpretation and statistical tools.

b) skills (k)

1. is able to effectively analyse defence, accident, failure data, attack models and vehicle dynamics data.
2. applies key analytical methods and statistical tools to draw conclusions from the data.
3. applies FMEA and fault tree analysis to identify risks and propose mitigation strategies.
4. reconstructs attack/incident scenarios based on limited and fragmented evidence.
5. operates software and tools for incident analysis, data capture and statistical evaluation.
6. communicates findings in technical reports and presentations.

c) attitude (a)

1. consistently strives to perform at their highest capability, maintaining precision and error-free workmanship, is committed to adhering to safety regulations and fostering collaborative relationships with colleagues.

d) autonomy and responsibility (o)

1. feels a strong sense of responsibility to set an example for their peers through the quality of the performed work and adherence to ethical standards, conscientiously applying the knowledge acquired during the course.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. midterm test	1. ZH1 2. ZH2	1. 50% 2. 50%	1. t1-7,k1-6,a1,o1 2. t1-7,k1-6,a1,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Passing the midterm tests

27. Grading rules

0-<50%: fail (1),
50-<62%: pass (2),
62-<75%: satisfactory (3),
75-<87%: good (4),
87-100%: excellent (5).

28. Attendance and participation requirements

According to TVSZ

29. Retake and delayed completion

The midterm tests can be retaken twice.

30. Consultation

Every lecture

31. Learning materials

Course bulletins available in moodle.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Air Traffic Control**				
2. Subject name in Hungarian	Légiforgalmi irányítás			**3. Programme**	BSc_MSc
4. Subject code	**BMEKORHBsM8007-00**		**5. Restrictions**	**except for students on ATM spec, MSc in Transportation**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	9 hours	**Homework**	0 hours
Reading written materials	27 hours	**Midterm preparation**	26 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Aeronautics and Naval Architecture		
14. Subject coordinator and its position	Dr. Rohács Dániel associate professor	**15. Email address**	rohacs.daniel@kjk.bme.hu
16. …organisational unit	Department of Aeronautics and Naval Architecture		
17. Instructor(s)	Dr. Roács Dániel, Gál István		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The student will acquire knowledge of the operation of air traffic control. They will have a detailed knowledge of ATC types, tasks, airspaces and their elements, as well as the main challenges.

20. Programme of lectures

TRAFFIC DATA - Traffic and statistical data from air traffic control. Types of forecasts, forecasting methods.

SUBSIDIES OF AIR CONTROL - History of air traffic control. Elements of air traffic control. Airport traffic control (TWR). Approach control (APP). Area control (ACC).

BASIC AIRSPACE TYPES AND PLACES - Concept of airspace. Classification of airspace. Elements of airspace. Hungarian airspace. Sectorisation. Special airspaces.

MODERN AIR CONTROL PROCEDURES - Limitations of previous procedures. National and European specificities. Introduction of functional airspace blocks (FABs). Flexible use of airspace (FUA). Free use of airspace. HUFRA (Hungarian Free Route Airspace)

SUPPORT SYSTEMS - Air traffic controllers' tasks, division of labour. Separation. Dangerous situations. Short and medium range conflict detection (STCA and MTCA). Proximity warning (MSAW and APW).

HUMAN ACTIVITIES IN AIR FORCE MANAGEMENT - Minimum capabilities and knowledge base. Methods of assessing skills, FEAST test. Psychological factors. Health factors. Human factors impact.

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows and understands the basic processes and necessities of air traffic flow management
2. knows the system of traffic management and sub-processes, related methods and technologies and their capabilities
3. gains knowledge of the main areas of current research and specific research

b) skills (k)

1. can easily and quickly acquire deeper, more specific knowledge of ATM activities

c) attitude (a)

1. strives for precise, aesthetic, clear and transparent documentation
2. is interested, responsive, meeting deadlines

d) autonomy and responsibility (o)

1. is able to produce documentation independently
2. understands the importance of their work and the consequences of errors

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test	1. ZH	1. 100%	1. t1-3,k1,a1-2,o1-2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

pass the final examination with at least 50% of the marks

28. Attendance and participation requirements

According to the rules of Study and Examination Regulations.

29. Retake and delayed completion

Retake exam possible according to the general rules of BME.

27. Grading rules

Excellent 80-100%
Good 70-79%
Satisfactory 60-69%
Pass 50-59%
Fail 0-49%

30. Consultation

at a time and in a form agreed with the lecturers

31. Learning materials

Supplementary materials published within the scope of the subject
Articles

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Aircraft maintenance, repair, and overhaul**				
2. Subject name in Hungarian	Légijárművek karbantartása, javítása és nagyjavítása			**3. Programme**	BSc_MSc
4. Subject code	**BMEKORHBsM8003-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**0 practice**	**1 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	17 hours	**Homework**	24 hours
Reading written materials	21 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Aeronautics and Naval Architecture		
14. Subject coordinator and its position	Dr. Rohács Dániel associate professor	**15. Email address**	rohacs.daniel@kjk.bme.hu
16. …organisational unit	Department of Aeronautics and Naval Architecture		
17. Instructor(s)	Dr. Rohács Dániel, Gál István		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Introduction to procedures, processes, methods and regulations related to aircraft maintenance, repair and overhaul.

20. Programme of lectures

1. Introduction to MRO Operations (Overview of MRO: Line, base, and depot maintenance. Regulatory frameworks: EASA Part 145, FAA 14 CFR Part 43. Roles and responsibilities in MRO operations.)

2. Maintenance Planning and Scheduling (Maintenance program development: MSG-3 methodology. Maintenance checks: A-checks to D-checks. Reliability-centered maintenance (RCM).)

3. Aircraft Maintenance Manuals and Documentation (Introduction to Aircraft Maintenance Manuals (AMM), Structural Repair Manuals (SRM), and Illustrated Parts Catalogs (IPC). Technical records management and compliance. Digital maintenance tracking systems.)

4. Human Factors and Safety in Maintenance (Principles of Human Factors in maintenance (e.g., fatigue, communication, teamwork. Safety Management Systems (SMS) and incident reporting. Human error case studies and lessons learned.)

5. Non-Destructive Testing (NDT) in MRO (Introduction to NDT methods: Ultrasonic, radiographic, eddy current, and magnetic particle inspection. Applications of NDT in structural and engine inspections. Advances in NDT technology.)

6. Corrosion Control and Structural Integrity (Common types of corrosion affecting aircraft structures. Corrosion prevention, detection, and repair techniques. Aging aircraft management and fatigue analysis.)

7. Avionics and Electrical Systems Maintenance (Overview of avionics systems and their role in modern aircraft.Electrical Wiring Interconnection Systems (EWIS) maintenance. Fault diagnosis and troubleshooting of avionics systems.)

8. Engine Maintenance and Overhaul (Maintenance of different engine types (turbofan, turboprop, and piston. Engine condition monitoring (ECM) and performance trend analysis. Procedures and challenges in engine overhaul.)

9. Tooling and Ground Support Equipment (Specialized tools for MRO tasks. Calibration and maintenance of tools. Ground support equipment (GSE) and its role in MRO operations.)

10. Emerging Technologies in MRO (Predictive maintenance using AI and IoT. Drones and robotics in aircraft inspections. Additive manufacturing (3D printing) for spare parts.)

11. Quality Assurance and Compliance (MRO quality assurance processes and audits. Aircraft inspection standards and best practices. Ensuring compliance with regulatory requirements.)

12. MRO Business and Industry Trends (Economic aspects of MRO: Cost management and optimization. Supply chain and inventory challenges. Trends in outsourcing, partnerships, and sustainability in MRO.)

21. Programme of practices

-

22. Programme of laboratories

Access, opening, reading, revising, understanding and analysing of documents about aircraft maintenance, repair and overhaul in printed and electronic formats.

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows and understands the major components, steps and processes involved in the maintenance, repair and overhaul of aircraft.

b) skills (k)

1. is able to understand the processes involved in aircraft maintenance, repair and overhaul.

c) attitude (a)

1. shall endeavour to maximise the knowledge and skills to the highest possible standard, in the shortest possible time, and to acquire in-depth knowledge capable of independent work.
2. shall cooperate with the teacher and fellow students in the development of the knowledge.
3. expands the knowledge through continuous independent learning to complement the knowledge acquired in the classroom.

d) autonomy and responsibility (o)

1. has the responsibility to set an example to the peers by the quality of the work and by respecting ethical standards.
2. shall apply the knowledge acquired in the course of the subject with responsibility, having regard to its scope.
3. is open to well-founded critical comments and uses them constructively.
4. accepts the framework of collaboration and is able to work independently or as part of a team, depending on the situation.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. homework	1. HF	1. 100%	1. t1,k1,a1-3,o1-4

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Participation in the laboratory practices and completing the homework according to the specification.

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The participation in laboratory practices is compulsory. The replacement and last possibility for completing the task is according to the Code of Studies.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Lecture notes, materials and documentations in printed and/or electronic version given by the lecturer.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Aircrafts**				
2. Subject name in Hungarian	Légijárművek			**3. Programme**	BSc_MSc
4. Subject code	**BMEKORHBsM8009-00**		**5. Restrictions**	**except for student on airtransport/ATM/aircrafts/aerospace spec, BSc and MSc in Transporation, Vehicle**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	20 hours	**Homework**	0 hours
Reading written materials	22 hours	**Midterm preparation**	20 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Aeronautics and Naval Architecture		
14. Subject coordinator and its position	Dr. Rohács Dániel associate professor	**15. Email address**	rohacs.daniel@kjk.bme.hu
16. …organisational unit	Department of Aeronautics and Naval Architecture		
17. Instructor(s)	Gál István		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The student will acquire knowledge of the basic elements, systems and solutions of aircraft and aviation.

