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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Aerodinamics** | | | | |
| **2. … in Hungarian** | Aerodinamika | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 20 hours |
| **Reading written materials** | 30 hours | **Midterm test preparation** | 18 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Jankovics István | **15. Email address** | jankovics.istvan@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Archtecture | | |
| **17. Lecturers** | Jankovics István | | |
| **18. Indicative prerequisites** | Fluid dynamics, thermodynamics and heat transfer 1. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The course aims to provide students with a comprehensive overview of aircraft aerodynamics. It introduces the fundamentals of lift generation and the methods of its control across low-speed, subsonic, transonic, and supersonic flight regimes. The course also explores various approaches to describing aerodynamic characteristics and reviews the unique aerodynamic properties of special-purpose aerial vehicles.

**20. Thematics of lectures**

Physics of the Atmosphere. Standard Atmosphere. Basics of fluid dynamics, potential flow, standard flows. Theory of boundary layer, laminar and turbulent boundary layers, flow separatation. Aerodynamics force, lift, drag and aerodynamic moment. Theory of airfoils. Theory of finite wings. Gas dynamics, shockwaves. Characteristics of subsonic, transonic and supersonic flight. Aerodynamics characterisation of aircraft, polar corve. Lift and drag augmentation. Aerodynamic characterisitics of non-conventional aircraft.

**21. Thematics of practices**

Solving and practicing numerical examples

**22. Thematics of laboratories**

Demonstrate measuring and calculating aerodynamic forces and moments, flow visualistaion methods.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the aerodinamics theories described in lectures.

**b) skills (k)**

1. is able to use the aerodinamics measurement and calculation knowledge described in details at Description of lectures.
2. is able to communicate his thoughts about aerodinamics, ideas clearly through sketches, and exercises.

**c) attitude (a)**

1. aims to create exact, aesthetic and obvious documentation.
2. is interested, responsive, independent, take care for the deadlines.

**d) autonomy and responsibility (o)**

1. able to create technical documentation independently.
2. aware of the significance of his work and the consequences of mistakes.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 85% | 1. t1,k1,k2,a1,a2,o1,o2 |
| 2. independent calculation task | 1. HF | 2. 15% | 2. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

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

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one midterm requirement.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Aircraft design and manufacturing** | | | | |
| **2. … in Hungarian** | Repülőgépek tervezési lépései és gyártása | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **7 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 15 hours | **Homework** | 0 hours |
| **Reading written materials** | 17 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Veress Árpád, Dr. Rohács József, Jankovics István | | |
| **18. Indicative prerequisites** | Flight mechanics and aero structures (suggested),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Basic aircraft design steps and aircraft production

**20. Thematics of lectures**

The design process; the steps in the aircraft design process: requirements, concept design, preliminary design, detailed design, production and testing. Fundamentals of aeronautical device manufacturing; introduction to main structural materials, manufacturing principles and processes, metallic materials, composite materials and manufacturing processes. Metallic fasteners, composite structure repair, composite structures and bonding methods, emerging additive machining technologies (e.g. 3D printing). Basic measurement and inspection methods.

**21. Thematics of practices**

Learn practical methods for aircraft manufacturing.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the aircraft design and manufacturing technologies, processes, and requirements

**b) skills (k)**

1. is able to reproduce, adapt and interpret the technologies in aircraft design and manufacturing in a meaningful way
2. is able to communicate the ideas and plans about aircraft technologies clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,k1,k2,a1,a2,o1,o2<br>2. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm tests

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one midterm requirement.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Aircraft maintenance and documentation** | | | | |
| **2. … in Hungarian** | Repülőgépek karbantartása és dokumentációi | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 15 hours | **Homework** | 0 hours |
| **Reading written materials** | 13 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Pásztor Zoltán, Kanti Dominik Máté, Maresch Norbert | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Collecting basic knowledge of aircraft maintenance specifications
Collecting basic knowledge of aircraft maintenance documentation
( Manufacturer, CAMO, Operator, MRO, Authotity issued documents )

**20. Thematics of lectures**

Intro – Maintenence Documents. Maintenence/Repair Docs ( Costumized, Non Costumized, Ad-Hoc ). Component Documents. Authority released documents. TC Holder ( Aircraft Designer ) released documents. Aircraft/Component Identification. Aircraft ( Manufacturer ) Service Documents. STC Holder released documents. Maintenence Tasks. CAMO released documents. Operator ( Ops, Maint ) released documents. MRO ( ACE ) released documents.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

Physical meet with some of the basic documentation learned in the lectures, and mastering their handling at a skill level

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the aircraft maintenance and documentation technologies, processes, and requirements

**b) skills (k)**

1. can find the way around different documents, interprets the validity of a given document, can identify different documents and concepts based on the abbreviations used in lectures.

**c) attitude (a)**

1. consider the specific maintenance requirements, needs and limitations of the aircraft being maintained.

**d) autonomy and responsibility (o)**

1. independently verify the unique identifiers of the aircraft/equipment/component concerned, and consequently determine the required applicable documentation.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,k1,a1,o1<br>2. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| successful (min. 50%) completion of the midterm tests | Excellent 88-100%<br>Good 75-87%<br>Satisfactory 63-74%<br>Pass 50-62%<br>Fail 0-49% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| Second retake from both midterm tests. | |

| 30. Consultation opportunities |
|---|
| at a time and in a form agreed with the teacher |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Aircraft systems and avionics** | | | | |
| **2. … in Hungarian** | Repülőgépek rendszerei és avionika | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **9** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **3 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **270 hours** |
| **Contact hours** | 98 hours | **Preparation for seminars** | 20 hours | **Homework** | 30 hours |
| **Reading written materials** | 62 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Rohács Dániel | **15. Email address** | rohacs.daniel@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Rohács József, Dr. Óvári Gyula, Rácz János, Hámori György | | |
| **18. Indicative prerequisites** | Flight mechanics and aero structures (suggested),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Gaining basic knowledge on the major aircraft systems and avionics.

To know the function of aircraft systems, the technical basis of their operation, their modern technological implementation, known development perspectives, the advantages of their use, their possible limitations, and the related terminology.

**20. Thematics of lectures**

Aircraft on-board systems: steering control, energy (fuel, hydraulic, pneumatic, electric), passenger and cargo transport, passenger comfort and rescue, flight safety (tempering and air conditioning, fire-fighting, de-icing, emergency), primary and navigation instruments (conventional and electronic ), autopilot, altimeter, radar, proximity indicator, flight monitoring systems. Related sensors and controllers and ground server systems.

On-board electrical and avionics systems of aircraft: electrical energy systems (generation, regulation, distribution, short circuit protection, conversion (frequency, voltage), conversion (into mechanical work, heat, cooling, lighting) primary and navigation instruments (conventional and electronic), automatic flight control, radio altimeter, radar, ground proximity warning, flight surveillance, collision avoidance, flight management, data recording systems.

**21. Thematics of practices**

Solving and practicing numerical examples necessary for the acquisition of the theoretical part of the curriculum.

During the practical excercises, students gain insight into the technical implementation of electrical and avionics systems in modern passenger aircraft.

**22. Thematics of laboratories**

Getting to know the mechanical and avionic systems of aircraft (on-board and ground) in practice.

Via video or 3D simulation students are gaining live impression about operation and use of electrical and avionic systems

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the aircraft systems and avionics technologies, processes, and requirements

**b) skills (k)**

1. is able to reproduce, adapt and interpret the technologies aircraft systems and avionics in a meaningful way
2. is able to communicate the ideas and plans about avionics clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. independent calculation task | 1. ZH<br>1. HF | 1. 40%<br>2. 20% | 1. t1,k1,k2,a1,a2,o1,o2<br>2. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 40% | 1. t1,k1,k2,a1,a2,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

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

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake or delayed completion is only from one midterm requirement.

**27. Final grade in percentage of performance**

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

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Artificial intelligence** | | | | |
| **2. … in Hungarian** | Mesterséges intelligencia | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 20 hours | **Homework** | 0 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 22 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Bécsi Tamás | **15. Email address** | becsi.tamas@kjk.bme.hu |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | |
| **17. Lecturers** | Dr. Bécsi Tamás | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to familiarize students with the basic principles, technological background and application possibilities of artificial intelligence. Special attention is paid to the ethical dimension of the use of AI, including issues of data protection, responsibility and social impacts. Students analyze and interpret the practical role, benefits and dilemmas of AI through real or realistic case studies.

**20. Thematics of lectures**

The lecture provides an introduction to the history, concepts, basic operating mechanisms of AI, and the basic principles of machine learning. The course material covers various structures of artificial intelligence: rule-based systems, decision trees, classical machine learning models, and then provides a deeper insight into modern deep learning architectures. Students will become familiar with, among others, convolutional neural networks; generative adversarial networks, etc. The comparison of different learning methods – supervised, unsupervised, and reinforcement – is also emphasized. A prominent topic is the presentation of the operation, teaching, and practical application of large language models (LLMs). Students will learn how these models work, what they are capable of, what risks they may pose, and how they can be used consciously in different fields.

The course also addresses the ethical and social aspects of AI: transparency, accountability, data protection, algorithmic biases, and the sustainable and equitable use of artificial intelligence. At the end of the course, students will analyze AI solutions from industry, education, healthcare, and the public sector through real or simulated case studies.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

The aim of the lab activities associated with the course is to give students hands-on experience in developing artificial intelligence-based models. The tasks are carried out in an AI-assisted way, where AI is used as a tool to support model building, coding and debugging. During the exercises, students will be introduced to different learning methods and AI application domains, fostering the development of reflective, problem-solving thinking.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the basic concepts of machine learning, the functioning of the "Internet of Things" (IoT), and the role of computer communication and application software in AI systems. (K:T17;J:T17,T21;L:T21)

2. Is aware of the basic principles of the operation of artificial intelligence and its ethical and data protection aspects. (K:T16;L:T20)

**b) skills (k)**

1. Is able to process structured data, use and design artificial intelligence applications, and effectively search, evaluate and manage digital content. (K:K4,K28,K29,K30,K31;J:K4,K36,K37,K38;L:K4,K31,K32,K33)

2. Is able to communicate, collaborate and interact effectively using digital technologies. (K:K12,K31;J:K12,K39;L:K12,K34)

3. Able to design, operate and test IT systems based on models. (K:K11,K34;J:K11,K42;L:K11,K37)

**c) attitude (a)**

1. Accepts the professional and ethical responsibility associated with the use of artificial intelligence and actively represents the values of digital rights and democracy. (J,K,L:A1,A2)

2. Continuously develops his/her AI-related knowledge with a reflective, self-critical attitude, is open to changes and technological self-education. (J,K,L:A3,A12)

3. Has a positive attitude towards complex problems related to artificial intelligence, strives for effective, responsible solutions and considers possible alternatives. (J,K,L:A4,A6,A10,A13)

**d) autonomy and responsibility (o)**

1. Able to take initiative and make decisions independently, from internal motivation, in the design, evaluation or application of artificial intelligence. (J,K,L:O1,O2,O4)

2. Has a critical and responsible attitude towards information related to AI, formulates his/her judgments in a well-founded and autonomous manner. (J,K,L:O5,O6)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test 1<br>2. midterm test 2 | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,t2,k2,a3,o1,o2<br>2. t1,t2,k1,k3,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

To obtain the semester grade, the combined average of Midterm 1 and Midterm 2 must reach at least 50%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Only one of the mid-semester requirements can be made up through repeated replacement.

**27. Final grade in percentage of performance**

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

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Automotive assembly technology** | | | | |
| **2. … in Hungarian** | Járműipari szereléstechnológia | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **7 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 0 hours | **Homework** | 20 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 22 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Varga Ferenc László | **15. Email address** | varga.ferenc.laszlo@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Bán Krisztián, Dr. Hlinka József, Dr. Vehovszky Balázs, Dr. Herczeg Szabolcs, Dr. Markovits Tamás, Dr. Göndöcs Balázs,Dr. Pál Zoltán, Szabados Gergely | | |
| **18. Indicative prerequisites** | Vehicle manufacturing processes 2. (strong),<br>Quality improvement methods in the automotive industry (suggested),<br>- - - | | |

**19. Aim of the subject**

The objective of the course is to provide students with adequate basic knowledge of assembly processes in the automotive industry. This knowledge should offer a sufficient basis for their further studies and engineering work.

**20. Thematics of lectures**

Construction requirements in assembling of conventional, hybrid and electric vehicles. Assembling by accumulative dimensions. Groups of operations and processes in assembling. Process plan and documentation of assembling. Processes and types of equipment of screwed joints, riveting, joining with plastic deformation. Properties and equipment of parts connections applied in the automotive industry. Assembling of shaft-hub-connections. Requirements and equipment of bearing assembling. Operations and equipment of handling technology. Types of equipment of mechanization and automatization in assembling. Structure and operation of assembly units. Common model, types, constructions, operation and control of assembly systems. Assembly systems of the automotive industry. Simulation of assembly processes. Logistic processes and types of equipment for assembly lines. The essence of the supply activity, its quality requirements and the conditions of becoming a supplier.

**21. Thematics of practices**

Construction analysis from the point of view of assembly, riveting, automatic arrangement planning, bearing assembly, process simulation, documentation of assembly technology.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Is familiar with fundamental assembly tools in the automotive industry.

**b) skills (k)**

1. By applying the knowledge about assembly tools and related professional expertise, is capable of contributing to solving tasks in automotive assembly technology systems.

