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

Transportation Engineering Master Programme

Major compulsory elective subjects

List and subject descriptions

Valid from September 2025

Major compulsory elective subjects

Subject name	Subject code	Language
Accident and malicious intervention analysis in the automotive industry	BMEKOGJBsM8008-00	HU EN
Intelligent logistics applications	BMEKOALMsM8002-00	HU EN
Vehicle maintenance	BMEKOGJBsM8009-00	HU EN
Vehice operation, reliability, and diagnositcs	BMEKOVJMsM8001-00	HU EN
Air Traffic Control	BMEKORHBsM8007-00	HU EN
System techniqe and analysis	BMEKOVJMsM8002-00	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

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. Term / role	the term and the role (szk – major compulsory elective) of subject in the recommended curriculum
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**	jKL
4. Subject code	**BMEKOGJBsM8008-00**			**5. Term | role**	**- | szk**
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	**Intelligent logistics applications**				
2. Subject name in Hungarian	Intelligens logisztikai alkalmazások			**3. Programme**	JK
4. Subject code	**BMEKOALMsM8002-00**			**5. Term | role**	**- | szk**
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 of modern neural network and fuzzy logic-based systems. The course also deals with machine vision: the extraction of high-level image descriptors from lower-level image features. It also deals with the logistical applicability of mobile robots.

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	**Vehicle maintenance**				
2. Subject name in Hungarian	Járműfenntartás			**3. Programme**	KL
4. Subject code	**BMEKOGJBsM8009-00**			**5. Term | role**	**- | szk**
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

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**	AJKL
4. Subject code	**BMEKOVJMsM8001-00**			**5. Term | role**	**- | szk**
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 reliability analysis, as well as block diagram and fault tree analysis, and solving design and operation problems with reliability theory methods.

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	**Air Traffic Control**				
2. Subject name in Hungarian	Légiforgalmi irányítás			**3. Programme**	jkKL
4. Subject code	**BMEKORHBsM8007-00**			**5. Term | role**	**- | szk**
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

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

Retake exam possible according to the general rules of BME.

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	**System techniqe and analysis**				
2. Subject name in Hungarian	Rendszertechnika és rendszeranalízis			**3. Programme**	AJKL
4. Subject code	**BMEKOVJMsM8002-00**			**5. Term | role**	**- | szk**
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	**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**	K
4. Subject code	**BMEKOKKBsM8001-00**			**5. Term | role**	**- | szk**
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 complex organisational, business and management skills with a market perspective. This course covers the legislative, business, and market factors.

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**	K
4. Subject code	**BMEKOKKBsM8002-00**			**5. Term | role**	**- | szk**
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
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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 complex organisational, business and management skills with a market perspective. This course covers the technological changes and challenges.

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.

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25. Exams

Name	Code	Share in final grade	Evaluated learning outcomes

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32. Start of validity for the subject decription

September 1st, 2025