20. Programme of lectures

History, types and operation of aircraft (civil and military), trends in development
Flight fundamentals (aerodynamics and flight mechanics)
Aircraft structure and systems
Propulsion and engines
Safety, environmental and aviation regulations
Aircraft production, operation, maintenance and repair
Air transport
Air traffic control
Airports and air traffic services

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student
a) knowledge (t)
1. knows the purposes for which aircraft are used, the types of aircraft, their operation and their expected evolution
2. knows the processes, infrastructure, tools, equipment and activities related to the operation and management of aircraft
b) skills (k)
1. is able to formulate a professional opinion on the most relevant aspects of aircraft operations on the basis of the knowledge acquired
c) attitude (a)
1. has vision, systems thinking, teamwork, planning, prioritising and documenting tasks accurately
2. complies with the safety rules and regulations to which he/she is familiar
3. respects sustainability and the environment
d) autonomy and responsibility (o)

1. can represent safety, technical and sustainability aspects in decision-making situations

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm exam that can be substituted by a submitted individual assignment.	1. ZH or optionally BF	1. 100%	1. t1-2,k1,a1-3,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

pass the final examination with at least 50% of the mark or acceptance of the assignment to be submitted

27. Grading rules

Excellent 80-100%
Good 70-79%
Satisfactory 60-69%
Pass 50-59%
Fail 0-49%

28. Attendance and participation requirements

According to the rules of Study and Examination Regulations.

29. Retake and delayed completion

Late completion of summative assessments is allowed for a second time in the late completion period upon payment of a special charge.

30. Consultation

at a time and in a form agreed with the lecturers

31. Learning materials

Lecture notes by the Department

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Autonomous vehicle-based mobility services**				
2. Subject name in Hungarian	Autonóm járművekre épülő mobilitási szolgáltatások			**3. Programme**	MSc
4. Subject code	**BMEKOKKMsM8001-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	5 hours	**Homework**	27 hours
Reading written materials	10 hours	**Midterm preparation**	20 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Földes Dávid research fellow	**15. Email address**	foldes.david@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Földes Dávid, Dr. Csiszár Csaba, Dr. Csonka Bálint		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Understanding mainly road-based mobility services built on autonomous vehicles, and the specific aspects of their planning and operation. Familiarization with the acceptance barriers of autonomous vehicles and an overview of their expected transport and s

20. Programme of lectures

Current transport system and modes (shared mobility services), general issues of transport sectors (traffic size, pollution, safety), supply and demand alignment, the role of the human factor. Alteration in transport modes after introduction of autonomous vehicles, service types, and future of mobility scenarios. Literature review on autonomous vehicle-based mobility services; evolution of publications in the field (topics, keywords). Automated vehicles in railway and aviation. Planning of autonomous vehicle-based mobility services. Operation of autonomous vehicle-based mobility services. Impact of autonomous vehicles (safety, traffic, environmental, land use, economic). Social acceptance of autonomous vehicles (expectations, trust, data protection, ethics). Case studies: autonomous vehicle-based mobility services.

21. Programme of practices

Case studies: autonomous vehicle-based mobility services. Fundamentals and calculations for planning demand-responsive mobility services (e.g., determination of pick-up points, capacity planning, service cost and quality). Design principles specific to au

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. Understands autonomous vehicle-based mobility services.
2. Understands the planning and operational characteristics specific to autonomous vehicle-based mobility services.
3. Becomes familiar with the expected impacts of autonomous vehicles.

b) skills (k)

1. Applies transport planning aspects in addition to vehicle or control software design.
2. Designs and visualizes autonomous vehicle-based mobility services at a conceptual level.
3. Considers the social, transport-related, and economic impacts of autonomous vehicles.

c) attitude (a)

1. Recognizes that a system-oriented approach is required for the introduction of autonomous vehicles.
2. Strives to enhance the social acceptance of autonomous vehicles.
3. Aims to carry out work with a system- and process-oriented mindset, applying a complex approach that incorporates sustainability and economic considerations.
4. Strives for comprehensiveness in acquiring knowledge and collaborates with the teacher.

d) autonomy and responsibility (o)

1. Makes responsible decisions in evaluating, planning, and operating autonomous vehicle-based mobility services.

2. Formulates independent proposals for economically, socially, and environmentally efficient autonomous vehicle-based mobility services.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. semester assignment (Conceptual design of an autonomous vehicle-based demand-responsive service)	1. ZH 2. F	1. 70% 2. 30%	1. t1-3,k3,a4 2. k1-2,a1-4,o1-2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Successful (min. 50%) completion of the midterm test and submission and acceptance of the semester assignment.

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The midterm test can be retaken during the semester on the date announced at the beginning of the semester. The semester assignment may be submitted after the original deadline until Wednesday of the make-up week, subject to an additional administrative f

27. Grading rules

Excellent 85-100%
Good 75-84.5%
Satisfactory 60-74.5%
Pass 50-59.5%
Fail 0-49%

30. Consultation

At a time and in a form agreed with the teacher

31. Learning materials

Presentation slides, thematic scientific papers

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Aviation incidents and their investigations**				
2. Subject name in Hungarian	Légijármű események, balesetek kivizsgálása			**3. Programme**	BSc_MSc
4. Subject code	**BMEKORHBsM8008-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	22 hours	**Homework**	29 hours
Reading written materials	11 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Aeronautics and Naval Architecture		
14. Subject coordinator and its position	Dr. Rohács Dániel associate professor	**15. Email address**	rohacs.daniel@kjk.bme.hu
16. …organisational unit	Department of Aeronautics and Naval Architecture		
17. Instructor(s)	Gál István		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Fundamentals of aircraft accident and incident investigation, basic investigation procedures, case studies, and experiences in aircraft design and development.

20. Programme of lectures

Week 1: Introduction to aviation incidents and investigations
- Definition of incidents and accidents
- The importance of safety and investigation in aviation
- Regulatory frameworks: EASA, FAA, NTSB
- Introduction to accident investigation authorities worldwide

Week 2: Fundamentals of aircraft safety and human factors
- The concept of aviation safety management
- The Swiss cheese model of accident causation

Week 3: Aircraft systems and their role in accidents
- Overview of key aircraft systems (engines, avionics, hydraulics, etc.)
- How system failures contribute to aviation incidents
- Case studies of system-related failures

Week 4: Accident scene management and investigation techniques
- Securing the scene and collecting evidence
- Recovery of black boxes (FDR and CVR) and data analysis
- Role of investigators in aviation accidents in his investigation

Week 5: Meteorological factors in aviation accidents
- Adverse weather and its impact on aviation (icing, wind shear, turbulence)
- Case studies of weather-related aviation accidents

Week 6: Air traffic control (ATC) and its role in aviation incidents
- Air traffic control tasks and procedures
- Mid-air collisions and air traffic control errors
- Case studies of air traffic control-related aviation incidents

Week 7: Human error and crew resource management
- The role of pilots and crew in aviation safety
- CRM principles and training
- Case studies of human error

Week 8: Structural defects and aircraft design defects
- Metal fatigue, composite defects and manufacturing defects
- Notable aircraft structural defects and lessons learned
Week 9: Terrorism, sabotage and security incidents
- Unlawful interference in aviation
- Famous aviation incidents related to terrorism
- Security measures in aviation
Weeks 10-11: Case study analysis and lessons learned
- In-depth analysis of famous aviation accidents (e.g. Tenerife disaster, Air France 447, United 232).
- Group discussion and findings
Weeks 12-14: Final project and summary
- Student presentations on selected aviation accidents
- Discussion on future trends in aviation safety
- Concluding remarks and key lessons learned

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student
a) knowledge (t)
1. knows aviation incidents, the justification for their investigation, the means and methods of investigation
2. knows vehicle, infrastructure and service factors associated with aviation incidents and their relationship to the incident

b) skills (k)
1. is able to interpret and compile case studies using the knowledge
2. is able to visually communicate ideas and plans clearly to others.
c) attitude (a)
1. works in a precise, aesthetic, clear and concise manner.
2. is interested, receptive, able to meet deadlines.
d) autonomy and responsibility (o)
1. is able to prepare documentation independently,
2. is aware of the importance of the work and the consequences of errors.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. homework	1. HF	1. 100%	1. t1-2,k1-2,a1-2,o1-2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

submission and presentation of task on time

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

Late completion of summative assessments is allowed for a second time in the late completion period upon payment of a special charge.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Lecture notes, materials and documentations in printed and/or electronic version given by the lecturer.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Electromobility**				
2. Subject name in Hungarian	Elektromobilitás			**3. Programme**	MSc
4. Subject code	**BMEKOKKMsK2A02-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	6 hours	**Homework**	35 hours
Reading written materials	6 hours	**Midterm preparation**	15 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Csonka Bálint senior research fellow	**15. Email address**	csonka.balint@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Csonka Bálint, Dr. Földes Dávid		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Understanding the components, characteristics, functioning, relationships, trends and challenges of the electromobility system. Learn analytical and design methods, procedures and applications for the planning and operation of electromobility services thr

20. Programme of lectures

Electromobility system; Electrification of urban bus networks; Vehicle and battery technology; Charging infrastructure and charging management; Economic and environmental impacts; Hydrogen-based electromobility.

21. Programme of practices

As part of the practice, students will be given a semester-long design assignment to solve individually or in groups. The results must be presented in 10-15 minutes by the students. The practice and the assignment are based on the following topics: Clust

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. Knows and understands the specific methods, technologies, and applications of electromobility systems and solutions for the integration into the transport system

2. Knows the tools and methods related to linear programming modelling for electric bus services and charging management

3. Knows and understands the methodology and tools for the design and research of electromobility services

b) skills (k)

1. Able to process and organise information collected on electromobility, analyse it, draw conclusions and explore the connections and further develop services

2. Able to solve problems creatively and solve complex problems flexibly in the field of electromobility, based on a systems and process-oriented way of thinking

3. Able to assess the status of electromobility services, to develop an evaluation and a proposal, to develop, plan, organise and manage complex service systems at a high level

c) attitude (a)

1. Open and receptive to technological development and innovation in electromobility, and a credible presenter in the topic.

2. Strives to contribute to the development of new methods related to electromobility.

3. Strives to carry out his/her work based on a systems and process-oriented mindset, in a complex approach, taking into account sustainability and economic aspects.