**c) attitude (a)**

1. Cooperates with instructors in their studies to develop knowledge of manufacturing systems.

**d) autonomy and responsibility (o)**

1. Is aware of the responsibility to set an example to your colleagues by the quality of your work and by adhering to ethical standards, applying the knowledge acquired in the subject with responsibility.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. Midterm test<br>2. Midterm test<br>3. Planning task | 1. ZH1<br>2. ZH2<br>3. TF1 | 1. 25%<br>2. 25%<br>3. 50% | 1. t1,k1,a1,o1<br>2. t1,k1,a1,o1<br>3. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Passing both midterm test, and approval of the planning task

**27. Final grade in percentage of performance**

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. Late completion opportunities**

One midterm test can be retaken twice, planning task can be supplemented during the delayed completion week.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Automotive drivelines and vehicle subsystems** | | | | |
| **2. … in Hungarian** | Erőátvitel és jármű rendszerelemek | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **6** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **3 lecture** | **1 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 16 hours | **Homework** | 30 hours |
| **Reading written materials** | 30 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Harth Péter | **15. Email address** | harth.peter@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Virt Márton, Dr. Harth Péter, Dr. Szabó Bálint, Dr. Lelkes Márk | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to provide an in-depth understanding of vehicle power transmission systems, brake systems, steering systems and automotive suspensions.

**20. Thematics of lectures**

Basic vehicle dynamics calculations. Clutches. Conventional gearbox designs. Automated power transmission systems. Planetary gears. Hydromechanical power transmission systems. Continuously variable transmissions. Differential gears. All wheel drives. Drivetrain joints. Hybrid and electric power transmission systems. Brake dynamics, brake force distribution. Automotive suspension system, characteristics and kinematics. Spring and damping systems. Steering mechanism

**21. Thematics of practices**

Engineering Calculations, dynamical simulations

**22. Thematics of laboratories**

Disassembly and assembly of power transmission devices. Introduction of automotive suspensions, measurement of steering system

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the power transmission systems.
2. knows the brake systems, brake distribution.
3. knows the automotive suspension systems, characteristics, kinematics.
3. knows the steering systems.

**b) skills (k)**

1. qualifies the power transmission system as a complex vehicle unit, perform calculations, select technologies
2. selects brake system parameters, determine brake force distribution.
3. analyses automotive suspensions, characteritics and kinematics.

**c) attitude (a)**

1. seeks to find the relationships between the different subject areas.
2. strives to interpret the content (lectures, statements, diagrams) of the lectures and exercises independently, and is open to thinking with the lecturer and other students.
3. strives for active participation in lectures and exercises.

**d) autonomy and responsibility (o)**

1. accepts the framework for the completion of the subject matter and carries out its tasks independently and responsibly within the framework of ethical standards.

2. responsibly applies the knowledge gained in the subject subject to its limitations.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Drivelines midterm test | 1. ZH1 | 1. 25% | 1. t1,k1,a1,o1,o2 |
| 2. Drivelines homework | 2. HF1 | 2. 25% | 2. t1,k1,a2,a3,o1,o2 |
| 3. Brake force distribution homework | 3. HF2 | 3. 15% | 3. t2,k2,a2,a3,o1,o2 |
| 4. Suspension analysis homework | 4. HF3 | 4. 15% | 4. t3,k3,a2,a3,o1,o2 |
| 5. Suspension and brake system midterm test | 5. ZH2 | 5. 20% | 5. t2,t4,k2,a1,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

The midterm test is passed if more than 50% of the maximum score is achieved. Attendance at labs during the semester is mandatory and submission of the homework at an acceptable level is required. A successful midterm test, completion of all labs and submission of homeworks with an acceptable grade is required to receive a passing grade.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

One midterm test can be retaken twice, homeworks can be supplemented during the delayed completion week.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Automotive electronics** | | | | |
| **2. … in Hungarian** | Gépjármű elektronika | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 30 hours | **Midterm test preparation** | 38 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Szalay Zsolt | **15. Email address** | szalay.zsolt@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Tollner Dávid, Dr. Pethő Zsombor | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to provide a comprehensive overview of automotive electronics, presenting the theoretical and practical aspects. In addition to acquiring general knowledge, students can start preparing for a possible future job as an automotive research and development engineer.

**20. Thematics of lectures**

The lectures cover the basic operation and structure of automotive electronics systems. After introducing the basics of electronics, the electrical network of vehicles is covered in detail, including power systems and grounding principles. Sensors and their applications in modern vehicles are covered. The role, design and communication of electronic control units (ECUs) using CAN, LIN and other communication systems are discussed. In the power electronics section, the electronics systems for engine control and electric drives are discussed. Finally, the possibilities of diagnostics and data acquisition, which are essential for fault detection and monitoring of vehicle status, are highlighted.

**21. Thematics of practices**

The objective is to give students hands-on experience in the basics of automotive electronics. During basic electronics measurements, students will learn about voltage, current and resistance measurements, as well as basic circuit calculations. In diagnostic exercises, they will perform fault code reading and vehicle status analysis using OBD and UDS protocols. They gain insight into the operation of vehicle communication networks by reading and interpreting CAN bus data. Finally, students will be introduced to high-voltage batteries and learn about the power supply systems of electric vehicles.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basics of vehicle electronics, including electrical networks, sensors, control units (ECUs), communication protocols (CAN, LIN) and power electronics.

2. learns the basic methods of diagnostics, data acquisition and troubleshooting required to understand and improve automotive systems.

**b) skills (k)**

1. is able to see the vehicle as a complex electronic system, to perform calculations, to select technologies.

**c) attitude (a)**

1. seeks to find the relationships between the different subject areas.

2. strives to interpret the content (lectures, statements, diagrams) of the lectures and exercises independently, and is open to thinking with the lecturer and other students.

3. strives for active participation in lectures and exercises.

**d) autonomy and responsibility (o)**

1. accepts the framework for the completion of the subject matter and carries out its tasks independently and responsibly within the framework of ethical standards.

2. responsibly applies the knowledge gained in the subject subject to its limitations.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 100% | 1. t1,t2,k1,a1,a2,a3,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Passing the midterm test with at least a pass grade.

**27. Final grade in percentage of performance**

Excellent: 81-100%; Good: 71-80%; Satisfactory: 61-70%; Pass: 50-60%; Fail: 0-49%

**28. Attendance and participation requirements**

According to TVSZ

**29. Late completion opportunities**

The midterm test can be retaken once.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Automotive engines 1.** | | | | |
| **2. … in Hungarian** | Gépjármű motorok 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **7** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **210 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 16 hours | **Homework** | 20 hours |
| **Reading written materials** | 30 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 30 hours |
| **13. Organisational unit in charge** | Department of Automotive Technologies | | | | |
| **14. Subject coordinator** | Dr. Nyerges Ádám | **15. Email address** | nyerges.adam@kjk.bme.hu | | |
| **16. …department** | Department of Vehicle Technologies | | | | |
| **17. Lecturers** | Dr. Nyerges Ádám, Dr. Szabados György, Dr. Harth Péter | | | | |
| **18. Indicative prerequisites** | Fluid dynamics, thermodynamics and heat transfer 1. (strong),<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

The aim of the course is to provide an in-depth understanding of vehicle's internal combustion engines.

**20. Thematics of lectures**

Internal combustion engine's cycles, construction, fuel systems, combustion processes, fuels, emission, charge exhage systems.

**21. Thematics of practices**

Design of internal combustion engines, emission calculation.

**22. Thematics of laboratories**

Engine assembly, engine dyno measurements with Otto and Diesel engines.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the internal combustion engines on system-level.

**b) skills (k)**

1. is able to understand the causalities in internal combustion engines.
2. is able to perform preliminary design calculations.

**c) attitude (a)**

1. seeks to find the relationships between the different subject areas.
2. strives to interpret the content (lectures, statements, diagrams) of the lectures and exercises independently, and is open to thinking with the lecturer and other students.
3. strives for active participation in lectures and exercises.

**d) autonomy and responsibility (o)**

1. accepts the framework for the completion of the subject matter and carries out its tasks independently and responsibly within the framework of ethical standards.
2. responsibly applies the knowledge gained in the subject subject to its limitations.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. mindterm exam<br>2. homework 1<br>3. homework 2 | 1. ZH<br>2. HF1<br>3. HF2 | 1. 25%<br>2. 12,5%<br>3. 12,5% | 1. t1,k1,k2,a1,o1,o2<br>2. t1,k1,k2,a2,a3,o1,o2<br>3. t1,k1,k2,a2,a3,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Written exam | 1. Vizsg1 | 1. 50% | 1. t1,k1,k2 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| Passing the midterm test with at least a pass grade, accepted homeworks. | Excellent: 81-100%; Good: 71-80%; Satisfactory: 61-70%; Pass: 50-60%; Fail: 0-49% |
| **28. Attendance and participation requirements** | |
| According to TVSZ | |
| **29. Late completion opportunities** | |
| The midter test can be retaken twice, homeworks can be supplemented during the delayed completion week. | |

| 30. Consultation opportunities |
|---|
| Every lecture |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Automotive engines 2.** | | | | |
| **2. … in Hungarian** | Gépjármű motorok 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 12 hours | **Homework** | 0 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 20 hours |
| **13. Organisational unit in charge** | Department of Automotive Technologies | | | | |
| **14. Subject coordinator** | Dr. Nyerges Ádám | **15. Email address** | nyerges.adam@kjk.bme.hu | | |
| **16. …department** | Department of Vehicle Technologies | | | | |
| **17. Lecturers** | Dr. Nyerges Ádám, Dr. Szabados György | | | | |
| **18. Indicative prerequisites** | Automotive engines 1. (strong),<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

The aim of the course is to provide an in-depth understanding of vehicle's electric and other alternative powertrains.

**20. Thematics of lectures**

Electric drivetrain's construction, rotating electric machines' construction, cooling, modelling, controlling. Power electronics' operation, cooling. Hybrid and fuel cell powertrains. Alternative fuels.

**21. Thematics of practices**

Design and simulation of rotating electric motors.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the alternative drivetrain systems on system-level

**b) skills (k)**

1. is able to understand the causalities in alternative drivetrains.
2. is able to perform preliminary design calculations.

**c) attitude (a)**

1. seeks to find the relationships between the different subject areas.
2. strives to interpret the content (lectures, statements, diagrams) of the lectures and exercises independently, and is open to thinking with the lecturer and other students.
3. strives for active participation in lectures and exercises.

**d) autonomy and responsibility (o)**

1. accepts the framework for the completion of the subject matter and carries out its tasks independently and responsibly within the framework of ethical standards.
2. responsibly applies the knowledge gained in the subject subject to its limitations.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 50% | 1. t1,k1,k2,a1,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Oral exam | 1. Vizsg1 | 1. 50% | 1. t1,k1,k2,a2,a3,o1,o2 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| Passing the midterm test with at least a pass grade, accepted homeworks. | Excellent: 81-100%; Good: 71-80%; Satisfactory: 61-70%; Pass: 50-60%; Fail: 0-49% |
| **28. Attendance and participation requirements** | |
| According to TVSZ | |
| **29. Late completion opportunities** | |
| The midter test can be retaken twice. | |

| 30. Consultation opportunities |
|---|
| Every lecture |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Automotive structure and design** | | | | |
| **2. … in Hungarian** | Gépjármű szerkezettan | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 38 hours | **Homework** | 0 hours |
| **Reading written materials** | 24 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Lelkes Márk | **15. Email address** | lelkes.mark@edu.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Virt Márton, Dr. Nyerges Ádám, Dr. Harth Péter, Dr. Szabó Bálint, Tollner Dávid, Dr. Hanula Barna, Dr. Lelkes Márk | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to provide students with a system-level understanding of motor vehicles, as well as to develop their presentation and communication skills.

**20. Thematics of lectures**

Overview of vehicle engines, transmissions, brakes, suspensions, electrical systems, and other vehicle subsystems.

**21. Thematics of practices**

Introduction to vehicle subsystems.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the motor vehicles like systems on system-level

**b) skills (k)**

1. is able to comprehend the vehicle as a system, and to give individual presentations on its subsystems

**c) attitude (a)**

1. seeks to find the relationships between the different subject areas.
2. strives to interpret the content (lectures, statements, diagrams) of the lectures and exercises independently, and is open to thinking with the lecturer and other students.
3. strives for active participation in lectures and exercises.

**d) autonomy and responsibility (o)**

1. accepts the framework for the completion of the subject matter and carries out its tasks independently and responsibly within the framework of ethical standards.
2. responsibly applies the knowledge gained in the subject subject to its limitations.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Maximum twelve 5 minute quiz at end of classes | 1. K | 1. 100% | 1. t1,k1,a1,a2,a3,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| Each quiz is 6 points, half of the maximum possible score must be achieved. | 0-<50%: fail (1),<br>50-<62%: pass (2),<br>62-<75%: satisfactory (3),<br>75-<87%: good (4),<br>87-100%: excellent (5). |
| **28. Attendance and participation requirements** | |
| According to TVSZ | |
| **29. Late completion opportunities** | |
| Combined verbal replacement of the quizzes is possible. | |

| 30. Consultation opportunities |
|---|
| Every lecture |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Aviation ecosystem** | | | | |
| **2. … in Hungarian** | Légiközlekedési ökoszisztéma | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **0 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 20 hours | **Homework** | 24 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 24 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Gál István | **15. Email address** | gal.istvan@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Gál István | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

The student who has completed this course will have a comprehensive knowledge of the use of aircrafts in the transport system. The necessary regulations, systems, methods and philosophies.

**20. Thematics of lectures**

The legal environment of air transport, the rule-making process, key national and international organisations and actors. Introduction to airspace and airspace elements, their applications. Air traffic management: definition and description of the different parts. Description of ATC as applied in the current aviation system. The main navigation and communication tools of air transport. Airports: description of the most important airport departments: terminals, aprons, runways, taxiways, electrical systems, lighting, navigation equipment, etc. Airport design principles. Legal basis for airport design. Airline as an economic operator. Scheduling and network planning basics, economics.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

Demonstration of the lecture topics through site visits.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. understand the processes and tasks of the avionics ecosystem
2. understand the sources and methods of further learning in the aviation

**b) skills (k)**

1. can apply their knowledge to the topics covered in aviation ecosystem
2. be able to communicate ideas and plans about aviation clearly and visually to others
3. use information technology and computer tools in the work

**c) attitude (a)**

1. aims to create exact, aesthetic and obvious documentation.
2. is interested, responsive, independent, take care for the deadlines.

**d) autonomy and responsibility (o)**

1. able to create technical documentation independently.
2. aware of the significance of his work and the consequences of mistakes.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. semestrial homework | 1. HF | 1. 15% | 1. t1,t2,k1,k2,k3,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Written exam | 1. V | 1. 85% | 1. t1,t2,k1,k2,k3,a1,a2,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

Requirement for signature of the subject: successful completion of the home work.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is available from the homework.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Basic ship theory** | | | | |
| **2. … in Hungarian** | Hajók elmélete | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **8** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **3 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **240 hours** |
| **Contact hours** | 98 hours | **Preparation for seminars** | 28 hours | **Homework** | 34 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Simongáti Győző | **15. Email address** | simongati.gyozo@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Simongáti Győző | | |
| **18. Indicative prerequisites** | Mechanics 1. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to familiarise students with the basic concepts of ship theory and the practice of buoyancy and stability calculations.

**20. Thematics of lectures**

Ship Types. Vessel floatation, determination of buoyancy on a stationary and a moving vessel. Lines drawing, curve of areas. Hydrostatic characteristics of the vessel. Calculation and experimental determination of the center of gravity. Determination of floatation. Free surface effects.

Concept of stability. Stability calculation methods. Cross cuves of stability. Creating a GZ curve. Universal GZ curve. Typical heeling moments on the vessel. The effect of free surface. Dynamical stability. Determination of dynamical stability curve Classification Society Regulations.

**21. Thematics of practices**

**22. Thematics of laboratories**

Computer Lab for learing ship design software. For given main dimensions, create a computer model of a vessel and use the software to prepare the Stability Manual of the vessel.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic physical rules of ship movements.

**b) skills (k)**

1. is able to reproduce, adapt and interpret the ship movements in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. homework (making a model and documentation) | 1. ZH<br>2. F1 | 1. 25%<br>2. 50% | 1. t1,k1,k2,a1,a2,o1,o2<br>2. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. oral exam | 1. V | 1. 25% | 1. t1 |

**26. Conditions for obtaining signature / midterm grade**

submission of assignments on time or on lessons and successful (min. 50%) completion of the midterm test

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one midterm requirement.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Basic theories of engineering** | | | | |
| **2. … in Hungarian** | Mérnöki alapismeretek | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **1 \| k** |
| **6. Credits** | **7** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **210 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 30 hours | **Homework** | 0 hours |
| **Reading written materials** | 46 hours | **Midterm test preparation** | 50 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Szabó Géza, Dr. Béda Péter, Forberger Árpád, Dr. Veress Árpád | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the subject is to bring the physical knowledge previously acquired at different educational places to the same level. Learning the engineering way of thinking, problem- and task-solving skills. Carrying out and evaluating simpler measurements. Electronics. Introduction to Vector Algebra. Curve fitting to measurement data. Interactive tasks using MATLAB. Writing dynamics and Newtonian equations. Hydrostatics, Pascal and Archimedes' law. Basic thermodynamic concepts, investigation of cycles, states of ideal gas. Examination of drives, their role in vehicle engineering practice.

**20. Thematics of lectures**

Basics of Statics and Strength of Materials. Basics of Kinematics — Kinetics. Basics of Mechanical Machines. Basics of Fluid Flow Processes in Vehicles. Basics of Thermal Processes in Vehicles. Basics of Electronics. Basics of Measurement Technology / Metrology.

**21. Thematics of practices**

Exercises are completed after each corresponding chapter by means of solving calculation tasks.

**22. Thematics of laboratories**

Writing balance equations, interactive tasks related to rigid bodies and material points, application of lossy Bernoulli equation with interactive tasks using MATLAB.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic physical rules of thermal and fluid dynamics, statiscs, streght of structures, vehicle dynamics, electronics (J,K,L:T2,T3,T6,T7)

**b) skills (k)**

1. is able to reproduce, adapt and interpret the knowledge about thermal and fluid dynamics, statiscs, streght of structures, vehicle dynamics, electronics in a meaningful way (J,K,L,:K10,K13,K14,K17;J:K36,K45;K:K28,K37;L:K31,K40)

2. is able to communicate the ideas and plans about basic theories of engineering clearly and visually to others (J,K,L,:K10,K13,K14,K17;J:K36,K45;K:K28,K37;L:K31,K40)

**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 the team (J,K,L:A1-A4,A6,A7,A10-A13)

2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks (J,K,L:A1-A4,A6,A7,A10-A13)

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others (J,K,L:O2-O6)

2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified (J,K,L:O2-O6)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,k1,k2,a1,a2,o1,o2<br>2. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm tests

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one midterm requirement.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Basics of master studies 1.** | | | | |
| **2. … in Hungarian** | MSc alapozás 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| m** |
| **6. Credits** | **5** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **0 lecture** | **2 practice** | **3 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 10 hours | **Homework** | 30 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Tulipánt Gergely | **15. Email address** | tulipant.gergely@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Tulipánt Gergely | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The objective of this course is to lay the foundation for students' MSc-level studies in the field of automotive engineering. Within this framework, it aims to develop students' English for automotive engineering technical language competencies, introduce them to the methodology of scientific research through a research project, and deepen their knowledge of vehicle dynamics.

**20. Thematics of lectures**

-

**21. Thematics of practices**

Introduction to the technical language of automotive engineering. Basic vocabulary of the most important fields (powertrain, body, chassis, electronics, etc.).
Vocabulary exercises, matching definitions, crosswords with technical terms.
Interpreting technical texts (e.g., technical descriptions, component catalogs). Main tenses and passive structures in technical texts.
Reading comprehension tasks, identifying keywords, extracting the main points.
Interpreting abstracts and introductions of scientific articles. The style and typical expressions of scientific writing.
Analyzing abstracts, identifying keywords and main statements.
Oral communication in a professional context: discussions, asking and answering questions.
Role-playing in professional situations (e.g., discussing component specifications).
Interpreting and explaining technical data and graphs in English.
Describing and comparing data based on graphs.
Giving short professional presentations in English (e.g., presenting a component or technology).
Preparing and delivering presentations in small groups, providing feedback.
Discussion and argumentation on professional topics in English.
Structured debates on technical issues.
Fundamentals of scientific research in automotive engineering. Formulating research questions.
Brainstorming potential research topics, exploring individual areas of interest.
Methods and sources for literature review. Critical evaluation of relevant information.
Searching for literature in online databases, selecting and preliminary analyzing articles.
Preparing a draft research plan: objectives, hypotheses, methods, expected outcomes.
Developing individual or small group draft research plans.
Research plan consultation and feedback. Refining the plans.
Presenting and discussing the developed plans with the instructor and other students.
Practical aspects of vehicle handling and stability. Case studies.

Analyzing simple handling and stability problems.
Examination of vehicle steerability. Steering characteristics.
Basics of steering simulations (if software is available).
Vehicle vibrations and damping. Aspects of comfort and stability.
Analyzing simple vibration models.
Vehicle dynamics fundamentals of active and passive safety systems (e.g., ABS, ESP).
Short case studies on the operation of safety systems.

## 22. Thematics of laboratories

Laboratory activities help to reinforce what you have learned in theory and practice.

## 23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)

The student

**a) knowledge (t)**

1. Knows the basic English technical terms and terminology in the field of automotive engineering.
2. Knows the basic methodology and process of scientific research in the field of automotive engineering.
3. Knows the basic principles of researching and critically evaluating relevant literature.
4. Knows the basic elements of a research plan and the ways of documenting research findings.
5. Knows the basic concepts of vehicle dynamics, the main physical laws governing vehicle motion.
6. Knows the basic characteristics of vehicle handling, stability, and vibrations.

**b) skills (k)**

1. Is able to interpret and translate English technical texts on automotive engineering topics into Hungarian, and to translate Hungarian content into English.
2. Is able to communicate in English on professional topics, both orally and in writing.
3. Is able to research literature, identify relevant sources, and evaluate them critically.
4. Is able to formulate a simple research question and develop a basic research plan.
5. Is able to interpret the basic phenomena related to vehicle motion.
6. Is able to identify and describe the basic problems related to vehicle handling, stability, and vibrations.

**c) attitude (a)**

1. Motivated to continuously develop English for automotive engineering.
2. Interested in the methodology of scientific research in the field of automotive engineering.
3. Open to critical thinking and thorough work with literature.
4. Strives for accurate and professional communication in English.
5. Sensitive to understanding the dynamic behavior of vehicles from a design and safety perspective.

**d) autonomy and responsibility (o)**

1. Is able to independently acquire the basic elements of English for automotive engineering.
2. Is able to independently search for and process literature for their research project.
3. Takes responsibility for preparing their research plan and the progress of the project.
4. Is able to independently understand and describe basic vehicle dynamics problems.
5. Approaches their studies and the achievement of their goals responsibly.

## 24. Midterm assessments

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 25% | 1. t1-t6,k1-k6,a1-a5,o1-5 |
| 2. project assignment | 2. PF1 | 2. 25% | 2. t1-t6,k1-k6,a1-a5,o1-5 |
| 3. project assignment | 3. PF1 | 3. 25% | 3. t1-t6,k1-k6,a1-a5,o1-5 |
| 4. project assignment | 4. PF1 | 4. 25% | 4. t1-t6,k1-k6,a1-a5,o1-5 |

## 25. Exam assessments

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

## 26. Conditions for obtaining signature / midterm grade

Participation in laboratory sessions, successful completion (min. 40%) of the midterm test and submission of the project assignments of sufficient quality.

## 27. Final grade in percentage of performance

Excellent 80-100%
Good 68-79%
Satisfactory 54-67%
Pass 40-53%
Fail 0-39%

## 28. Attendance and participation requirements

according to the rules of CoS

## 29. Late completion opportunities

There is a retake option for the midterm test and each project assignment can resubmitted upon request till the end of delayed completion week.

## 30. Consultation opportunities

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

## 31. Validity of the subject datasheet starts from:

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Basics of master studies 2.** | | | | |
| **2. … in Hungarian** | MSc alapozás 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| m** |
| **6. Credits** | **9** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **4 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **270 hours** |
| **Contact hours** | 98 hours | **Preparation for seminars** | 20 hours | **Homework** | 60 hours |
| **Reading written materials** | 52 hours | **Midterm test preparation** | 40 hours | **Exam preparation** | 0 hours |
| **13. Organisational unit in charge** | Department of Automotive Technologies | | | | |
| **14. Subject coordinator** | | **15. Email address** | | | |
| **16. …department** | Department of Automotive Technologies | | | | |
| **17. Lecturers** | | | | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

The objective of this course is to lay the foundation for students' MSc-level studies in the field of automotive engineering. Within this framework, it aims to develop students' English for automotive engineering technical language competencies, introduce them to the methodology of scientific research through a research project, and deepen their knowledge of vehicle dynamics.

**20. Thematics of lectures**

-

**21. Thematics of practices**

-

**22. Thematics of laboratories**

Laboratory activities help to reinforce what you have learned in theory and practice.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the basic English technical terms and terminology in the field of automotive engineering.
2. Knows the basic methodology and process of scientific research in the field of automotive engineering.
3. Knows the basic principles of researching and critically evaluating relevant literature.
4. Knows the basic elements of a research plan and the ways of documenting research findings.
5. Knows the basic concepts of vehicle dynamics, the main physical laws governing vehicle motion.
6. Knows the basic characteristics of vehicle handling, stability, and vibrations.

**b) skills (k)**

1. Is able to interpret and translate English technical texts on automotive engineering topics into Hungarian, and to translate Hungarian content into English.
2. Is able to communicate in English on professional topics, both orally and in writing.
3. Is able to research literature, identify relevant sources, and evaluate them critically.
4. Is able to formulate a simple research question and develop a basic research plan.
5. Is able to interpret the basic phenomena related to vehicle motion.
6. Is able to identify and describe the basic problems related to vehicle handling, stability, and vibrations.

**c) attitude (a)**

1. Motivated to continuously develop English for automotive engineering.
2. Interested in the methodology of scientific research in the field of automotive engineering.
3. Open to critical thinking and thorough work with literature.

4. Strives for accurate and professional communication in English.
5. Sensitive to understanding the dynamic behavior of vehicles from a design and safety perspective.