4. 1. strives for completeness in the acquisition of knowledge, cooperates with the teacher and fellow students, is empathetic and tolerant towards members of his/her team.

d) autonomy and responsibility (o)

1. In addition to narrow professional criteria, ensures sustainability in the use of his/her knowledge, is able to self-monitor and correct errors independently, while taking into account the professional opinion of others

2. Makes responsible decisions in analysis, planning and operation of electromobility services, and formulates independent proposals to solve identified challenges

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. urban bus service electrification assignment	1. ZH 2. HF	1. 50% 2. 50%	1. t1,t2,t3,k1,k3,a1,a3,a4,o1,o2, 2. t1,t2,t3,k1,k2,k3,a1,a2,a3,a4,o2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

submission and presentation of task on time and successful (min. 50%) completion of the midterm test

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

second retake or delayed completion is only from one midterm requirement

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

presentation slides

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Engineering mathematics**				
2. Subject name in Hungarian	Mérnöki matematika			**3. Programme**	MSc
4. Subject code	**BMEKOKJBsM8012-00**		**5. Restrictions**	**except for students in MSc in autonomous vehicle control**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**0 practice**	**1 laboratory**	**10. Language**	**EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	14 hours	**Homework**	48 hours
Reading written materials	0 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Control for Transportation and Vehicle Systems		
14. Subject coordinator and its position	Dr. Varga Balázs research fellow	**15. Email address**	varga.balazs@kjk.bme.hu
16. …organisational unit	Department of Control for Transportation and Vehicle Systems		
17. Instructor(s)	Dr. Varga Balázs, Ormándi Tamás		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The subject gives an introduction and tools to modelling and solving different problems in vehicle control engineering. The main topics covered are numerical errors, error propagation, numerical solution of differential equations and optimization.

20. Programme of lectures

1. Numerical errors, error propagation, condition numbers
2. Selected topics from matrix algebra (eigenvalues, eigenvectors, matrix decompositions, matrix inversion, pseudoinverse)
3. Stability and convergence of numerical solutions of ordinary differential equations, A-stability of numerical algorithms, local and global errors, Euler and higher order methods
4. Numerical solution of partial differential equations, discrete and semi-discrete solutions, Lax equivalence theorem, Courant, Friedrichs, and Lewy condition
5. Introduction to optimization: cost functions and constraints – categorization and how to solve them.
6. Multi-objective optimization, pareto front

21. Programme of practices

-

22. Programme of laboratories

During the labs Matlab/Simulink and Python will be used.

1. Numerical precision, number representation errors in different programming languages
2. Singular value decomposition, Principal component analysis
3. Deep dive into Simulink's solvers
4. PDE lab

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows how errors propagate through algorithms
2. knows the different types of numerical solvers and their stability regions

3. is familiar with different types of cost functions and constraints

b) skills (k)

1. can model error propagation in numerical calculations
2. identifies the cause of instability in numerical methods
3. can formulate optimization problems and choose appropriate cost functions and constraints and implement them

c) attitude (a)

1. is open to understanding how calculations are done with a computer
2. is motivated to solve the homeworks in high quality

d) autonomy and responsibility (o)

1. can independently model engineering problems and solve them with a computer.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. Homework	1. H	1. 100%	1. t1-3,k1-3,a1-2,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Obtaining the semester grade requires the acceptance of the take home exam

27. Grading rules

Excellent 88–100%
Good 75–87%
Satisfactory 63–74%
Pass 50–62%
Fail 0–49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The take home exam can be resubmitted once until the end of the late completition period

30. Consultation

Consultation is possible at a time and in a form agreed with the teacher.

31. Learning materials

1. Gergó Lajos: Numerical methods (in Hungarian), ELTE Eötvös kiadó Kft, 2013
2. Bürgisser, Peter, and Felipe Cucker. Condition: The geometry of numerical algorithms. Vol. 349. Springer Science & Business Media, 2013
3. Butcher, John Charles. Numerical me

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Environmental awarness in aviation**				
2. Subject name in Hungarian	Környezetvédelem a légiközlekedésben			**3. Programme**	BSc_MSc
4. Subject code	**BMEKORHBsM8002-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	9 hours	**Homework**	0 hours
Reading written materials	27 hours	**Midterm preparation**	26 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Aeronautics and Naval Architecture		
14. Subject coordinator and its position	Dr. Rohács Dániel associate professor	**15. Email address**	rohacs.daniel@kjk.bme.hu
16. …organisational unit	Department of Aeronautics and Naval Architecture		
17. Instructor(s)	Dr. Rohács Dániel, Dr. Utku Kale		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The objective of this course is to introduce the connection between aviation and environment.

20. Programme of lectures

Thestructure of aviation.
The main activities and roles of each actor.
The most important externalities.
Measurement and determination methods.
Tools and methods for mitigating and managing externalities.
Case studies.

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student
a) knowledge (t)
1. knows and understands the environmental role of air transport.
2. knows the most important externalities, their measurement and management methods.
b) skills (k)
1. based on the knowledge, can more easily and effectively reconcile air transport with environmental needs.
c) attitude (a)
1. is curious, receptive.
d) autonomy and responsibility (o)
1. is able to independently develop further in various specialized areas of the studied field.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test	1. ZH	1. 100%	1. t1-2,k1,a1,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade	27. Grading rules
successful (min. 50%) completion of the midterm test	Excellent 88-100% Good 75-87% Satisfactory 63-74% Pass 50-62% Fail 0-49%
28. Attendance and participation requirements	
according to the rules of CoS	
29. Retake and delayed completion	
Retake exam possible according to the general rules of BME.	

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Supplementary materials published within the scope of the subject
Articles

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Innovation and Entrepreneurship in transportation**				
2. Subject name in Hungarian	Innováció és szolgáltatásfejlesztés a közlekedésben			**3. Programme**	MSc
4. Subject code	**BMEKOKKBsM8006-00**		**5. Restrictions**	**-**	
6. Credits	**6**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**2 practice**	**0 laboratory**	**10. Language**	**EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**180 hours**
Contact hours	56 hours	**Preparation for lessons**	20 hours	**Homework**	74 hours
Reading written materials	30 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Esztergár-Kiss Domokos tudományos főmunkatárs	**15. Email address**	esztergar-kiss.domokos@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Tóth János, Aba Attila, Kózel Miklós		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Aim of the course is to give a theoretical and practical overview to the students about innovation and service development in order to gain experience for their career either as an entrepreneur or an employee.

20. Programme of lectures

The importance of skills and their categorization. Innovation and value proposition. Principles and methodologies of customer centric product and service development (value proposition canvas, business canvas, persona canvas, affinity map e.g.). Principles of interview making. Customer journey analysis. Idea development. Methodology of pitch presentation.

21. Programme of practices

In a group project assignment, you have to take practical steps to innovate and develop a product or service in a transport problem area.

1. Group formation, formulation of objective
2. Interviewing potential customers.
3. Problem identification.
4. Idea

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows the basic principle of innovation and serivce development.
2. knows the theory and practice of innovation and service development methodologies.

b) skills (k)

1. is able to see services and products with a business approach.
2. is able to evaluate processes of transportation with a customer point of view.
3. is able to effectively present ideas and suggestions.

c) attitude (a)

1. strives to be creative and cooperate.
2. is open to new evaluation and presentation techniques.

d) autonomy and responsibility (o)

1. is able to identify technical aspects of a non-technical issue.
2. responsibly applies of acquired knowledge in individual or in team work.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. supporting materials 2. presentation	1. TA 2. EA	1. 80% 2. 20%	1. t1-2,k1-3,a1,o1 2. a2,o2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Doing the pitch presentation, and submission of the related slides and supporting canvases.

27. Grading rules

excellent 85-100%
good 70-84%
satisfactory 55-69%
pass 40-54%
fail 0-39%

28. Attendance and participation requirements

The student shall attend at least 70% of workshops.

29. Retake and delayed completion

The presentation can be retaken once.

30. Consultation

either on in-class workshops or at a time and form agreed with the lecturers

31. Learning materials

Presentations

32. Start of validity for the subject decription

February 1st, 2026

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Intelligent logistics applications**				
2. Subject name in Hungarian	Intelligens logisztikai alkalmazások			**3. Programme**	MSc
4. Subject code	**BMEKOALMsM8002-00**		**5. Restrictions**	**except for students on logistics aut. spec in MSc in Logistics**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**0 practice**	**1 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	12 hours	**Homework**	0 hours
Reading written materials	18 hours	**Midterm preparation**	32 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Material Handling and Logistics Systems		
14. Subject coordinator and its position	Dr. Bohács Gábor senior research fellow	**15. Email address**	bohacs.gabor@kjk.bme.hu
16. …organisational unit	Department of Material Handling and Logistics Systems		
17. Instructor(s)	Dr. Bohács Gábor, Dr. Rinkács Angéla, Dr. Rózsa Zoltán		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The objective of the course is to familiarize students with basics of intelligent solutions and some applications in logistics systems and to enable them to choose the right solution in practical life. Within this, it discusses in detail the applicability

20. Programme of lectures

Development of artificial intelligence methods. Application areas of neural networks. Application of neural networks in logistics. Application of fuzzy logic in logistics. Application of machine vision in intelligent logistics systems. Application of mobile robots in logistics systems. Examples of the implementation of theory into practical solutions.

21. Programme of practices

-

22. Programme of laboratories

Computer labs, in which the methods learned in the lectures are tested in the available software environment. The labs specifically reflect on what was said in the lectures and present examples..

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows the systematic approaches to the construction and operation of intelligent logistics systems.
2. knows an intelligent method applicable to a given task in logistics and a possible software solution for it.
3. understands the theoretical and practical elements of related disciplines that influence the development of intelligent machines in logistics.

b) skills (k)

1. is able to formulate the advantages and disadvantages of intelligent logistics solutions
2. is able to perform basic tests related to the evaluation of systems
3. determines the components of intelligent systems, their characteristics and impact

c) attitude (a)

1. is open to the practical application of new methods emerging in the field of intelligent systems
2. strives to the maximum of his abilities to complete his studies at the highest possible level, acquiring in-depth and independent knowledge
3. cooperates with instructors and teammates in solving complex problems

d) autonomy and responsibility (o)

1. is responsible for design problems and makes independent suggestions

2. uses a systems engineering approach in the thinking

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. midterm test	1. ZH 2. ZH	1. 50% 2. 50%	1. t1-t3,k1-k3,a1-a3,o1,o2 2. t1-t3,k1-k3,a1-a3,o1,o2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Both bidterm tests are at least 50%.

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

both midterm tests can be retaken maximum 1-1 times

30. Consultation

At a time and in a form agreed with the teacher.