**d) autonomy and responsibility (o)**

1. Is able to independently acquire the basic elements of English for automotive engineering.
2. Is able to independently search for and process literature for their research project.
3. Takes responsibility for preparing their research plan and the progress of the project.
4. Is able to independently understand and describe basic vehicle dynamics problems.
5. Approaches their studies and the achievement of their goals responsibly.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. project assignment<br>3. project assignment<br>4. project assignment | 1. ZH<br>2. PF1<br>3. PF1<br>4. PF1 | 1. 25%<br>2. 25%<br>3. 25%<br>4. 25% | <br>1. t1,k1,a1,o1<br>2. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Participation in laboratory sessions, successful completion (min. 40%) of the midterm test and submission of the project assignments of sufficient quality.

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

There is a retake option for the midterm test and each project assignment can resubmitted upon request till the end of delayed completion week.

**27. Final grade in percentage of performance**

Excellent 80-100%
Good 68-79%
Satisfactory 54-67%
Pass 40-53%
Fail 0-39%

**30. Consultation opportunities**

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

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Basics of operational engineering 1.** | | | | |
| **2. … in Hungarian** | Üzemmérnöki alapok 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| m** |
| **6. Credits** | **5** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **0 lecture** | **2 practice** | **3 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 10 hours | **Homework** | 50 hours |
| **Reading written materials** | 0 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Tulipánt Gergely | **15. Email address** | tulipant.gergely@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Tulipánt Gergely | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The course aims to introduce students to the fundamentals of operational engineering, focusing on occupational safety, legal and ethical compliance, and production organization. Through a comprehensive project assignment, students develop core engineering thinking, teamwork skills, and responsible decision-making, all essential for professional engineering practice.

**20. Thematics of lectures**

-

**21. Thematics of practices**

1. Occupational Safety Basics
Fundamental concepts of workplace safety
Safety regulations in industrial and laboratory environments
Personal protective equipment and accident prevention practices
2. Legal Basics: Ethics and Compliance
Engineering ethics and professional responsibility
Introduction to compliance principles and practical application
Case studies and interactive situational exercises
3. Introduction to Operations Management
Basic production models and organizational methods
Comparison of manufacturing and service processes
Introduction to efficiency and quality management principles
4. Project Work I – Project Planning and Definition
Team formation, topic and goal setting
Scheduling and assigning responsibilities
Preparing a research and data collection plan
5. Project Work II – Implementation and Analysis
Collecting and processing practical data
Analyzing results and drawing conclusions
Problem-solving and evaluating alternatives
6. Project Work III – Presentation and Feedback
Group presentations of project results
Evaluation and reflective discussion
Summarizing individual and group takeaways

## 22. Thematics of laboratories

Laboratory activities help to reinforce what you have learned in the practical sessions.

## 23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)

The student

**a) knowledge (t)**

1. Understands the basic principles of occupational safety and workplace risk management.
2. Recognizes the importance of legal and ethical compliance in engineering.
3. Possesses foundational knowledge of production and operations management.

**b) skills (k)**

1. Able to identify and assess safety-critical situations in the workplace.
2. Capable of planning and executing a small-scale engineering project in a team setting.
3. Able to apply basic organizational and operational principles in problem-solving contexts.

**c) attitude (a)**

1. Demonstrates commitment to safe, ethical, and regulation-compliant engineering practice.

**d) autonomy and responsibility (o)**

1. Can carry out a small project independently or contribute effectively in a group, taking responsibility for specific tasks.

## 24. Midterm assessments

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 25% | 1. t1-t3,k1-k3,a1,o1 |
| 2. project assignment | 2. PF1 | 2. 25% | 2. t1-t3,k1-k3,a1,o1 |
| 3. project assignment | 3. PF1 | 3. 25% | 3. t1-t3,k1-k3,a1,o1 |
| 4. project assignment | 4. PF1 | 4. 25% | 4. t1-t3,k1-k3,a1,o1 |

## 25. Exam assessments

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

## 26. Conditions for obtaining signature / midterm grade

Participation in laboratory sessions, successful completion (min. 40%) of the midterm test and submission of the project assignments of sufficient quality.

## 27. Final grade in percentage of performance

Excellent 80-100%
Good 68-79%
Satisfactory 54-67%
Pass 40-53%
Fail 0-39%

## 28. Attendance and participation requirements

according to the rules of CoS

## 29. Late completion opportunities

There is a retake option for the midterm test and each project assignment can resubmitted upon request till the end of delayed completion week.

## 30. Consultation opportunities

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

## 31. Validity of the subject datasheet starts from:

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Basics of operational engineering 2.** | | | | |
| **2. … in Hungarian** | Üzemmérnöki alapok 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| m** |
| **6. Credits** | **9** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **4 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **270 hours** |
| **Contact hours** | 98 hours | **Preparation for seminars** | 20 hours | **Homework** | 60 hours |
| **Reading written materials** | 52 hours | **Midterm test preparation** | 40 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | | **15. Email address** | |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The objective of this course is to provide students with a comprehensive overview of the fundamental aspects of industrial engineering, introducing them to the basic principles of business economics, practical quality management methods, the development of professional self-awareness, and practical experience through the successful completion of a project assignment.

**20. Thematics of lectures**

Week 1: Introduction to Industrial Engineering: Course objectives, syllabus, requirements. The industrial engineering mindset.

Weeks 2-3: Fundamentals of Business Economics: Basic concepts of enterprises, business operations. Costs, revenues, profit. Fundamental economic indicators.

Weeks 4-6: Practical Quality Management: The concept of quality, its dimensions. Quality management systems (brief overview). Basic quality management tools and methods (e.g., Pareto chart, Ishikawa diagram, flowchart).

Weeks 7-8: Professional Self-Awareness and Communication: Self-awareness models. Identifying strengths and weaknesses in engineering work. Basics of career planning. Effective communication and teamwork.

Weeks 9-12: Fundamentals of Project Management: Planning, scheduling, resource management, risk management. Aspects of preparing project reports.

Weeks 13-14: Presentation of Project Results. Drawing conclusions. Summary of the semester.

**21. Thematics of practices**

Week 1: Forming groups for the project assignment. Introduction of the project assignment, topic selection, initial brainstorming. Outlining the semester schedule.

Weeks 2-3: Case studies on cost management and pricing. Simple economic analysis tasks in group work. Preliminary consideration of the business aspects of the project assignment.

Weeks 4-6: Analyzing quality issues in group work using the learned tools. Case studies on quality assurance processes. Identifying the quality aspects of the project assignment.

Weeks 7-8: Self-awareness tests, reflection exercises. Role-playing to practice communication situations. Group discussions on project progress, addressing emerging problems.

Weeks 9-12: Intensive group work on the project assignment. Planning, executing, and documenting the sub-tasks of the project. Instructor consultations on project progress.

Weeks 13-14: Group project presentations. Evaluation of project reports. Providing feedback on student work.

**22. Thematics of laboratories**

Laboratory activities help to reinforce what you have learned in the practical sessions.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the basic concepts and interrelationships of business economics and the fundamental principles of business operations.
2. Knows cost and pricing methods, as well as basic economic analysis indicators.
3. Knows the fundamental concepts of quality management, the role of quality assurance and continuous improvement.
4. Knows the basic principles of the most commonly used quality management tools and methods.
5. Knows the basic models of professional self-awareness and the steps of career planning.
6. Knows the fundamental principles of effective professional communication and collaboration.
7. Knows the basic concepts of project management, the steps of project planning, execution, and evaluation.

**b) skills (k)**

1. Is able to perform basic economic analyses and interpret the results.
2. Is able to identify and analyze simple quality issues using the learned tools.
3. Is able to independently assess their own strengths and areas for development in the engineering profession.
4. Is able to communicate and collaborate effectively in group work during the implementation of the project assignment.
5. Is able to prepare and implement a project plan in group work to solve a given problem.
6. Is able to present the results of the project orally and in writing.

**c) attitude (a)**

1. Open to the multidisciplinary approach of industrial engineering.
2. Sensitive to the importance of quality in the production of goods and services.
3. Committed to continuous professional development and open to self-awareness work.
4. Cooperative and constructive in group work, respects the opinions of others.
5. Proactive in solving problems and takes responsibility for their own and the group's work.

**d) autonomy and responsibility (o)**

1. Is able to independently gather and process information on topics related to the course.
2. Is able to independently plan and execute tasks in project work.
3. Takes responsibility for their own learning process and the results of the group project assignment.
4. Acts responsibly with the available resources during the implementation of the project.
5. Critically evaluates their own and their group's work and is able to draw conclusions.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 25% | 1. t1-t7,k1-k6,a1-a5,o1-o5 |
| 2. project assignment | 2. PF1 | 2. 25% | 2. t1-t7,k1-k6,a1-a5,o1-o5 |
| 3. project assignment | 3. PF1 | 3. 25% | 3. t1-t7,k1-k6,a1-a5,o1-o5 |
| 4. project assignment | 4. PF1 | 4. 25% | 4. t1-t7,k1-k6,a1-a5,o1-o5 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Participation in laboratory sessions, successful completion (min. 40%) of the midterm test and submission of the project assignments of sufficient quality.

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

There is a retake option for the midterm test and each project assignment can resubmitted upon request till the end of delayed completion week.

**27. Final grade in percentage of performance**

Excellent 80-100%
Good 68-79%
Satisfactory 54-67%
Pass 40-53%
Fail 0-39%

**30. Consultation opportunities**

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

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Control engineering** | | | | |
| **2. … in Hungarian** | Irányítástechnika | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 14 hours | **Homework** | 0 hours |
| **Reading written materials** | 32 hours | **Midterm test preparation** | 32 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Tettamanti Tamás | **15. Email address** | tettamanti.tamas@kjk.bme.hu |
| **16. …department** | Department of Control for Transportation and Vehicle Systems | | |
| **17. Lecturers** | Dr. Tettamanti Tamás, Dr. Varga Balázs, Wágner Tamás, Ormándi Tamás | | |
| **18. Indicative prerequisites** | Mathematics A1a (weak),<br>Electrotechnics - Electronics (weak),<br>- - - | | |

**19. Aim of the subject**

The Control Engineering course covers the fundamentals of classical and modern control engineering for linear, time-invariant systems. This includes the basics of system theory (modeling, identification, time-domain and frequency-domain analysis, stability), frequency-domain control (basic transfer functions, series compensation, PID control, filters), state-space theory based modeling and control (state feedback structure, pole placement, LQ control, discrete-time modeling, Kalman filtering). Students who complete the course will be able to interpret, apply and design industrial control solutions in automotive engineering, transport engineering and logistics.

**20. Thematics of lectures**

In the Control Engineering lectures, students learn the basics of classical and modern control engineering for linear, time-invariant systems through practical examples (from automotive, transport, and logistics fields). The lectures will be presented in Matlab Live Script format in order to demonstrate the applicable methods directly in algorithmic form and to allow the students to easily try them in an interactive way. Lecture topics: basic concepts of control engineering, control design process, time domain analysis of system properties, BIBO stability, Laplace transformation, mathematical modeling of systems, transfer function, system identification, description of systems with basic transfer functions, control block diagram, frequency domain, Bode diagram, closed loop systems analysis, series compensation structure, PID control, tuning of PID control, filters, physical realization of controls/filters, state space theory, state space canonical forms, relationship between transfer function and state space, state space properties (stability, controllability), feedback control structure, pole placement, LQ control, state space identification, discrete-time state space, discrete-time LQ control, Kalman filtering.

**21. Thematics of practices**

In the practical part of the Control Engineering course, students will learn the basics of classical and modern control engineering for linear, time-invariant systems by solving practical examples. Topics of the exercises: system modeling (electronic and mechanical systems), time domain analysis, stability analysis, Laplace transformation, transfer function calculation, frequency domain analysis, application of Bode diagrams, series compensation problems, state space theory based modeling and analysis (stability, controllability), application of feedback control structure (pole placement, LQ control), discrete time state space, discrete time LQ control.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knowledge of the basic modeling, analysis and regulation paradigms of the control engineering for linear, time-invariant systems in the field of vehicle engineering, transport and logistics. (J:T9,T15)

**b) skills (k)**

2. The student understands the modeling approach and the regulation method used for a given control problem for linear, time-invariant systems in the field of vehicle engineering, transport and logistics.
(J:K10,K11,K12,K17,K36,K40,K42,K43,K44;K:K10,K11,K12,K17,K28,K32,K34,K35,K36;L:K10,K11,K12,K17,K31,K35,K37,K38,K39)

**c) attitude (a)**

3.The student is interested in the implementation of system modeling and control in the field of vehicle engineering, transport and logistics. (J,K,L:A2)

**d) autonomy and responsibility (o)**

4. The student is able to independently resolve a given control problem in the field of vehicle engineering, transport and logistics. (J,K,L:O1,O3)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written midterm test 1.<br>2. written midterm test 2.<br>4. four electronic practice assignments | 1. ZH1<br>2. ZH2<br>3. EF | 1. 40%<br>2. 40%<br>3. 20% | 1. t1,k1,a1,o1<br>2. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Successful completion of the midterm tests (min. 50% each), successful completion of the 4 electronic practice assignments (min. 85% each).

**27. Final grade in percentage of performance**

Excellent 92-100%
Good 79-91%
Satisfactory 67-78%
Pass 50-66%
Fail 0-49%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake or delayed completion is allowed for both midterm tests.

**30. Consultation opportunities**

There will be a practical lesson and a consultation before the midterm exam. Moreover, consultation is possible at a time and in a form agreed with the teacher.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Diesel motion power** | | | | |
| **2. … in Hungarian** | Dízel vontatójárművek | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 14 hours | **Homework** | 0 hours |
| **Reading written materials** | 0 hours | **Midterm test preparation** | 26 hours | **Exam preparation** | 24 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Zábori Zoltán | **15. Email address** | zabori.zoltan@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Kiss Csaba | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

To introduce railway specialization students to the basics and specifics of the construction, operation, and structure of railway diesel traction vehicles.

**20. Thematics of lectures**

General overview of railway diesel engines. Motor cycles, air ratio, degree of charge. Diesel engine losses, efficiency, fuel consumption. Characteristic curves, speed and charge control of diesel engines. Charge systems, engine and supercharger cooperation. Charge exchange control, valve drive systems. Fuel metering systems, mixture formation, combustion chamber, combustion process, energy conversion, air pollution. Structural structure of diesel engines, main units. Balancing of mass forces and torque, torsional oscillations. Regulators, engine cooling and lubrication systems. Air filtration, noise reduction, starting of diesel engines. Main tasks of diesel engine maintenance, structure of maintenance systems. Comparison of railway power transmission systems, their characteristics. Traction force development in the wheel-rail connection, this is the force connection factor and its characteristics. Specific properties of railway mechanical power transmission elements, reverse and axle drives. Structural design and operating characteristics of railway hydrodynamic power transmissions, hydrodynamic torque converters and clutches. The hydraulic cycle. Cooperation of the diesel engine and hydrodynamic elements. Electrical power transmission systems of railway diesel traction vehicles. Characteristics of generators, controlled cooperation of engine and generator. Supply of direct and alternating current traction motors, operating characteristics. Derivation of the traction force curve.

**21. Thematics of practices**

Numerical determination of the traction curve of a hydrodynamic and electric diesel traction vehicle.

**22. Thematics of laboratories**

Measurements related to the operation of the diesel engine: measurement of characteristic curves, determination of heat balance. Computer laboratory simulations to study certain operating processes of a diesel engine. Measurements related to railway power transmission (measurement of force relationship factor) as well as computer laboratory simulation tests to study the characteristics of power transmissions.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the characteristics and main elements of diesel railway traction vehicles.
2. Knows the basic relationships of traction vehicle systems and their application possibilities.

**b) skills (k)**

1. Is able to navigate the system of physical concepts and units used in vehicle technology.
2. Is able to recognize and navigate the specifics related to railway diesel traction vehicles.
3. Is able to determine basic diesel railway traction vehicle characteristics.

**c) attitude (a)**

1. Is open and receptive to new knowledge.
2. Meets the expectations of engineering work – demanding, clear and precise.

**d) autonomy and responsibility (o)**

1. Takes the first step without waiting for what others say or do.
2. Expresses own opinion on issues related to railway vehicles.
3. Solves the own task and controls it.
4. Takes responsibility for the correct documentation of the methods and procedures used.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. I. Midterm test<br>2. II. Midterm test | 1. ZH1<br>2. ZH2 | 1. 20%<br>2. 20% | 1. t1,t2,k1-k3,a1,a2,o1-o4<br>2. t1,t2,k1-k3,a1,a2,o1-o4 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Exam | 1. V | 1. 60% | 1. t1,t2,k1-k3,a1,a2,o1-o4 |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm tests

**28. Attendance and participation requirements**

According to the rules set out in the AER.

**29. Late completion opportunities**

The midterm tests can be retaken separately, with one retake and one repeated retake.

**27. Final grade in percentage of performance**

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

**30. Consultation opportunities**

At a time and in a format agreed upon with the instructor.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Electric motive trains** | | | | |
| **2. … in Hungarian** | Villamos vasutak | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **8** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **3 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **240 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 42 hours | **Homework** | 0 hours |
| **Reading written materials** | 66 hours | **Midterm test preparation** | 28 hours | **Exam preparation** | 20 hours |
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | | | |
| **14. Subject coordinator** | Dr. Zábori Zoltán | **15. Email address** | zabori.zoltan@kjk.bme.hu | | |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | | | |
| **17. Lecturers** | Dr. Zábori Zoltán, Hillier István, Dr. Tulipánt Gergely | | | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

To introduce future railway vehicle engineers to the vehicle-side and track-side characteristics of electric traction. It presents the characteristics of direct current and alternating current locomotives, as well as the characteristics of current converters found on traction vehicles.

**20. Thematics of lectures**

Drive systems of electric traction units (traditional or DC chopper system), layout, principle of operation. Main circuit of vehicles equipped with DC chopper. Control of the vehicles used chopper systems. Main circuit of vehicles having semi- or totally controlled rectifier bridges. Vehicles with asynchronous motors, methods of controlling of the tractive/breaking effort. Basic circuit of electric traction energy supply systems. Catenary system and third rail. Layout of the catenary system. Electric control systems of the electric traction units. Leaderships of the modern units. Operation method of the relay based control systems. Pantograph systems and switches. Tranformers and additional equipments of electric units. Rectifiers, inverters and contactors. Auxiliary devices, lighting-, heating and battery charger systems.

**21. Thematics of practices**

The topics of the exercises are related to the calculation assignments issued as homework during the semester, during which the students select a traction motor suitable for certain traction tasks, determine the traction and power requirements of traction vehicles and calculate the electric traction motor heating.

**22. Thematics of laboratories**

Test bench study of DC electric machine group cooperation; Measuring the transient states of a DC machine group; Simulation study of heating of a traction electric machine; Simulation study of the electromechanical processes of the propulsion system of an electric traction vehicle

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the structure of the railway system, its actors, the regulations and processes related to the licensing and operation of vehicles
2. Knows the type test of railway vehicles
3. Knows the safety and occupational safety rules of railway operation, the methods of technical rescue
4. Recognizes markings used in railway operation
5. Knows the technical equipment of railway vehicle depots.
6. Knows the performance and reliability characteristics related to the operation of railway vehicles
7. Knows inventory task related to the operation of railway vehicles
8. Knows the basic principle of track-vehicle system diagnostics

**b) skills (k)**

1. Is able to compile and systematize relevant specifications and necessary type test measurements from the point of view of the homologation of a given railway vehicle.
2. Is abble to explain the tasks of the different railway conformity assessment bodies and their interconnections.
3. Is able to determine and analyse the reliability characteristics of railway vehicles.
4. Is able to use simple inventory procedures.
5. Is able to create computer implementations for the evaluation of vehicle diagnostic signals based on simple algorithms.

**c) attitude (a)**

1. Is independently interested and open to new technical solutions and procedures in the field.
2. Strives to increase the quality and reliability of railway rolling stock operation

**d) autonomy and responsibility (o)**

1. Keeps and makes others comply with work protection and railway safety regulation)
2. Takes on responsibility for compliance of the procedures applie

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Midterm test | 1. ZH | 1. 25% | 1. t1-t3,t7,k1,k2,o1,o2 |
| 2. Railway vehicle marking system assignment | 2. F1 | 2. 5% | 2. t4,a1,a2,o1 |
| 3. Wheel load assignment | 3. F2 | 3. 5% | 3. t5,a1,a2,o2 |
| 4. Inventory assignment | 4. F3 | 4. 5% | 4. t6,k3,a1,a2,o2 |
| 5. Reliability assignment | 5. F4 | 5. 5% | 5. t7,k5,a1,a2,o2 |
| 6. Diagnostics assignment | 6. F5 | 6. 5% | 6. t8,k6,a1,a2,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. exam | 1. V | 1. 50% | 1. t1,t2,t3,k1,k2,k4,k6,a1,a2,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

Successful completion of the midterm test (min. 50%) and submission of the assignments by the deadline or on the lessons.

**27. Final grade in percentage of performance**

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

**28. Attendance and participation requirements**

**29. Late completion opportunities**

The midterm tests can be replaced with the replacement test written in the delayed completion week

**30. Consultation opportunities**

At a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Electrotechnics - Electronics** | | | | |
| **2. … in Hungarian** | Elektrotechnika - Elektronika | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **2 \| k** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **3 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 14 hours | **Homework** | 16 hours |
| **Reading written materials** | 26 hours | **Midterm test preparation** | 24 hours | **Exam preparation** | 30 hours |
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | | | |
| **14. Subject coordinator** | Dr. Szabó Géza | **15. Email address** | szabo.geza@kjk.bme.hu | | |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | | | |
| **17. Lecturers** | Dr. Szabó Géza | | | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

The aim of the course is to introduce the most important engineering topics in electronics and electrical engineering and to provide a basic level of proficiency.

**20. Thematics of lectures**

It provides basic engineering knowledge of principles of electrotechnics, of its measurements, of its basic models. Introduces students to the operating principles of the basic elements of electronics, to their parameters, features, characteristics as well as their selection/engineering options. It also introduces the students to the schematics, modelling and analysis principles of amplifying and switching circuitry, and shows the special transportation and vehicle applications. It presents the principles and main parameters of electrical machines as well as their application in vehicle and transportation.

**21. Thematics of practices**

Application of the principles presented on lectures, solving exercises. The aim is to teach independent application of circuit principles and independent problem solving.

**22. Thematics of laboratories**

Laboratory measurements from selected topics.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. understands the basic principles and basic relationships of electrotechnics, the operation, symbols, features and characteristics of basic electronic components, the amplifying and switching circuits, and the working principles of electrical machines. (J,K,L:T2,T4,T6,T7)

**b) skills (k)**

1. is able to understand and analyze the operation of simple electronic circuits. (J,K,L:K10,K17;J:K36,K42;K:K28,K34;L:K31,K37)

**c) attitude (a)**

1. participates in solving basic electric problems in the field of transport or vehicle, to work efficiently and willingly with specialists of other fields (in particular: electrical engineering). (A2)

**d) autonomy and responsibility (o)**

1. is aware of and treats the responsibility associated with the task solution during electric and electronic system problem solving and analysis. (O1,O3)

**24. Midterm assessments**

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

| | | | |
|---|---|---|---|
| 3. homework<br>4. homework<br>5. laboratory measurement and report<br>6. laboratory measurement and report<br>7. laboratory measurement and report | 3. HF1<br>4. HF2<br>5. LJ1<br>6. LJ2<br>7. LJ3 | 3. 7,5%<br>4. 7,5%<br>5. 2%<br>6. 2%<br>7. 2% | 3. t1,k1,a1,o1<br>4. t1,k1,a1,o1<br>5. t1,k1,a1,o1<br>6. t1,k1,a1,o1<br>7. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. oral exam | 1. V | 1. 67% | 1. t1,k1,a1,o1 |

**26. Conditions for obtaining signature / midterm grade**

During the semester: two midterm tests, two homework and three laboratory measurements with their report about the results.

**27. Final grade in percentage of performance**

0%-49%: fail; 50%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent

**28. Attendance and participation requirements**

According to the rules of CoS.

**29. Late completion opportunities**

The midterm tests have individual re-tests and second (paid) re-tests; the second (paid) re-test can be taken only if a test or a re-test has been taken. Homeworks can be corrected or submitted during the delayed completion week (paid). The laboratory practices can be re-taken during the delayed completion week; protocols about labs can be submitted or corrected during the delayed completion week (paid).

**30. Consultation opportunities**

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

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Engineering drawing 1.** | | | | |
| **2. … in Hungarian** | Mérnöki rajz 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **2 \| k** |
| **6. Credits** | **5** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 20 hours | **Homework** | 30 hours |
| **Reading written materials** | 14 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Lovas László | **15. Email address** | lovas.laszlo@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Lovas László, Dr. Török István, Győri Márk | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Preparing future engineers in the basics of graphical communication in engineering

**20. Thematics of lectures**

Elements of space geometry, basic theorems. Definition and properties of point, line and plane. Intersection of lines and planes. Intersection of curved shaped solids and lines. Intersection and projection of plane-shaped bodies.

Basics of representation methods: perspective, axonometry, projections.

Part drawings. Algorithm of drawing. Basics of technical drawing: types of projections and sections. Dimensioning, dimension system, text instructions. Indication of holes, slope, and conicity. Relationship between drawing and production. Simplified representations: threads, gears, splines.

**21. Thematics of practices**

Basic notions of descriptive geometry, basic constructions. Axonometric and projection views. Technical representation: projections, cutouts, sections, simplified representation. Dimensioning of parts.

CAD software use, particularities of the 3D modeling. Building 3D models, generating and completing 2D drawings.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the national and international requirements, regulations, and guidelines to ensure that products, services and processes are of good quality and fit for purpose. (T2)
2. Knows the concepts and problem solving methods in the field of vehicles and mobile machines. (T10)
3. Knows the computer communication and the main software applications in the field. (T17)

**b) skills (k)**

1. Able to read and interpret technical drawings and documentation prepared by other engineers (K13)
2. Able to build, repair, model, or operate a product from a technical drawing or technical documentation. (K14,K26)
3. Creates technical plans and drawings using special software. (K18)
4. Uses computer-aided design software. (K45)

**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 (A15)

2. is receptive and proactive in the performance of the tasks assigned to him/her, self-critical of the tasks assigned to him/her (A11,A12,A13,A14)

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

2. makes responsible decisions in solving managerial tasks in his/her chosen field of activity, formulating independent proposals to solve the challenges identified (O5)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework | 1. HF1 | 1. 9,2% | 1. t1, t2, k3, k4, a1, a2, o1, o2 |
| 2. homework | 2. HF2 | 2. 10,6% | 2. t1, t2, k3, k4, a1, a2, o1, o2 |
| 3. homework | 3. HF3 | 3. 13,1% | 3. t1, t2, k3, k4, a1, a2, o1, o2 |
| 4. homework | 4. HF4 | 4. 13,1% | 4. t1, t2, k3, k4, a1, a2, o1, o2 |
| 5. midterm test | 5. ZH1 | 5. 27% | 5. t1, t2, a1, a2, o1, o2 |
| 6. midterm test | 6. ZH2 | 6. 27% | 6. t1, t2, a1, a2, o1, o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

The two tests and the homeworks written during the semester are evaluated by a point system, the sum of which results in the semester mark; the semester mark is determined on the basis of the semester points.