31. Learning materials

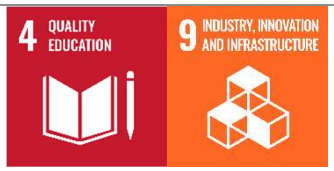
Students can download the electronic learning materials and other aids related to the subject from the e-learning framework used.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Introduction to Matlab programming**				
2. Subject name in Hungarian	Bevezetés a Matlab programozásba			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKJBsM8019-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**0 lecture**	**0 practice**	**2 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	0 hours	**Homework**	0 hours
Reading written materials	28 hours	**Midterm preparation**	34 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Control for Transport and Vehicle Systems		
14. Subject coordinator and its position	Dr. Szabó Ádám research fellow	**15. Email address**	szabo.adam@kjk.bme.hu
16. …organisational unit	Department of Control for Transport and Vehicle Systems		
17. Instructor(s)	Dr. Szabó Ádám, Lindenmaier László		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The subject aims the learning of the Matlab programming language and environment. This tool aim to support the students in the implementation tasks required by other courses. The goal on one hand is the introduction of the syntax of the two languages: Typ

20. Programme of lectures

-

21. Programme of practices

-

22. Programme of laboratories

In the laboratory practice, the goal is to learn the independent use of the syntactic and algorithmic design skills. In doing so, students learn the programming of languages through prepared examples in its development environment.
The topic of the course

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows the basic syntax and structure of the programming environment,
2. knows how the types, operators, and basic instructions work,
3. is familiar with the process control principles and syntax of structured programs, branches, sequences, cycles,
4. knows the complex data structures, their use,
5. knows the basic algorithm design paradigms.

b) skills (k)

1. can write simple standalone programs in the program language concerned;
2. can implement informally or formally specified algorithms,
3. can program source code interpretation, error correction,
4. is able to test and optimize ready-made programs and modules.

c) attitude (a)

1. is interested in modern it solutions,
2. is capable of algorithmic thinking that can be applied in other areas.

d) autonomy and responsibility (o)

1. in addition to known environments, is able to acquire other unknown program languages and development tools in autodidact,
2. is capable of designing and implementing software modules alone, responsibly,

3. is able to consult in a team in algorithmic and programming tasks, to make independent decisions.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. Midterm test	1. ZH	1. 100%	1. t1-5,k1-4,a1-2,o1-3

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Obtaining the semester grade requires a satisfactory performance on the midterm test

27. Grading rules

Excellent 88–100%
Good 75–87%
Satisfactory 63–74%
Pass 50–62%
Fail 0–49%

28. Attendance and participation requirements

According to the rules of CoS

29. Retake and delayed completion

The midterm test can be retaken in accordance with university regulations.

30. Consultation

Students may request consultation opportunities with the lecturer and instructors by prior arrangement

31. Learning materials

Lecture Notes, Matlab help, Matlab academy

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Machine vision**				
2. Subject name in Hungarian	Gépi látás			**3. Programme**	MSc
4. Subject code	**BMEKOALMsM8001-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	12 hours	**Homework**	20 hours
Reading written materials	10 hours	**Midterm preparation**	20 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Material Handling and Logistics Systems		
14. Subject coordinator and its position	Dr. Rózsa Zoltán research fellow	**15. Email address**	rozsa.zoltan@kjk.bme.hu
16. …organisational unit	Department of Material Handling and Logistics Systems		
17. Instructor(s)	Dr. Szirányi Tamás, Dr. Rózsa Zoltán		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The course aims to provide students with an understanding of the principles and applications of 3D machine vision. To this end, they will acquire theoretical knowledge ranging from calibration to biometrics to 3D reconstruction and LiDAR technology. Throu

20. Programme of lectures

During the lectures, students will learn the basics of video motion analysis, the operation of biometric systems, and the MRF and fMRF models used for spatial inference. The basics of 3D vision, stereo imaging, and LiDAR technology will be presented in detail, complemented by the importance of sensor calibration. Finally, the course will touch on VO-SLAM methods essential for spatial orientation and mapping of robots.

21. Programme of practices

Computer exercises; MATLAB programming

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows three-dimensional shape recognition methods,

2. is familiar with environmental reconstruction technologies3. is familiar with modern, neural network-based approaches to 3D machine vision

b) skills (k)

1. designs 3D object and shape recognition algorithm,
2. can see the architectural issues of a machine vision system,
3. is able to select a suitable tool and algorithm for a given task.

c) attitude (a)

1. open to learn about modern 3D vision systems
2. open to automatic use of machine vision in vehicle control

d) autonomy and responsibility (o)

1. can participate in image processing projects independently or in a team,
2. responsibly designs a vision system that meets the given task and safety requirements

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes

1. midterm test 2. homework	1. ZH 2. HF	1. 60 % 2. 40 %	1. t1-t3,k1-k3,a1,a2,o1,o2 2. t1-t3,k1-k3,a1,a2,o1,o2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

At least 50% completion of the midterm and homework assignment separately.

27. Grading rules

Excellent 80-100%
Good 70-79%
Satisfactory 60-69%
Pass 50-59%
Fail 0-49%

28. Attendance and participation requirements

According to the rules of CoS.

29. Retake and delayed completion

According to the rules of CoS.

30. Consultation

At a time and in a form agreed with the teacher.

31. Learning materials

Students can download the electronic learning materials and other aids related to the subject from the e-learning framework used.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Modern automotive products and development methods**				
2. Subject name in Hungarian	Korszerű autóipari termékek és fejlesztési módszerek			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKJBsM8007-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	28 hours	**Homework**	0 hours
Reading written materials	0 hours	**Midterm preparation**	34 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Control for Transportation and Vehicle Systems		
14. Subject coordinator and its position	Dr. Bartha Tamás associate professor	**15. Email address**	bartha.tamas@kjk.bme.hu
16. …organisational unit	Department of Control for Transportation and Vehicle Systems		
17. Instructor(s)	Dr. Bartha Tamás		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The aim of the course is to familiarize students with the structure and operation of modern automotive electronic systems, as well as the tools and methodologies used in their development. The course emphasizes the understanding of driver assistance syste

20. Programme of lectures

The aim of the course is to introduce students to modern automotive electronics products, the tools used in their development and the methodologies applied. Students will be introduced to the most important automotive electronic systems, electrical and electromechanical auxiliaries, sensor principles, information and other relevant high reliability electronic devices for assisting driving. They will learn about advanced product development processes, methods of developing safety-critical automotive systems, related roles and expectations.

Topics: Automotive product cybersecurity, Model-based Systems Engineering in the Automotive Industry, Electric car, eMobility, Automated Driving, Electric Power Steering system, Low power electric motor applications in vehicles, Video Based Driver Assistance Systems, Ultrasound-based driver and parking maneuver assistance systems, Radar based driver assistance systems, MEMS (miniature sensing devices) in the car, EMC Focused Hardware Design for Car Multimedia Applications, Project Management

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows the main driver support, assistance and comfort vehicle systems
2. knows and understands the basic processes involved in the development of modern automotive systems
3. knows and understands the main sensing principles and limitations
4. knows and understands the sensing and intervention mechanisms of driver assistance systems
5. knows tools and methodologies used in automotive development
6. understands the aspects and risks considered in automotive development
7. understands the purpose and tools, knowledge and soft skills required to manage projects

b) skills (k)

1. is able to understand and evaluate the main trends and development directions in the automotive industry
2. is able to distinguish between vehicle systems applying different principles in the same field and to select the most appropriate one for a given project
3. is able to apply the principles of best practice in the automotive industry as identified in the subject

4. is able to apply project management methods in practice

c) attitude (a)

1. is open and receptive to learning about and communicating developments and innovations in the field
2. analytical analyses the knowledge acquired, searches for connections, thinks in systems

d) autonomy and responsibility (o)

1. takes the initiative in the professional work
2. independently selects and applies solution methods
3. makes decisions carefully, taking into account risks and advantages and disadvantages, and assuming responsibility
4. takes decisions in compliance with safety, environmental, economic and engineering standards

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. attitude and autonomy (lecture active attendance) 2. attitude and autonomy (1. midterm test) 3. attitude and autonomy (2. midterm test) 4. knowledge and skills (1. midterm test) 5. knowledge and skills (2. midterm test)	1. ATT&AUT(EA) 2. ATT&AUT(1.ZH) 3. ATT&AUT(2.ZH) 4. TUD&KEP(1.ZH) 5. TUD&KEP(2.ZH)	1. 15% 2. 7,5% 3. 7,5% 4. 35% 5. 35%	1. a1-2,o1-o4 2. a1-2,o1-o4 3. a1-2,o1-4 4. t1-7,k1-4 5. t1-7,k1-4

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Obtaining the semester grade requires a satisfactory performance on the midterm tests

27. Grading rules

Excellent 88–100%
Good 75–87%
Satisfactory 63–74%
Pass 50–62%
Fail 0–49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

Both midterm exams will be offered a make-up opportunity during the semester or in the make-up period, according to the regulations of the TVSZ.

30. Consultation

Students may request consultation opportunities with the lecturer and instructors by prior arrangement

31. Learning materials

"Modern automotive products and their development methods" - a learning guide compiled by the staff of the Robert Bosch Engineering Centre in Budapest (in Hungarian only)

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Passenger transportation systems**				
2. Subject name in Hungarian	Személyközlekedési rendszerek			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKKMSK1004-00**		**5. Restrictions**	**-**	
6. Credits	**5**	**7. Evaluation type**	**e**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**2 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for lessons**	15 hours	**Homework**	34 hours
Reading written materials	20 hours	**Midterm preparation**	15 hours	**Exam preparation**	10 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Csiszár Csaba professor	**15. Email address**	csiszar.csaba@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Csiszár Csaba, Dr. Csonka Bálint, Dr. Földes Dávid		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

To learn and master the methods of analysis, evaluation, modeling, and planning of the passenger transport system and its subsystems, with particular attention to new (transitional) modes of transport and the interconnection and substitutability of modes.