The conditions for obtaining a semester mark are:

- attendance of 70% of the practice classes;
- 40% of the sum of test points;
- the sum of the homework and test points reaches 40% of the total.

**27. Final grade in percentage of performance**

Excellent 84-100%
Good 72-83%
Satisfactory 62-71%
Pass 50-61%
Fail 0-49%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Combined retake test from the topics of all the midterm tests.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Engineering drawing 2.** | | | | |
| **2. … in Hungarian** | Mérnöki rajz 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **3 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 12 hours | **Homework** | 24 hours |
| **Reading written materials** | 6 hours | **Midterm test preparation** | 22 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Ficzere Péter | **15. Email address** | ficzere.peter@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Lovas László, Dr. Ficzere Péter, Dr. Török István, Győri Márk | | |
| **18. Indicative prerequisites** | Engineering drawing 1. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Continuation of what has been started in Engineering drawing 1. Modelling assemblies of multiple parts. Drawing of typical parts, use of part libraries, parametrized modelling. Basics of standardization, use of standards.

**20. Thematics of lectures**

Modelling assemblies of multiple parts. Structure and characteristics of assembly drawings. Bolted link drawings and bolt fixation. Shaft-hub assembly drawings. Symbols of welding, welded structure drawings. Spring drawings of various type. Riveted assembly drawings. Basics of CAD theory. Drawing analysis, understanding of drawing. Detail drawings. Role and types of product documentation. Technical drawing in integrated corporate data handling softwares. Application of computer assisted drawing and documentation making. Drawing of typical parts, use of part libraries, parametrized modelling. Basics of standardization, use of standards.

**21. Thematics of practices**

Guided exercise solving in the field of part assembly technical drawing.

**22. Thematics of laboratories**

Application of computer assisted drawing and documentation making

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows and understands the mutual position of space elements, knows the rules and symbols of engineering drawings. (T2,T10,T17)

**b) skills (k)**

1. is able to visualize solid objects from two-dimensional drawings with depth perception and represents solid objects in two dimensions. (K13,K14,K18,K26,K45,S1)

**c) attitude (a)**

1. aims to create exact, aesthetic and obvious drawings. (A11,A12,A13,A14,A15)

**d) autonomy and responsibility (o)**

1. is able to create technical drawing documentation; is aware of the significance of his work and the consequences of mistakes. (O5)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework | 1. HF1 | 1. 12,5% | 1. t1,k1,a1,o1 |
| 2. homework | 2. HF2 | 2. 12,5% | 2. t1,k1,a1,o1 |
| 3. homework | 3. HF3 | 3. 12,5% | 3. t1,k1,a1,o1 |
| 4. homework | 4. HF4 | 4. 12,5% | 4. t1,k1,a1,o1 |

| | | | |
|---|---|---|---|
| 5. midterm test (on computer)<br>6. midterm test (classroom) | 5. ZH-SZG<br>6. ZH-K | 5. 25%<br>6. 25% | 5. t1,k1,a1,o1<br>6. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

The two tests and the homeworks written during the semester are evaluated by a point system, the sum of which results in the semester mark; the semester mark is determined on the basis of the semester points.
The conditions for obtaining a semester mark are:
- attendance of 70% of the practice classes;
- 40% of the sum of test points;
- the sum of the homework and test points reaches 40% of the total.

**27. Final grade in percentage of performance**

Excellent 84-100%
Good 72-83%
Satisfactory 62-71%
Pass 50-61%
Fail 0-49%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Midterm test correction possibility in the delayed completion period.

**30. Consultation opportunities**

at a time and in a form agreed with the lecturers and instructors

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Flight mechanics and aero structures** | | | | |
| **2. … in Hungarian** | Repülésmechanika és repülőgépek szerkezete | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 15 hours | **Homework** | 20 hours |
| **Reading written materials** | 25 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Jankovics István, Dr. Rohács József | | |
| **18. Indicative prerequisites** | Aerodinamics (strong),<br>Material science and technology (strong),<br>- - - | | |

**19. Aim of the subject**

his course provides an introductory overview of flight mechanics and aircraft structures. Students will become familiar with typical flight conditions, aircraft performance characteristics, and optimal operating modes. The course introduces the fundamentals of both static and dynamic stability of aircraft. It also covers the types of loads acting on an aircraft and the associated design requirements. Students will gain insight into common structural configurations, methods for determining aerodynamic loads, as well as the materials and fastening elements commonly used in the aerospace industry.

**20. Thematics of lectures**

Production of thrust. Performance characteristics of aircraft propulsion systems. Measurement of airspeed. Reference frames. Steady level flight, climbing, gliding, turning. Take-off and landing. Optimal flight modes. Load and fligiht envelope. 6d of equation of motion of aircraft Basics of static and dynamic stability, control of aircraft. Main structural units of aircraft (wing, fuselage, tail, landing gear, engine mounts). Strength requirements, EASA and FAR rules. Loads on wings and tails. Construction methods of aircraft components. Fasteners. Composite materials and processes. Aeroelastic phenomena, divergence, control reversal, flutter. Station identification. Aircraft alignment and symmetry.

**21. Thematics of practices**

Solving and practicing numerical examples

**22. Thematics of laboratories**

computer simulations

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the flight mechanics and aero structure technologies and processes

**b) skills (k)**

1. is able to reproduce, adapt and interpret the technologies in flight mechanics and aero structure in a meaningful way
2. is able to communicate the ideas and plans about flight mechanics clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. independent calculation task | 1. ZH<br>1. HF | 1. 40%<br>2. 20% | 1. t1,k1,k2,a1,a2,o1,o2<br>2. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 40% | 1. t1,k1,k2,a1,a2,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

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

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one midterm requirement.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Fluid dynamics, thermodynamics and heat transfer 1.** | | | | |
| **2. … in Hungarian** | Hő- és áramlástan 1. | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **3 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 0 hours | **Midterm test preparation** | 22 hours | **Exam preparation** | 32 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai Csaba, Jankovics István, Dr. Veress Árpád | | |
| **18. Indicative prerequisites** | Basic theories of engineering (suggested),<br>Mathematics A2a (suggested),<br>- - - | | |

**19. Aim of the subject**

Understanding the basic thermodynamic, heat transfer and flow processes, learning their theoretical and practical aspects

**20. Thematics of lectures**

Introduction: Systems, Fluid dynamics, thermodynamics and heat transfer and their applications in logistics, transportation and vehicle engineering, Continuum mechanics, Kinetic theory of gases, introduction of basic parameters (ρ, v, p, T), equations of state. Fluid dynamics: Liquids, steams, and gases in p-v-T state space (compressible and incompressible mediums), Description of fluid motions according to Euler and Lagrange, The principle of mass, momentum and energy conservation laws, Hydrostatics, Newtonian fluid, The basic laws of viscous flow, Boundary layer, Boundary layer separation, Internal, external and cascade flows, Fluid dynamics in and around of logistics', transportation's and vehicle's systems – forces and coefficients, Similarity theory of fluids, Compressible fluids: sound speed in liquids and gases, Pressure waves, Doppler's effect, Sound barrier, Mach cone, Allievi's water hammer effect. Thermodynamics: Heat and specific heat, The 1st law of thermodynamics, Thermodynamic processes, The 2nd law of thermodynamics, Cycles, useful work, thermal efficiency and coefficient of performance, Air with moisture and corresponding processes, Introduction to heat transfer – classification, principles, characteristics, applications and their conditions.

**21. Thematics of practices**

Exercises are completed after each corresponding chapter by means of solving calculation tasks.

**22. Thematics of laboratories**

Temperature measurement of gases. Measurement of thermodynamic processes. Determination the ratio of specific heats by experiments. Investigation of thermodynamic processes in moist air. Reynolds experiment. Volume flow measurement. Determination of contraction factor. Jet engine model.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the theoretical together with measurement- and analytical calculation-based practical aspects of the studied chapters in fluid dynamics, technical thermodynamics and heat transfer in continuum flow regime with especial care for the logistics, transportation and vehicle engineering, meanwhile she/he knows the advantages, disadvantages, conditions and application ranges of the different processes and methods; (J,K,L:T4,T7;J:T9)

2. knows the relevant professional literature, she/he knows the way of finding, questing the needed detailed technical information about the investigated problem and the student knows and the student is able to use diagrams and tables in the field of fluid dynamics, thermodynamics and heat transfer. (J,K,L:T4,T7;J:T9)

**b) skills (k)**

1. can complete theoretical and practical (measurements, experiments, tests and calculations) tasks in the field of fluid dynamics, technical thermodynamics and heat transfer in line with the content of the subject in the field of maintenance and developments with verification, plausibility check and validation (in case of relevancies) (J,K,L:K10,K11,K17;J:K22,K26,K27,K29,K32,K33,K36;K:K28;L:K31)

2. can recognise the desired modifications (e.g.: improvements and developments) in the fields of the subject, the student can perform the needed actions for changes and can check, analyse and understand the results of the modifications. (J,K,L:K10,K11,K17;J:K22,K26,K27,K29,K32,K33,K36;K:K28;L:K31)

3. can understand complex systems and processes, can plan, monitor, evaluate and making decision together with considering all external and internal effects acting on the investigated activity and the effects of her/his activity on other systems. (J,K,L:K10,K11,K17;J:K22,K26,K27,K29,K32,K33,K36;K:K28;L:K31)

**c) attitude (a)**

1. aims to complete the studies at the highest level, under the shortest time, by providing the knowledge and capacity at the best to obtain knowledge for deep and independent professional work; (J,K,L:A2)

2. cooperates with professors and mates during the studies; (J,K,L:A2)

3. continuously increases the knowledge independently by having information from the external literature given by the lectures to complete the studies; (J,K,L:A2)

**d) autonomy and responsibility (o)**

1. completes the homework, reports about laboratory practices and makes exercises about calculation tasks independently; (J,K,L:O3)

2. takes responsibility for guiding mates by the quality of the work and by keeping ethic norms; (J,K,L:O3)

3. takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints; (J,K,L:O3)

4. can friendly accept the well-established constructive criticism and can utilize that in future; (J,K,L:O3)

5. can accept the form of the cooperation; she/he can work alone or in a team member depends on the actual situation; (J,K,L:O3)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 0% | 1. t1,t2,k1-k3,a1-a3,o1-o5 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Written exam | 1. V | 1. 100% | 1. t1,t2,k1-k3,a1-a3,o1-o5 |

**26. Conditions for obtaining signature / midterm grade**

Requirement for signature of the subject: successful completion of the midterm exam and the laboratory practices.

**28. Attendance and participation requirements**

According to the rules of Study and Examination Regulations.

**29. Late completion opportunities**

Second retake from the midterm test.

**27. Final grade in percentage of performance**

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

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Fluid dynamics, thermodynamics and heat transfer 2.** | | | | |
| **2. … in Hungarian** | Hő- és áramlástan 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 10 hours |
| **Reading written materials** | 15 hours | **Midterm test preparation** | 13 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba, Dr. Veress Árpád | | |
| **18. Indicative prerequisites** | Fluid dynamics, thermodynamics and heat transfer 1. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Expansion of the basic knowledge of thermodynamics and fluid mechanics discussed in the Heat and Fluid Mechanics 1 course to the BSC Vehicle Engineering level. Overview, characterization and role of machines operating on the principles of thermal and fluid mechanics discussed in the course in the devices used in transportation.

**20. Thematics of lectures**

Energetic investigation of non-solid materials (thermology): Heat transfer (heat conduction, heat transfer, heat emission and heat radiation), Gas mixtures, Thermodynamic processes and cycles of machines, Steams and steam cycles. Dynamic investigation of non-solid materials (fluidics):

Flows assumed to be ideal (frictionless): Compressible flows: gas dynamics, supersonic flow (Laval tube), Basic acoustic concepts, Investigation of plane flows using the method of complex potentials, flow around a stationary and rotating cylinder,

Vortex flows (consistency of momentum theorem, Helmholtz and Thomson theorems), Vortex panel method. Real flows

(frictional): Navier-Stokes equation, Reynolds averaged Navier-Stokes equation, Turbulent flows (Prandtl turbulence model,

basics of k-ω, k-ε models), Boundary layer theory (Prandtl boundary layer model, dimensionless boundary layer characteristics), Basics of numerical flow modeling. Basics of fluid mechanics: Characteristics of pipes, pipe systems (loop law, nodal law, characteristic curve), Basics of vortex pumps (structure, operation, impeller types, Euler turbine equation, gear ratio,

reaction ratio, characteristic curve, effective power).

**21. Thematics of practices**

Presentation of the development of calculation tasks after each relevant chapter.

**22. Thematics of laboratories**

Gas turbine measurement. Experimental determination of the water vapor tension curve. Investigation of the heat transfer of a horizontal pipe.

Comparison of heat radiation of surfaces. Measurement of pipe friction.

Measurement of air force on a wing. Water jet pump. Measurement and calculation of flow around a cylinder (CFD).

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. understands the fundamental principles describing the energetic and dynamic behavior of non-solid materials, including various modes of heat transfer, flow theory models, and the operating principles of flow machinery. (T9,T10)

**b) skills (k)**

1. is able to reproduce, adapt and interpret the content of the subject in a meaningful way (K22,K26,K27,K29,K30,K32)

2. is able to communicate his/her ideas and plans clearly and visually to others (K33)

**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 the team

2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

2. makes responsible decisions in solving tasks in his/her chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Mid term test<br>2. Homework 1<br>3. Homework 2<br>4. Gas turbine measurement.<br>5. Experimental determination of the water vapor tension curve.<br>6. Investigation of the heat transfer of a horizontal pipe.<br>7. Comparison of heat radiation of surfaces.<br>8. Measurement of pipe friction.<br>9. Measurement of air force on a wing.<br>10. Water jet pump investigation.<br>11. Measurement and calculation of flow around a cylinder (CFD). | 1. ZH<br>2. F1<br>3. F2<br>4. M1<br>5. M2<br>6. M3<br>7. M4<br>8. M5<br>9. M6<br>10. M7<br>11. M8 | 1. 0%<br>2. 7,5%<br>3. 7,5%<br>4. 0%<br>5. 0%<br>6. 0%<br>7. 0%<br>8. 0%<br>9. 0%<br>10. 0%<br>11. 0% | 1. t1,k1-2,a1-2,o1-2<br>2. t1,k1-2,a1-2,o1-2<br>3. t1,k1-2,a1-2,o1-2<br>4. t1,k4,a1-2,o1-2<br>5. t1,k4,a1-2,o1-2<br>6. t1,k4,a1-2,o1-2<br>7. t1,k4,a1-2,o1-2<br>8. t1,k4,a1-2,o1-2<br>9. t1,k4,a1-2,o1-2<br>10. t1,k4,a1-2,o1-2<br>11. t1,k4,a1-2,o1-2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 85% | t1 |

**26. Conditions for obtaining signature / midterm grade**

The conditions for having the signature at the end of the semester are: submission of homeworks on time, successful (min. 50%) completion of the midterm test, and the fulfilment of the laboratory practices and the acceptance of the report about the labs.

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake or delayed completion is only from one lab exercise

**27. Final grade in percentage of performance**

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

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Fundamentals of mobility** | | | | |
| **2. … in Hungarian** | Mobilitás alapjai | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **1 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **3 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 32 hours | **Homework** | 0 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 12 hours | **Exam preparation** | 0 hours |
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu | | |
| **16. …department** | Department of Aeronautics and Naval Architecture | | | | |
| **17. Lecturers** | Dr. Veress Árpád | | | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

The aim of the course is to present the activities of companies and partner institutions active in the field of vehicle engineering and the opportunities for students placed with them. In addition, students will acquire the university-civic competences related to vehicle engineering.

**20. Thematics of lectures**

The lectures will provide students with direct exposure to the field of vehicle engineering through guest speakers from industry partners, who will describe their jobs, what an industry partner expects from engineering students and graduates, and what career opportunities they can offer.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

During the laboratory sessions, students will be introduced to the framework of student and university-civic life in the context of a tutorial.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the technologies and processes in mobility (T8,T10-T14)
1. is familiar with the university-civic competences

**b) skills (k)**

1. is able to reproduce, adapt and interpret the university-civic competences in a meaningful way
2. is able to communicate the ideas and plans about mobility clearly and visually to others (K19-K21)

**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 the team (A15)
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks (A15)

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others (O13)
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified (O13)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. attendance on lectures | 1. ZH<br>2. JEL | 1. 20%<br>2. 80% | 1. t2,k1,a1,a2,o1,o2<br>2. t1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| successful (min. 50%) completion of the midterm test and the attendance criterion | Excellent 80-100% participation in the lectures<br>Good 70-79% participation in the lectures<br>Satisfactory 60-69% participation in the lectures<br>Pass 50-59% participation in the lectures<br>Fail 0-49% participation in the lectures |
| **28. Attendance and participation requirements** | |
| at least 50% of lectures must be visited, max. 30% of laboratory classes can be missed | |
| **29. Late completion opportunities** | |
| Second retake from the midterm test. | |

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Fundamentals of vehicle dynamics** | | | | |
| **2. … in Hungarian** | Járműdinamikai alapok | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **0 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 8 hours | **Homework** | 30 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Harth Péter | **15. Email address** | harth.peter@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Szabó Bálint, Virt Márton | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of this course is to learn the fundamentals of vehicle dynamics, to use this knowledge to understand the behaviour of different vehicle systems.

**20. Thematics of lectures**

Introduction to vehicle dynamics, Tyre dynamics, Longitudinal dynamics, handling, vehicle vertical dynamics

**21. Thematics of practices**

-

**22. Thematics of laboratories**

Simple vehicle dynamical simulation and motion analysis

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the basics of vehicle dynamics, knows the possibilities and measures of vehicle dynamics modeling.

**b) skills (k)**

1. Is able to set up simple vehicle models and perform simulations to analyse vehicle motions.

**c) attitude (a)**

1. seeks to find the relationships between the different subject areas.
2. strives to interpret the content (lectures, statements, diagrams) of the lectures and exercises independently, and is open to thinking with the lecturer and other students.
3. strives for active participation in lectures and exercises.

**d) autonomy and responsibility (o)**

1. accepts the framework for the completion of the subject matter and carries out its tasks independently and responsibly within the framework of ethical standards.
2. responsibly applies the knowledge gained in the subject subject to its limitations.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework about simulation model building and analysis<br>2. homework about simulation model building and analysis<br>3. midterm test | 1. HF1<br>2. HF2<br>3. ZH1<br>4. ZH2 | 1. 20%<br>2. 20%<br>3. 30%<br>4. 30% | 1. t1,k1,a1,a2,a3,o1,o2,o3<br>2. t1,k1,a1,a2,a3,o1,o2,o3<br>3. t1,k1,a1,a2,a3,o1,o2<br>4. t1,k1,a1,a2,a3,o1,o2 |

| | | | |
|---|---|---|---|
| 4. midterm test | | | |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| The midterm test is passed if more than 50% of the maximum score is achieved. Attendance at labs during the semester is mandatory and submission of the homework at an acceptable level is required. A successful midterm test, completion of all labs and submission of homeworks with an acceptable grade is required to receive a passing grade. | 0-<50%: fail (1),<br>50-<62%: pass (2),<br>62-<75%: satisfactory (3),<br>75-<87%: good (4),<br>87-100%: excellent (5). |
| **28. Attendance and participation requirements** | |
| According to TVSZ | |
| **29. Late completion opportunities** | |
| One midterm test can be retaken twice, homeworks can be supplemented during the delayed completion week. | |

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Greening and flight safety** | | | | |
| **2. … in Hungarian** | Környezetvédelem és repülésbiztonság | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 27 hours | **Midterm test preparation** | 25 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Rohács Dániel | **15. Email address** | rohacs.daniel@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Kale Utku, Dr. Rohács Dániel | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

## 19. Aim of the subject

Aviation Safety and Environmental Awareness course is designed to provide individuals with essential knowledge and training related to aviation safety practices and the environmental impact of aviation operations. These courses are essential for students working to improve safety standards and minimise the environmental impact of aviation.

## 20. Thematics of lectures

This lecture series covers the critical intersection of aviation safety and environmental awareness, examining how operational models, human factors, and environmental considerations shape modern aviation practices.I will explore a variety of topics related to the safety, performance, and environmental impact of aviation, emphasizing the importance of understanding both human and technological factors to ensure effective decision-making and sustainable practices.

Key Topics:

Operator Models:

Load Management: Understanding the impact of operational load on decision-making and performance.

Situation Awareness: How pilots and operators maintain awareness of both immediate and long-term conditions affecting flight safety.

Information Flow and Decision-making: Analyzing how information is processed and its role in effective decision-making in dynamic aviation environments.

Swiss Cheese Model: Understanding how system failures accumulate and how layers of safety mechanisms help to prevent accidents.

Single Pilot Operations (SPO):

Examining the increasing role of single-pilot operations in aviation and the unique challenges they pose for safety, workload management, and communication.

Communication and the Changing Role of Aviation Operators:

Exploring the evolving responsibilities of aviation operators and the importance of clear, effective communication in ensuring safety and operational efficiency.

Investigating pragmatic failures in aviation communication, including misunderstandings and misinterpretations that can lead to safety risks.

New Airspace Configurations:

Understanding how changes in airspace design and management influence aviation safety and efficiency.

Operator Stress/Load Assessment Methods:

Investigating methods to assess and measure the stress and load on aviation operators, including physiological and psychological factors that influence performance.

Exploring the latest measurement techniques and tools used to assess pilot workload and stress levels.

Virtual Reality (VR) Solutions and Smart Training:

The application of VR technology in training programs, focusing on how it can enhance safety by providing realistic, immersive scenarios for training without the risks associated with real-world flight training.

Environmental Effects of Transportation:

Air Pollution: Investigating the role of aviation in contributing to air pollution and examining strategies for reducing emissions.

Noise Pollution: Analyzing the environmental impact of aviation noise, particularly near airports, and exploring potential mitigation strategies.

Land Degradation: Understanding the indirect impacts of aviation on land use and development, particularly around airports.

Environmental Sustainability in Aviation:

Energy Efficiency: Examining methods to improve energy use within the aviation sector, including the adoption of more fuel-efficient technologies and aircraft.

Alternative Fuels: A look at the potential of alternative fuels (e.g., biofuels, hydrogen) to reduce aviation's carbon footprint.

Clean Technologies: Investigating innovations in aviation technology that aim to reduce harmful emissions and improve overall environmental sustainability.

Strategies for Reducing Aviation’s Carbon Footprint:

Policy Measures: Exploring current and future policy frameworks designed to reduce the environmental impact of aviation, such as emissions trading schemes, carbon offsets, and regulatory initiatives.

Technological Innovations: Identifying key innovations, such as electric or hybrid aircraft, that have the potential to drastically reduce aviation’s carbon emissions.

Behavioral Change: Understanding how changing operator behaviors, industry practices, and public attitudes toward aviation can contribute to environmental sustainability.

## 21. Thematics of practices

In the Aviation Safety and Environmental Awareness lecture, the practical session will involve the examination of real-world aircraft incident and accident videos, accompanied by a detailed PowerPoint presentation. During this session, we will analyze the major and contributory causes of each accident and incident, fostering a deeper understanding of aviation safety challenges.

The primary goal of this practical part is to engage students in an interactive discussion on these real-world cases, allowing them to apply the theoretical knowledge gained from previous lectures. Through analyzing video footage and discussing the incidents in-depth, students will gain insights into how safety protocols, human factors, operational models, and environmental considerations contribute to aviation safety and risk management.

Key activities during the practical session will include:

Video Analysis: Watching and analyzing aircraft incident and accident videos to identify critical safety issues.

Root Cause Investigation: Investigating both major and contributory factors involved in each incident, such as pilot errors, system failures, communication breakdowns, and environmental factors.

Group Discussion: Encouraging students to discuss potential safety improvements and preventive measures based on the incident findings.

Harmonizing Theory with Practice: Connecting theoretical concepts from previous lectures (e.g., operator models, situation awareness, decision-making, etc.) with real-world examples to reinforce learning.

Safety Recommendations: Students will work collaboratively to develop safety recommendations and mitigation strategies that could prevent similar accidents from occurring in the future.

This interactive practical session will allow students to better understand the complexities of aviation safety, the role of human and environmental factors, and the importance of continuous learning and improvement in the aviation industry.

## 22. Thematics of laboratories

-

## 23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (CAPITAL LETTERS)

The student

**a) knowledge (t)**

1. is familiar with national and international aviation regulations, compliance and guidelines to ensure the safety, quality, and environmental standards of aircraft and operations.

2. is familiar with the specific knowledge needed for safe operation of aviation-related vehicles, ensuring efficiency and safety.

3. knows the operating principles and structural components of aircraft, focusing on safety, functionality, and environmental impact.

**b) skills (k)**

1. uses systematic processes to analyze aviation incidents and environmental data, helping development of new insights and improved practices for enhancing safety and sustainability in aviation operations.

2. is able to use mathematical principles in evaluating aviation safety data, environmental impacts, and risk assessments, ensuring appropriate interpretation of key data related to safety and environmental standards.

3. utilizes digital technologies, such as simulation tools and data analysis software, to communicate and present their findings on aviation safety and environmental awareness effectively.

**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 the team

2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 100% | 1. t1-t3,k1-k3,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm test

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake from the midterm test.

**30. Consultation opportunities**

at a time and
in a form agreed
with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Heat engines and fluid machines 1.** | | | | |
| **2. … in Hungarian** | Járművek hő- és áramlástechnikai berendezései 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 28 hours | **Homework** | 0 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 24 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Simongáti Győző | **15. Email address** | simongati.gyozo@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Simongáti Győző | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Fluid dynamics, thermodynamics and heat transfer 2. (strong),<br>Basic theories of engineering (suggested),<br>Mathematics A3j (suggested) |

**19. Aim of the subject**

Classification of fluid machinery and heat engines, principles and characteristics, their function by means of vehicle engineering.