20. Programme of lectures

Characterization of passenger transport demand
Characterization of passenger transport supply
Reconciliation of supply and demand in passenger transport
Quality of passenger transportation services, measures
Car-sharing systems
Planning of traffic calming and parking
Planning of public transport services
Planning of pedestrian and bicycle traffic
Ride-sharing systems, chauffeur services
Taxi service, „Amusement transportation"

21. Programme of practices

Learning and mastering measurement, analysis, and design procedures at a skill level. Learning about case studies with the help of guest speakers. Independent literature research and topic processing supported by consultations; giving student presentation

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. Has comprehensive knowledge of global social and economic processes. (T2)
2. Knows and understands the properties and application areas of solutions applied in the field of transport and transportation; the methodology and tools of their design and research. (T3,T7)
3. Knows and understands the information and communication technologies related to the field of transport and transportation. (T5)
4. Knows the widely applicable problem-solving techniques necessary for research or scientific work. (T8)

b) skills (k)

1. Able to process and systematize information collected during the implementation of transport and transportation systems and processes, analyze, draw conclusions and explore relationships, and further develop information systems. (K4,K10)

2. Able to apply integrated knowledge of transport and transportation processes, vehicles implementing processes, process theory, and related fields of informatics. (K6)

3. Able to creatively handle problems in the field of transport and to flexibly solve complex tasks using innovative ideas. (K7,K14)

4. Able to conduct research and to conduct publication activities and negotiations in their field of expertise in their native language and at least one foreign language. (K5,K13)

c) attitude (a)

1. Open and receptive to learning about and accepting professional, technological development and innovation in the field of transport and transportation, and authentically conveying it. (A1,A2)

2. Strives to contribute to the development of new methods and tools related to transport and transportation, to have a broad perspective and to connect multiple modes. (A4,A9,A10)

3. Strives to carry out his/her work based on a systems and process-oriented mindset, in a complex approach, taking into account sustainability and economic aspects. (A6,A7)

d) autonomy and responsibility (o)

1. They are responsible for sustainability, health protection and environmental awareness, and take these aspects into account in their decisions. (O3,O4)

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm	1. ZH_1	1. 12,5 %	1. t1, t2, k2, a1, a2, a3
2. midterm	2. ZH_2	2. 12,5 %	2. t1, t2, k2, a1, a2, a3
3. home assignment_1	3. HF_1	3. 10 %	3. t1, t2, t3, t4, k1, k3, k4, a1, a2, a3, o1
4. home assignment_2	4. HF_2	4. 5 %	4. t1, t2, t3, t4, k1, k3, k4, a1, a2, a3, o1
5. home assignment_3	5. HF_3	5. 5 %	5. t1, t2, t3, t4, k1, k3, k4, a1, a2, a3, o1
6. home assignment_3_presentation of results	6. HF_3_B	6. 5 %	6. k4, a1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes
1. oral exam	1. V	1. 50 %	1. t1,t2,k2,a1,a2,a3

26. Criteria to obtain a signature / midterm grade

mid-semester ‘signature’ is obtained if all the midterms are passed, and the assignments are submitted and accepted, and attendance on guest lectures is completed.

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

28. Attendance and participation requirements

According to the rules of CoS. Attendance on guest lectures is mandatory.

29. Retake and delayed completion

Up to one midterm test can be retaken in the delayed completion week.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

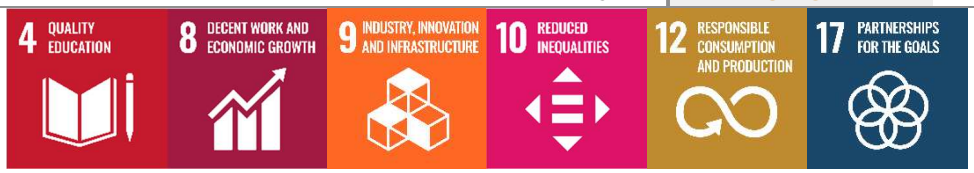
ppt slides, Csaba Csiszár – Bálint Csonka – Dávid Földes (2019): Innovative Passenger Transportation Systems (book)

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Process planning**				
2. Subject name in Hungarian	Folyamattervezés			**3. Programme**	MSc
4. Subject code	**BMEKOALBsM8002-00**		**5. Restrictions**	**except for students in MSc in Logistics**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	17 hours	**Homework**	35 hours
Reading written materials	10 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Material Handling and Logistics Systems		
14. Subject coordinator and its position	Dr. Kovács Gábor senior lecturer	**15. Email address**	kovacs.gabor@kjk.bme.hu
16. …organisational unit	Department of Material Handling and Logistics Systems		
17. Instructor(s)	Dr. Kovács Gábor, Bakos András		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

To familiarize students with formalized methods for describing processes.

20. Programme of lectures

Interpretation of the process, parts, contacts, activities, events and processes. Standard methods for the description of the processes. Process Charting Techniques. Process Description levels. Top-down and bottom-up modeling. Standard process description languages. Standard Operating Procedure. Cross-Functional Flowchart. Event Driven Process Chain (EPC). Business Process Modeling Notation (BPMN).

21. Programme of practices

Exercising process description languages (SOP, EPC, BPMN) through examples. Preparation of the semester work.

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows the process modeling basics
2. knows the process description languages included in the course description

b) skills (k)

1. is able to model processes using standard methods based on written and oral descriptions

c) attitude (a)

1. strives to maximize their abilities to make their studies at the highest possible level, with a profound and independent knowledge, accurate and error-free, in compliance with the rules of the applicable tools, in collaboration with the instructors

d) autonomy and responsibility (o)

1. takes responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. semester task	1. F	1. 100%	1. t1,t2,k1,a1,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade			**27. Grading rules**
Completion of semester task at least 50% level.			Excellent 87,5-100% Good 74,5-87% Satisfactory 62,5-74% Pass 50-62% Fail 0-49%
28. Attendance and participation requirements			
According to the rules of CoS.			
29. Retake and delayed completion			
According to the rules of CoS.			
30. Consultation			
At a time and in a form agreed with the teacher.			
31. Learning materials			
Students can download the electronic learning materials and other aids related to the subject from the e-learning framework used.			
32. Start of validity for the subject decription			
September 1st, 2025			

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Reinforcement learning in vehicle control**				
2. Subject name in Hungarian	Megerősítéses tanulás alkalmazása a járműirányításban			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKJBsM8011-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	14 hours	**Homework**	34 hours
Reading written materials	14 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Control for Transportation and Vehicle Systems		
14. Subject coordinator and its position	Dr. Bécsi Tamás associate professor	**15. Email address**	becsi.tamas@kjk.bme.hu
16. …organisational unit	Department of Control for Transportation and Vehicle Systems		
17. Instructor(s)	Dr. Bécsi Tamás		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The course aims to give students practical knowledge in the fundamentals of reinforcement and deep learning, with a focus on modern algorithms. Students will learn to implement and optimize RL methods in simulation environments using Python.

20. Programme of lectures

During the lectures, students will learn the basics of the Python programming language and fundamental concepts of Deep Learning, including neural networks, the backpropagation algorithm, batch learning, hyperparameter optimization, and the workings of optimizers.

Following this, students will study and implement basic Reinforcement Learning (RL) algorithms, initially without function approximators and then with their use (Q-Learning, Deep Q-Network, Double Deep Q-Network, Policy Gradient, Actor-Critic solutions). After gaining a comprehensive understanding of how these algorithms work, students will use pre-implemented environments provided by OpenAI Gym to practice training the algorithms and optimizing their parameters. The course concludes with an introduction to complex algorithms that are currently considered state-of-the-art in the field.

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. understands the basics of git version control.
2. understands the use of the python programming language and complementary machine learning frameworks.
3. understands the fundamentals, equations, and principles of reinforcement learning and machine learning.
4. can distinguish between various reinforcement learning algorithms.
5. understands the principles and procedures related to rl applications.
6. knows and comprehends basic model development techniques.
7. understands the limitations and application opportunities of agents necessary for learning.

b) skills (k)

1. can apply different rl algorithms.
2. can utilize git as a version control tool for project development.
3. can apply integrated knowledge to implement and train new agents.
4. can employ object-oriented development in personal projects.
5. can define and create evaluation algorithms for personal projects.

c) attitude (a)

1. is open and receptive to developments and innovations in the field, and able to communicate them.
2. demonstrates a strong sense of professional dedication.
3. strives for a systems-thinking approach to comprehensively address processes.

d) autonomy and responsibility (o)

1. proactively chooses and applies solutions in professional work.
2. makes decisions with care and takes responsibility for them.
3. considers environmental, safety, economic, and engineering ethical regulations in decision-making.
4. is capable of independently planning and executing a project to address a specific problem using reinforcement learning.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. Project work	1. P	1. 100%	1. t1-7,k1-5,a1-3,o1-4

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Obtaining the semester grade requires the acceptance of project work

27. Grading rules

Excellent 88–100%
Good 75–87%
Satisfactory 63–74%
Pass 50–62%
Fail 0–49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

We offer a free make-up presentation opportunity, and a second opportunity during the make-up week for a fee. The requirements are the same as for the first opportunity.

30. Consultation

Students may request consultation opportunities with the lecturer and instructors by prior arrangement

31. Learning materials

[01] Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. MIT press, 2018.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Selected topics from the advanced material sciences**				
2. Subject name in Hungarian	Válogatott fejezetek a modern anyagtudományból			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOGJBsM8007-00**		**5. Restrictions**	**-**	
6. Credits	**4**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	28 hours	**Preparation for lessons**	5 hours	**Homework**	22 hours
Reading written materials	50 hours	**Midterm preparation**	15 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Automotive Technologies		
14. Subject coordinator and its position	Dr. Bán Krisztián associate professor	**15. Email address**	ban.krisztian@kjk.bme.hu
16. …organisational unit	Department of Automotive Technologies		
17. Instructor(s)	Dr. Bán Krisztián, Dr. Hlinka József, Dr. Vehovszky Balázs, Bereczki Alexandra, Dr. Markovits Tamás		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

We recommend this course for students who are pursuing their studies at the bachelor's or master's level or are doing PhD work in a special research field and have a strong interest in material sciences and technology. The aim of the subject is to gain a

20. Programme of lectures

The topics of the lectures follow the results of the latest R&Ds of material technology in the vehicle industry, therefore the topics of the lectures partially may vary but with a connection of the following issues:

1. Properties and production technologies of non-equilibrium alloys (e.g. effect of the non-equilibrium phase transformations on the properties of additive manufactured alloys).
2. Materials science background and consequences of special manufacturing processes (e.g. the effect of additive manufacturing on material properties).
3. From the nucleation process to the developed macro-scale properties of materials (the importance of nanostructured materials in applications). The lecture discusses the exceptional properties derived from the nanostructured phase environment.
4. Hysteresis phenomena and their outcomes in technical materials (mechanical, magnetic and storage applications, hydrogen storage).
5. Application of machine learning to predict the results of materials technology processes.
6. Role of interfaces and phase boundary in material processes (wetting, oxidation and reduction processes, formation and decomposition of hydride phases in storage materials, surface passivation and activation, etc.)
7. Nondestructive and special material testing and their scientific background.
8. Materials science on the duty of sustainable development and environmental protection.

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. Gets deeper knowledge in the field of material science and technology, to reach a deeper understanding of the phenomena and their background in material processes.

b) skills (k)

1. Is able to process publications in the field of material science and technology in the English language, and can interpret and explain appropriately the methods, results and concepts of it.

c) attitude (a)

1. Strives to develop their level of understanding, and find relationships among different fields of science.

d) autonomy and responsibility (o)

1. strives to work independently and to process the selected article completely and without distortion.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. Midterm test 2. Student assignment	1. ZH 2. HF	1. 30% 2. 70%	1. t1,a1 2. k1,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Students take a midterm exam during the semester. In addition, students carry out a professional article processing written in English on a personal topic as agreed with the professor, prepare a summary slideshow, and present it at the end of the semester

27. Grading rules

0-<50%: failed (1),
50-<62%: satisfactory (2),
62-<75%: fair (3),
75-<87%: good (4),
87-100%: excellent (5).

28. Attendance and participation requirements

According to TVSZ

29. Retake and delayed completion

Midterm test retake is two times and supplementary presentation is one time allowed during the semester at a time agreed in advance.

30. Consultation

We provide an opportunity for consultation on student assignments based on individual appointment arrangements.

31. Learning materials

1. Non-equilibrium Processing of Materials 49-85 (chapt. 4). ed. Suryanarayana C., (Pergamon , Materials Series Series editor R.W. Cahn, 1999)
2. Luborsky F.E., Amorphous Metallic Alloys (Butterworths Monographs in Materials) 1984
4. Y. Fukai The Metal-Hy

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Strategic policy instruments in transportation**				
2. Subject name in Hungarian	Stratégiai szabályozási eszközök a közlekedésben			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKKMSK2C03-00**		**5. Restrictions**		**-**
6. Credits	**6**	**7. Evaluation type**	**e**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**1 practice**	**1 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**180 hours**
Contact hours	56 hours	**Preparation for lessons**	8 hours	**Homework**	32 hours
Reading written materials	34 hours	**Midterm preparation**	30 hours	**Exam preparation**	20 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Mészáros Ferenc associate professor	**15. Email address**	meszaros.ferenc@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Mészáros Ferenc		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Within the framework of the course, students will learn the techniques and steps of transport policy and strategy making, as well as the transport policy objectives and instruments used in each field.

20. Programme of lectures

The need for transport policy and strategy, identification of the relevant market areas, the regulatory process. The environmental, economic and social aspects of sustainable mobility and the mainstreaming of horizontality in transport policy. European mobility strategy and its measures, infrastructure reform and regulation. Policy achievements in urban transport and freight, challenges of traffic and mobility management. Policy achievements in interoperable, interconnected and automated transport. Policy achievements in greening transport and the automotive industry.

21. Programme of practices

Tools and techniques for policy preparation, evaluation and decision-making.

22. Programme of laboratories

Financial and economic modelling of policy decisions.

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. understand the process of transport policy and strategy making and the technical, legal, financial, economic, social and institutional framework and related R&D and innovation directions (T10)

b) skills (k)

1. be able to identify the main problems of the transport system, select the transport policy instruments to address them, evaluate their results and impacts, and identify the needs for the development of transport policy instruments

c) attitude (a)

1. strives for completeness in the acquisition of knowledge, cooperates with the instructor and fellow students, is empathetic and tolerant towards members of his/her team

2. is open to new and innovative ideas and research, is self-critical in the tasks entrusted to him/her, and is fully committed to sustainability

d) autonomy and responsibility (o)

1. ensures that, in addition to narrow professional aspects, sustainability aspects are also taken into account in the use of his/her knowledge, is able to self-check and correct errors independently, while taking into account the professional opinions of others

2. can make responsible decisions in the field of transport engineering management in response to open questions, and can formulate independent proposals to resolve the challenges identified

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test	1. ZH1	1. 17,5%	1. t1,k1
2. midterm test	2. ZH2	2. 17,5%	2. t1,k1
3. holistic transport policy individual assignment	3. HF	3. 15%	3. k1,a1,a2,o1,o2
4. specific transport policy individual assignment	4. SF	4. 15%	4. k1,a1,a2,o1,o2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes
1. oral exam	1. V	1. 35%	1. t1,k1,a1,a2,o1,o2

26. Criteria to obtain a signature / midterm grade

successful completion (min. 50%) of each of the two midterm test and the submission and presentation of the two individual assignments by the deadline

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

second retake or delayed completion is only from one midterm requirement

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Peter Stopher, John Stanley (2014) Introduction to Transport Policy: A Public Policy View. Edward Elgar Publishing
presentation slides

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Sustainable aviation**				
2. Subject name in Hungarian	Fenntartható repülés			**3. Programme**	BSc_MSc
4. Subject code	**BMEKORHBsM8006-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	22 hours	**Homework**	29 hours
Reading written materials	11 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Aeronautics and Naval Architecture		
14. Subject coordinator and its position	Dr. Rohács Dániel associate professor	**15. Email address**	rohacs.daniel@kjk.bme.hu
16. …organisational unit	Department of Aeronautics and Naval Architecture		
17. Instructor(s)	Gál István		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Understanding the fundamental aspects of sustainable and green aviation, reviewing the basic regulatory environment, environmental impacts, potential technological solutions, alternative propulsion systems, procedures, and related airport and ATM area con

20. Programme of lectures

Week 1: Introduction to sustainable aviation
- Definition and importance of sustainability in aviation
- Environmental impacts of aviation (carbon dioxide emissions, noise pollution, etc.)

Week 2: Regulatory frameworks
- Regulatory and measurement bases, rules and regulations determining sustainability and environmental protection

Week 3-4: Basic environmental impacts
- The contribution of aviation to global CO_2 emissions
- The formation of greenhouse gases and contrails
- Definition and measurement of pollutant emissions
- Other environmental impacts

Weeks 5-6: Aviation Noise
- Basic Noise Sources
- Noise Measurement Methods
- Noise Reduction Methodologies

Week 7: Sustainable Propulsion Systems
- Types of SAF (Biofuels, Synthetic Fuels, Hydrogen)
- Fundamentals of Hydrogen and Electric Propulsion
- Battery-Electric Aircraft and Hybrid-Electric Propulsion
- Case Studies on SAF Implementation (Airlines and Manufacturers)

Week 8-9 Week 1: Airport and airline sustainability strategies and operational measures
- Green airport initiatives (energy-efficient infrastructure, sustainable operations)
- Carbon offset programs and net zero targets
- Case studies on sustainable airlines and airports

Week 10: Urban air mobility (UAM) and sustainable aviation
- eVTOLs and electric air taxis
- Integrating UAM into existing airspace
- Sustainable benefits and challenges of UAM

Week 11: Future trends
- New technologies and R&D in sustainable aviation
Weeks 12-14: Student case studies
- Student presentations on sustainability case studies

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows the topics of the subject. The student knows the relevant literature and knows where to find more detailed information for each field of study to complete his/her task.

b) skills (k)

1. is able to independently prepare documentation related to the areas covered by the subject matter
2. is able to recognize the changes that are relevant to the topics and are necessary in order to achieve the expected goal.
3. is able to think, plan, control, evaluate and make decisions in complex systems and processes, and to carefully consider the effects on the case under study and the impact of his/her activities on other systems.

c) attitude (a)

1. strives to complete his studies at the highest possible level, in the shortest possible time, by providing the maximum of his knowledge and abilities, acquiring in-depth knowledge capable of independent creation.
2. cooperates with the instructor and fellow students in expanding his knowledge.
3. expands his knowledge through continuous independent acquisition of knowledge, supplementing what has been taught in the course.

d) autonomy and responsibility (o)

1. completes the assignments independently.
2. feels responsible for setting an example to the peers with the quality of the work and adherence to ethical standards.
3. applies the knowledge acquired during the course responsibly, taking into account the limitations of its validity.
4. is open to well-founded critical comments and uses them constructively in the future.
5. accepts the framework of cooperation and is able to perform his/her work independently or as part of a team, depending on the situation.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. homework	1. HF	1. 100%	1. t1,k1-3,a1-3,o1-5

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

submission and presentation of task on time

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

Late completion of summative assessments is allowed for a second time in the late completion period upon payment of a special charge.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Lecture notes, materials and documentations in printed and/or electronic version given by the lecturer.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Synergy of Engineering and Business: The Disruptive Transformation of the Truck Industry as a case study 1.**				
2. Subject name in Hungarian	Synergy of Engineering and Business: The Disruptive Transformation of the Truck Industry as a case study 1.			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKKBsM8001-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	20 hours	**Homework**	27 hours
Reading written materials	15 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Mészáros Ferenc associate professor	**15. Email address**	meszaros.ferenc@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Jürgen Steinberger		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Technological developments in the truck industry have accelerated significantly in recent years, with a particular focus on automation and connected vehicle systems. Today, the automotive industry requires not only precise engineering knowledge, but also

20. Programme of lectures

The truck industry has been the steady, slow changing backbone of the logistic industry for decades. 70% of the goods shipped on land are transported by trucks. Technologies, market players and business models has changed and developed slowly, gradually, and evolutionary. With 20 times the weight and 5 times the lifetime of a passenger car, the requirements for the reliability and safety of a truck have defined industry standards, worldwide.

However, over the last 5 years the speed of change with respect to legal requirements, market consolidation, business models and technology changes has factually exploded. Emerging countries like India, Brazil and China have defined a sequence of legislative rules for new safety standards requiring ESP and new ADAS (Advanced Driver Assistance Systems). European legislation is focusing on emission reduction, functional safety requirements as well as cyber security standards. A former fragmented market with numerous small regional truck manufacturer is consolidating to a few global and regional players, driving purchasing power and technical standardization. At the same time, driver shortage and continuously increasing costs for trucks and infrastructure demand automated solutions. In consequence, new safety standards, Connectivity and Highly Automated Driving solutions as well as E-Mobility and emission reduction systems are going to be developed within the next 5 to 7 years, each region setting a different focus and timeline.

The challenges could not be greater. Due to the possibility of setting technical and business standards, time to market becomes crucial. Concurrently, the focus on talents has shifted from the classical mechanical expertise towards electrical, software and system engineering. To manage the challenges, new organizational and management approaches need to be implemented.

The highlighted topics to be discussed are the business, ecological and social factors, the legal framework conditions, as well as technical management, structural and organizational change needs. The lectures of the semester are organized into 4 blocks, each of which is 3 x 1:30 long, with 2 x 10-minute breaks between them. Another 2 x 1:30 sessions are reserved for the exam and one retake option.

21. Programme of practices

2x case studies to be elaborated as a teamwork:

(1) Analyse the disruption of HAD and E-mobilty for a European and a Chinese Truck manufacturer, define the counterstrategy and draw a worldwide picture of the truck industry in 10 years

(2) Feasibiliy Study

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. focuses on and explain the technology changes and challenges in detail, while giving the students the necessary background information to understand the legal, business and market drivers.

b) skills (k)

1. to complete the picture, gets acquainted with new organizational and technical management approaches to face the upcoming challenges.

c) attitude (a)

1. in addition to the technical competence, is able to understand and analyze problems based on business, market, and legal aspects, as they actually appear in real life.

d) autonomy and responsibility (o)

1. can make responsible decisions independently and prepare decision-making materials considering technical, business, market and legal aspects.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. Case study report (team work) 2. Case study report (team work)	1. CSR1 2. CSR2	1. 50% 2. 50%	1. t1,k1,a1,o1 2. t1,k1,a1,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

The midterm grade is primarily based on the student's activity and the submitted case study. Grading: Students must form teams of 5. Each team receives a maximum of 5 points per person to distribute among its members: 1-5 per person. The group members dec

27. Grading rules

Excellent 81-100%
Good 61-80%
Satisfactory 41-60%
Pass 40%
Fail 0-39%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The case study work can be retaken once.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Lecture notes

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Synergy of Engineering and Business: The Disruptive Transformation of the Truck Industry as a case study 2.**				
2. Subject name in Hungarian	Synergy of Engineering and Business: The Disruptive Transformation of the Truck Industry as a case study 2.			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKKBsM8002-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	20 hours	**Homework**	27 hours
Reading written materials	15 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Mészáros Ferenc associate professor	**15. Email address**	meszaros.ferenc@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Jürgen Steinberger		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Technological developments in the truck industry have accelerated significantly in recent years, with a particular focus on automation and connected vehicle systems. Today, the automotive industry requires not only precise engineering knowledge, but also

20. Programme of lectures

The truck industry has been the steady, slow changing backbone of the logistic industry for decades. 70% of the goods shipped on land are transported by trucks. However, over the last 5 years the speed of change with respect to legal requirements, market consolidation, business models and technology changes has factually exploded. The subject reviews – based on the legislative, business and market factors – the technical changes and challenges.

Main chapters of the lecture are:

- Worldwide standardization of active safety systems (braking-, steering- and ADAS systems).
- Business rational of ADAS systems, technical approach and industrial approach and strategic considerations consequently.
- Connectivity: areas and market model, interaction with HAD, ADAS and Chassis Control Systems.
- E-mobility: Market drivers and regional penetration scenarios, technology changes and consequences on the truck.
- Functional Safety: redundancy and diagnostic requirements for different ASIL levels, technical concepts / implementation examples: sensor / actuator checking; plausibility checks; cost-optimized redundancy solutions
- Cybersecurity: market needs and consequences, technical concepts.

The lectures of the semester are organized into 4 blocks, each of which is 3 x 1:30 long, with 2 x 10-minute breaks between them.

21. Programme of practices

2x case studies to be elaborated as a teamwork.

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. focuses on and explain the technology changes and challenges in detail, while giving the students the necessary background information to understand the legal, business and market drivers.

b) skills (k)

1. to complete the picture, gets acquainted with new organizational and technical management approaches to face the upcoming challenges.

c) attitude (a)

1. in addition to the technical competence, is able to understand and analyze problems based on business, market, and legal aspects, as they actually appear in real life.

d) autonomy and responsibility (o)

1. can make responsible decisions independently and prepare decision-making materials considering technical, business, market and legal aspects.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. Case study report (team work) 2. Case study report (team work)	1. CSR1 2. CSR2	1. 50% 2. 50%	1. t1,k1,a1,o1 2. t1,k1,a1,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

The midterm grade is primarily based on the student's activity and the submitted case study. Grading: Students must form teams of 5. Each team receives a maximum of 5 points per person to distribute among its members: 1-5 per person. The group members dec

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The case study work can be retaken once.

27. Grading rules

Excellent 81-100%
Good 61-80%
Satisfactory 41-60%
Pass 40%
Fail 0-39%

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Lecture notes

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**System techniqe and analysis**				
2. Subject name in Hungarian	Rendszertechnika és rendszeranalízis			**3. Programme**	MSc
4. Subject code	**BMEKOVJMsM8002-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	12 hours	**Homework**	0 hours
Reading written materials	22 hours	**Midterm preparation**	28 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Railway Vehicles and Vehicle System Analysis		
14. Subject coordinator and its position	Dr. Zábori Zoltán senior research fellow	**15. Email address**	zabori.zoltan@kjk.bme.hu
16. …organisational unit	Department of Railway Vehicles and Vehicle System Analysis		
17. Instructor(s)	Dr. Zábori Zoltán		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Learning the basic methods of vehicle and machine structure analysis, developing a systems approach

20. Programme of lectures

Systems-based vehicle and machine analysis. System characterisation using graph theory. Structural structure-hierarchy, element, element group, machine and machine system. Effect diagram, structure graph and signal flow diagram of complex systems. Ways of describing system relationships. Transfer properties, operators. Linear and nonlinear systems. Construction of action diagram of vehicle systems and analysis of system output. System equation generation by synthetic and analytical methods. Lagrange and Hamiltonian equations. General theory of linear systems. Investigation in the time domain and frequency domain for periodic, aperiodic and weakly stationary stochastic spreading, SIMO and MIMO systems. Analysis of coherence relations.

21. Programme of practices

Exercising of the theoretical material by the solving of the numerical examples.

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. Understands and applies the mathematical and scientific principles and procedures of system technique and system analysis.
2. Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of system technique and system analysis.
3. Knows and understands the basic facts, limits and development possibilities of system technique and system analysis.
4. Knows and is capable to understand in details the methods of modelling in system technique and system analysis.

b) skills (k)

1. Is able to recognize mechanical system problems, formulate the problem and select and apply the solution method.
2. Is able to solve simple systems analysis type problems numerically.

c) attitude (a)

1. Is interested in learning more about technical issues related to mechanical systems.
2. Is interested in new technical solutions in the field.

d) autonomy and responsibility (o)

1. Expresses independent opinions on issues related to the analysis of mechanical systems and the management of systems.
2. Takes responsibility for the adequacy of the procedures he applies.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. midterm test	1. ZH1 2. ZH2	1. 50% 2. 50%	1. t1-4,k1-2,a1-2,o1-2 2. t1-4,k1-2,a1-2,o1-2

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

The condition for obtaining at least a pass mid-term grade is: at least appropriate completion of each of the two midterm tests. The condition for qualifying as pass is the full fulfillment of the expected learning outcomes.

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 62-74%
Pass 50-61%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The midterm tests can be repair separately one by one during the study period and the late completion period.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Zobory I.: System technique and analysis (in Hungarian). Department notes, 2011., presentation slides

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Transport Infrastructure and Regional Development**				
2. Subject name in Hungarian	Transport Infrastructure and Regional Development			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKKBsM8003-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	15 hours	**Homework**	27 hours
Reading written materials	20 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Mészáros Ferenc associate professor	**15. Email address**	meszaros.ferenc@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Mészáros Ferenc		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

The course aims to develop theoretical and empirical background to understand the nature of transport infrastructure and its implication on regional economic development.

20. Programme of lectures

Trasnport infrastructure and developement are linked, although the link between them is not straightforward. The lectures explore and analyse this link. Regional development and its measurement is scrutinized as is the monetarisation of infrastructure charging and calculatiuon of costs. The course engages the disciplines of economics, regional planning, environmental science, geography, and sociology in investigating the externalities of transportation.

Definition of regional development. Indicators of sustainable regional development and green economics. Pricing transport use: charges, elasticites, time saving and road pricing. Describing relationship between transport improvements and economic activity. Traffic and transport infrastructure in condition of suppressed demand. Traffic demand management and reallocation of road space. Transport externalities: congesion on the road network, air pollution and greenhouse gas emission, noise annoyance, spatial inequalities and urban sprawl, social inequalities. Financing transport infrastructures. European policy on transport infrastructure and regional development.

21. Programme of practices

The practice aims to provide a practical and contemporary, but yet critical introduction to the subject. It involves studying real and contemporary examples.

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. knows the definitions and interrelations of transport infrastructure and regional developments, gets know the sustainability goals and indicators.

b) skills (k)

1. is able to identify and calculate/evaluate the wider impacts of transport infrastructure investments on the regional development.

c) attitude (a)

1. strives for completeness in the acquisition of knowledge, co-operates with the teacher and the other students, is open towards new and innovative ideas, researches and uses information technology and computing tools for its work.

d) autonomy and responsibility (o)

1. in addition to the narrow professional aspects, also takes into account social and economic aspects in the utilization of its knowledge, asks for the professional opinions of others, makes responsible decisions in the selection of the most efficient transport investments, and takes care of the challenges responsibly.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. Case study report (individual work)	1. CSR	1. 100%	1. t1,k1,a1,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Preparation, work out, and presentation of an individual case study report about a transportation development project, highlighting the regional economic, environmental, and social effects.

27. Grading rules

Excellent 81-100%
Good 61-80%
Satisfactory 41-60%
Pass 40%
Fail 0-39%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The case study work can be retaken once.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

1. Caralampo Focas (2006) Transport Infrastructure and Regional Development. Course material, BME Department of Transport Economics, Budapest
2. Eddy Van de Voorde, Thierry Vanelslander (2010) Applied Transport Economics, De Boeck
3. André de Palma , Robi

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Transport infrastructure management**				
2. Subject name in Hungarian	Közlekedési infrastruktúra menedzsment			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOKKMSK2C01-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	4 hours	**Homework**	12 hours
Reading written materials	34 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Transport Technology and Economics		
14. Subject coordinator and its position	Dr. Mészáros Ferenc associate professor	**15. Email address**	meszaros.ferenc@kjk.bme.hu
16. …organisational unit	Department of Transport Technology and Economics		
17. Instructor(s)	Dr. Mészáros Ferenc		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Introduction of rules and practice of transport infrastructure development and management.

20. Programme of lectures

Transport infrastructure and corridor policy of the EU and Hungary, network development strategies and transport policy. Infrastructure operation and maintenance strategies, adaptation to climate change. Types of operation contracts, risk management techniques.

21. Programme of practices

Techniques for asset valuation and registration of transport infrastructure. Asset management methods in practice. Risk assessment and management. Case studies related to transport infrastructure management.

22. Programme of laboratories

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. is familiar with the EU and Hungary's infrastructure and corridor policy (T2,T9)
2. understands the methods used to evaluate and manage infrastructure efficiently (T3,T8,T10)
3. identify the climate challenges of transport infrastructure (T2)

b) skills (k)

1. select and use effective tools for transport infrastructure management (K4,K10,K11)
2. analyse and evaluate the results and impacts of transport infrastructure management (K2,K3,K9)

c) attitude (a)

1. strives for completeness in the acquisition of knowledge, cooperates with the teacher and fellow students, is empathetic and tolerant towards members of his/her team (A9,A10)
2. is open to new and innovative ideas and research, is self-critical of the tasks assigned to him/her, and takes full responsibility for sustainability (A1,A2,A6)

d) autonomy and responsibility (o)

1. in addition to narrow professional criteria, ensures sustainability in the use of his/her knowledge, is able to self-monitor and correct errors independently, while taking into account the professional opinion of others (O3,O4)
2. makes responsible decisions in the field of transport infrastructure management in response to open questions and formulates independent proposals to solve identified challenges (O2)

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. risk assessment task	1. ZH 2. F	1. 85% 2. 15%	1. t1, t2, t3, k1,k2,o2 2. k2,a1,a2,o1

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

submission and presentation of task on time and successful (min. 50%) completion of the midterm test

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 63-74%
Pass 50-62%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

second retake or delayed completion is only from one midterm requirement

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

presentation slides

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Vehice operation, reliability, and diagnositcs**				
2. Subject name in Hungarian	Járműüzem, megbízhatóság és diagnosztika			**3. Programme**	MSc
4. Subject code	**BMEKOVJMsM8001-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**2 lecture**	**0 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	12 hours	**Homework**	0 hours
Reading written materials	22 hours	**Midterm preparation**	28 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Railway Vehicles and Vehicle System Analysis		
14. Subject coordinator and its position	Dr. Tulipánt Gergely associate professor	**15. Email address**	tulipant.gergely@kjk.bme.hu
16. …organisational unit	Department of Railway Vehicles and Vehicle System Analysis		
17. Instructor(s)	Dr. Zábori Zoltán, Németh István		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Studying the timeline of vehicle operation, the technical environment of maintenance, energy, materials and information, the probability calculation basics of vehicle reliability theory, as well as getting to know the practical methods of vehicle reliabil

20. Programme of lectures

Chronology, maintenance-, energetic-, mass- and info technical environment of the vehicle operation. Basics of probability analysis of vehicle reliability. Practical methods to analysing the vehicle reliability: block-diagram and fault-tree analysis. Solving of the design and operation problems using the methods of the reliability-theory. Data collection and information systems which are the basis of the vehicle reliability analysis. Specialities of the up-to-date RCM systems. Analysis of the vehicle servicing systems by semi-Markovian approach, negotiation of the questions of the mass service and storage sytems. Basis of the vehicle system diagnostic: the observation, the measurement, the automatic diagnostic evaluation, the statement of the operability. Using the databases based on system technical simulation to authorise the operation of the vehicles which are have suitable for transportation-safety criterions technical conditions. Exploring of the weaknesses by using diagnostic test.

21. Programme of practices

-

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. Understands and applies mathematical and scientific principles and procedures related to vehicle operation and reliability.
2. Understands and widely applies theories and terminologies developed in the field of vehicle operation, reliability and diagnostics.
3. Knows and understands the basic facts, limits and development opportunities of vehicle operation, reliability and diagnostics.
4. Knows and understands the transport, logistics, environmental, work and fire protection aspects related to vehicle operation.
5. Knows and understands the information and communication technology related to vehicle operation, reliability and diagnostics.
6. Knows and understands the methods of computer modeling and simulation related to vehicle operation, reliability and diagnostics.

b) skills (k)

1. Is able to apply the mathematical and natural science principles and procedures learned in an innovative way in solving problems related to vehicle operation, reliability and diagnostics.
2. Is able to analyze and evaluate methods applied in the field of vehicle operation, reliability and diagnostics.
3. Is able to apply integrated knowledge in the field of vehicle operation, reliability and diagnostics.

c) attitude (a)

1. Open and receptive to learning about and communicating development and innovation in the given field.

2. Has a deepened professional sense.
3. Assumes the professional and ethical values related to the technical field.
4. Strives to approach processes in a complex way based on a systems approach.

d) autonomy and responsibility (o)

1. Takes initiative in his/her professional work, independently selects and applies solution methods.
2. Makes decisions carefully and with responsibility.
3. In its decisions, takes into account environmental, safety, economic and engineering ethics regulations

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. midterm test	1. ZH1 2. ZH2	1. 50% 2. 50%	1. t1-6,k1-3,a1-4,o1-3 2. t1-6,k1-3,a1-4,o1-3

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

The condition for obtaining at least a pass mid-term grade is: at least appropriate completion of each of the two midterm tests. The condition for qualifying as pass is the full fulfillment of the expected learning outcomes.

27. Grading rules

Excellent 88-100%
Good 75-87%
Satisfactory 62-74%
Pass 50-61%
Fail 0-49%

28. Attendance and participation requirements

according to the rules of CoS

29. Retake and delayed completion

The midterm tests can be repair separately one by one during the study period and the late completion period.

30. Consultation

at a time and in a form agreed with the teacher

31. Learning materials

Zobory I.: Vehicle operation, reliability, and diagnostics (in Hungarian). University notes, Budapest, 2010.

32. Start of validity for the subject decription

September 1st, 2025

BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Faculty of Transportation Engineering and Vehicle Engineering

Subject description

1. Subject name	**Vehicle maintenance**				
2. Subject name in Hungarian	Járműfenntartás			**3. Programme**	BSc_MSc
4. Subject code	**BMEKOGJBsM8009-00**		**5. Restrictions**	**-**	
6. Credits	**3**	**7. Evaluation type**	**m**	**8. Nature**	**contact lessons**
9. Weekly contact hours	**1 lecture**	**1 practice**	**0 laboratory**	**10. Language**	**HU EN**
11. SDG Learning outcomes' contribution to the EU/UN sustainable development goals					
12. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for lessons**	7 hours	**Homework**	0 hours
Reading written materials	25 hours	**Midterm preparation**	30 hours	**Exam preparation**	0 hours

13. Organisational unit in charge	Department of Automotive Technologies		
14. Subject coordinator and its position	Dr. Bán Krisztián associate professor	**15. Email address**	ban.krisztian@kjk.bme.hu
16. …organisational unit	Department of Automotive Technologies		
17. Instructor(s)	Dr. Bán Krisztián, Dr. Pál Zoltán, Dr. Markovits Tamás, Dr. Hlinka József, Dr. Dömötör Ferenc, Dr. Varga Ferenc László		

18. Indicative prerequisites	- - -, - - -, - - -

19. Purpose

Providing additional, application-oriented knowledge in the field of vehicle maintenance technologies, systems and diagnostic methods, in addition to the content of the basic courses.

20. Programme of lectures

During the lectures, we present modern technologies and methods of vehicle maintenance through practical examples and case studies. This complements the knowledge of the basic course with several practical application examples. The topics of the lectures may be modified in accordance with the latest trends, but they cover the following topics: post-production, renovation and repair technologies of typical vehicle parts, vehicle maintenance systems, modern diagnostic methods, and specific technologies of modern drives.

21. Programme of practices

Presentation and analysis of case studies in the field of vehicle maintenance and repair in classrooms and external sites of a transport service provider.

22. Programme of laboratories

-

23. Learning outcomes (lower case) and their link to the traning programme's learning outcomes (upper case)

The student

a) knowledge (t)

1. Knows the technologies for the after-production, renewal and repair of the most important vehicle components.
2. Knows the maintenance systems and their characteristics.
3. Knows the most important diagnostic methods.

b) skills (k)

1. Is able to suggest a technology for the after-production, renewal or repair of common vehicle parts.
2. Is able to suggest a method for fault detection and diagnosis in the event of a fault phenomenon or condition assessment.
3. Is able to suggest a maintenance strategy for a vehicle operating system.

c) attitude (a)

1. Strives to expand and deepen their knowledge.
2. Accepts and considers professional ethics principles binding on itself.
3. Is open and willing to cooperate.

d) autonomy and responsibility (o)

1. Feels responsible for performing the work with the best results while adhering to ethical standards.
2. Is responsible for supervising the operation of the system entrusted to him/her.

3. Applies the professional knowledge within the given validity limits.
4. Knows its authority and performs the work independently within this, but always in cooperation with the colleagues and managers.

24. Midterm assessments

Name	Code	Share in final grade	Evaluated learning outcomes
1. midterm test 2. midterm test	1. ZH1 2. ZH2	1. 50% 2. 50%	1. t1-t3,k1-k3,a1-3,o1-4 2. t1-t3,k1-k3,a1-3,o1-4

25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

26. Criteria to obtain a signature / midterm grade

Passing the midterm tests

27. Grading rules

0-<50%: fail (1),
50-<62%: pass (2),
62-<75%: satisfactory (3),
75-<87%: good (4),
87-100%: excellent (5).

28. Attendance and participation requirements

According to TVSZ

29. Retake and delayed completion

The midterm tests can be retaken twice.

30. Consultation

On request, at a separately agreed time.

31. Learning materials

Course bulletins available in moodle.

32. Start of validity for the subject decription

September 1st, 2025