**20. Thematics of lectures**

Overview and characterisation of positive displacement compressors and their application in vehicles. Mode of operation, types, construction, control, calculation options, sizing and selection criteria.

Dynamic compressors and Turbines: Fundamentals: basic equations, head, efficiency, velocity triangles, Euler turbine equation, reaction factor, characteristic curves. Equivalence numbers and their application. Detailed discussion of radial machines (compressor and turbine). Detailed discussion of axial machines (compressor and turbine). Characteristic curves and control of fluid machines.

Basic parameters, performance data, characteristics and curves of piston engines.

Comparison of gas turbines and reciprocating engines. Description, operation, construction, theoretical and practical aspects of each type of gas turbine; ideal and real processes and optimum characteristics. Possibilities for increasing the efficiency of gas turbine engines (heat exchanger, working fluid recooling, heat input per unit, combined cycle). Basic principles of jet engine operation, propulsion efficiency and thrust.

Turbochargers.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

Centrifugal compressor map, Single stage air turbine, Operational characteristics of gas turbine and turbocharger, Piston compressor characteristics

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. will be familiar with the theoretical aspects of the topics covered in the course description and related to thermal and electrical machines and equipment, as well as the practical aspects based on laboratory measurements and analytical calculations, with particular emphasis on automotive applications, knows the advantages and disadvantages, validity criteria and fields of application of the various methods, the relevant literature, knows where to find more detailed information for each field of specialisation in order to carry out the task. (T9,T10)

**b) skills (k)**

1. be able to distinguish between different types of machines operating on and within different principles (K22,K23)
2. be able to select the appropriate equipment for a given task (K22,K23)
3. can compare different types of machines (K22,K23,K27,K32)

4. can communicate ideas and plans clearly to others (K27,K33)

**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 the team (A16)

2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical of the tasks assigned (A16)

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others (O16)

2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified (O14)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1: Centrifugal compressor map<br>2: Single stage air turbine<br>3: Operational characteristics of gas turbine and turbocharger<br>4: Piston compressor characteristics | 1. M1<br>2. M2<br>3. M3<br>4. M4 | 1. 0%<br>2. 0%<br>3. 0%<br>4. 0% | 1. t1,k4,a1-2,o1-2<br>2. t1,k4,a1-2,o1-2<br>3. t1,k4,a1-2,o1-2<br>4. t1,k4,a1-2,o1-2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 100% | t1 |

**26. Conditions for obtaining signature / midterm grade**

The conditions for having the signature at the end of the semester are the fulfilment of the laboratory practices and the acceptance of the report about the labs

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one lab exercise

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Heat engines and fluid machines 2.** | | | | |
| **2. … in Hungarian** | Járművek hő- és áramlástechnikai berendezései 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 28 hours | **Homework** | 0 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 24 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Hargitai L. Csaba | **15. Email address** | hargitai.laszlo.csaba@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Fluid dynamics, thermodynamics and heat transfer 2. (strong),<br>Basic theories of engineering (suggested),<br>Mathematics A3j (suggested) |

**19. Aim of the subject**

Classification of fluid machinery and heat engines, principles and characteristics, their function by means of vehicle engineering.

**20. Thematics of lectures**

Overview, description and application in vehicles of the machines listed below. For all machines: Mode of operation, types, structure, control, calculation possibilities, dimensioning-selection aspects, determination of working point.

Fans. Noise calculation.

Pumps. Selection, dimensioning, non-cavitation operation.

Heat exchangers.

Air conditioners for vehicles.

Refrigerators, heat exchangers. Working fluids for refrigerators and heat exchangers.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

Measurement of the operating conditions of a refrigerator. Measurement of the characteristic curve of a centrifugal pump. Measurement of the characteristic curve of a gear pump. Measurement of the operating conditions of a water-water heat exchanger.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. will be familiar with the theoretical aspects of the topics covered in the course description and related to thermal and electrical machines and equipment, as well as the practical aspects based on laboratory measurements and analytical calculations, with particular emphasis on automotive applications, knows the advantages and disadvantages, validity criteria and fields of application of the various methods, the relevant literature, knows where to find more detailed information for each field of specialisation in order to carry out the task. (T9,T10)

**b) skills (k)**

1. be able to distinguish between different types of machines operating on and within different principles (K22,K23)
2. be able to select the appropriate equipment for a given task (K22,K23)
3. can compare different types of machines (K22,K23,K27,K32)
4. can communicate ideas and plans clearly to others (K27,K33)

**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 the team (A16)

2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical of the tasks assigned (A16)

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others (O16)

2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified (O14)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Measurement of the operating conditions of a refrigerator.<br>2. Measurement of the characteristic curve of a centrifugal pump.<br>3. Measurement of the characteristic curve of a gear pump.<br>4. Measurement of the operating conditions of a water-water heat exchanger. | 1. M1<br>2. M2<br>3. M3<br>4. M4 | 1. 0%<br>2. 0%<br>3. 0%<br>4. 0% | 1. t1,k4,a1-2,o1-2<br>2. t1,k4,a1-2,o1-2<br>3. t1,k4,a1-2,o1-2<br>4. t1,k4,a1-2,o1-2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 100% | t1 |

**26. Conditions for obtaining signature / midterm grade**

The conditions for having the signature at the end of the semester are the fulfilment of the laboratory practices and the acceptance of the report about the labs

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one lab exercise

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Machine learning** | | | | |
| **2. … in Hungarian** | Gépi tanulás | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **0 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 22 hours | **Homework** | 30 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Bécsi Tamás | **15. Email address** | becsi.tamas@kjk.bme.hu |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | |
| **17. Lecturers** | Dr. Bécsi Tamás | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to enable students to acquire practical skills in understanding, developing, and applying machine learning algorithms through real-world problem solving.

**20. Thematics of lectures**

-

**21. Thematics of practices**

Throughout the course, students develop machine learning models in a Python environment (e.g. Scikit-learn, TensorFlow, PyTorch) using both structured and unstructured data. The training follows the complete machine learning workflow step by step: data preprocessing, feature selection, model selection, training, evaluation, and fine-tuning. During the lab sessions, students implement supervised and unsupervised algorithms and test their performance in realistic scenarios such as classification, prediction, and clustering.

The goal is not only to understand how algorithms work, but to be able to apply them to novel, unseen datasets and critically evaluate the results. Throughout the semester, students carry out smaller individual and group projects, develop their own models, experiment with hyperparameters, and gain experience in identifying and handling practical challenges in machine learning.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Recognizes and understands the different groups of machine learning algorithms (supervised, unsupervised, reinforcement learning).
2. Describes and defines the steps of data preparation, model selection, and evaluation in the machine learning process.

**b) skills (k)**

1. Apply basic machine learning algorithms on structured and unstructured data.
2. Implement and test machine learning models, then evaluate their performance based on real-world scenarios.

**c) attitude (a)**

1. Is open to trying new algorithms, tools, and learning methods, and is committed to data-driven thinking.

**d) autonomy and responsibility (o)**

1. Independently formulates solution proposals for new data analysis problems and creatively directs his/her own learning process.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. Homework | 1. HF | 1. 100% | 1. t1,t2,k1,k2,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

To obtain a mid-year pass, homework must be accepted.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The homework can be submitted during the delayed completion week.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Maintenance, repair and modernisation** | | | | |
| **2. … in Hungarian** | Karbantartás, javítás és modernizáció | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 27 hours | **Midterm test preparation** | 25 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Bán Krisztián, Faltin Zsolt, Dr. Markovits Tamás, Dr. Veress Árpád | | |
| **18. Indicative prerequisites** | Manufacturing (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to familiarize students with the various maintenance and repair technologies, technological methods and strategies used in railway and road vehicles, as well as in aviation industry. In addition, students will encounter current technical problems and their solutions through various case studies.

**20. Thematics of lectures**

Maintenance systems, methods, strategies (condition monitoring, inspection systems), Failure phenomena, Detection methods, Repair methods, Failure and repair of specific components, parts (case studies), Tribology, lubrication systems, Wear, corrosion, cracking, Surface restoration techniques.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

In the lab, maintenance and repair examples are presented through case studies from different fields.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the vehicle maintenance, repair and modernization technologies and processes (T1,T9,T10,T15)

**b) skills (k)**

1. is able to reproduce, adapt and interpret the elements and devices of vehicle maintenance and repair in a meaningful way (K23-K26,K34)
2. is able to communicate the ideas and plans about vehicle modernization clearly and visually to others

**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 the team (A16)
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others (O14)
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 100% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm test

**27. Final grade in percentage of performance**

Excellent 90-100%
Good 76-89%
Satisfactory 63-75%
Pass 50-62%
Fail 0-49%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake from the midterm test.

**30. Consultation opportunities**

with the teacher at a previously agreed time and form

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Management and business economics** | | | | |
| **2. … in Hungarian** | Menedzsment és vállalkozás gazdaságtan | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **3 lecture** | **0 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 20 hours | **Homework** | 0 hours |
| **Reading written materials** | 28 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Transport Technology and Economics | | |
| **14. Subject coordinator** | Dr. Kővári Botond | **15. Email address** | kovari.botond@kjk.bme.hu |
| **16. …department** | Department of Transport Technology and Economics | | |
| **17. Lecturers** | Dr. Kővári Botond | | |

**18. Indicative prerequisites**

- - -,
- - -,
- - -

**19. Aim of the subject**

To familiarize students with the basic operations, economic, marketing and human resources tasks of companies, and to prepare them to perform managerial tasks in companies.

**20. Thematics of lectures**

General overview of companies, its environment, and company forms. Types of companies, foundation in the practise. Liquidation of the companies. Competition regulation. Features of a market. Company resources, processes. Evaluation of resources. Productivity indicators, correlations. Cost definitions, correlations. Human resource management. Basic tax knowledge. Innovation and its process. Management aspects of the transportation modes.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the customer and market needs of companies' products (K,L:T2)
2. knows the costs incurred during production and the provision of services, their groups (K,L:T5)
3. is able to apply communication techniques in business life appropriately (K:T11)
4. is able to evaluate and determine the position of the market and companies, and set relevant goals (K:T15)
5. is able to evaluate basic data and information related to the market and the operation of the company (K:T9,T12;L:T9)

**b) skills (k)**

1. analyzes market needs, manages customers, performs marketing tasks (K,L:K1,K2,K5)
2. effectively manages company processes, controls costs (K:K3,K8,K30;L:K33)
3. uses communication with competitors and partners, supports decisions with economic studies (K:K7,K9,K12,K31;L:K34,S1)
4. analyzes alternative decisions, the offered portfolio, economic factors related to production (K:K16,K19,K21)
5. examines market conditions, characteristics, is able to plan the delivery of products (K:K20,K26,K29;L:K20,K32)

**c) attitude (a)**

1. strives to the best of his/her abilities to solve complex economic tasks (K,L:A1,A2,A4,A5,A11,A12)
2. strives to solve complex problems in his/her work, always taking into account multiple aspects (K,L:A7,A8,A9,A13;K:A14,A15,A18,A22)

**d) autonomy and responsibility (o)**

1. is able to solve economic and marketing problems independently or as part of a team to a high standard (K,L:O4,O5,O6,O10)
2. feels responsible for the results and quality of his work (K,L:O7,O8,O11;K:O18)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,t2,t3,t4,t5,k1,k2,k3,k4,k5,a1,a2,o1,o2<br>2. t1,t2,t3,t4,t5,k1,k2,k3,k4,k5,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm test

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake or delayed completion is only from one midterm requirement.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Manufacturing** | | | | |
| **2. … in Hungarian** | Gyártástechnológia | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **3 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 16 hours | **Exam preparation** | 16 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Markovits Tamás | **15. Email address** | markovits.tamas@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Pál Zoltán, Dr. Takács János, Dr. Markovits Tamás, Dr. Varga Ferenc László | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Material science and technology (strong),<br>- - -,<br>- - - |

**19. Aim of the subject**

Introduction to the basic phenomena, main process types and main characteristics of cutting processes used in vehicle manufacturing.

**20. Thematics of lectures**

In connection with cutting in vehicle manufacturing, the basic phenomena of cutting, machining with definite and indefinite edge geometry and its main characteristics are presented (Turning, drilling, planing, chiseling, milling, boring, thread machining, grinding and fine surface machining.) Typical vehicle component manufacturing technologies are described. Various aspects of correct manufacturing design and the main measurement methods used in manufacturing technology are presented.

**21. Thematics of practices**

During the practice, various cutting equipment, tool edge geometry, main steps of technological design, and traditional and coordinate measurement techniques help to better understand the theoretical material.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the basic characteristics of cutting processes, knows the main procedures, tools, movement conditions and main application cases. (T9,T10)
2. Knows the manufacturing accuracy relationships of the construction. (T1,T15)
3. Knows the main measurement techniques necessary for the qualification of machined parts. (T10,T15)

**b) skills (k)**

1. Is able to take into account production aspects based on the procedures and methods described, apply them where appropriate, and further deepen the production knowledge based on this. (K15,K23,K24,K27,K28,K30,K34,K41)

**c) attitude (a)**

1. Is open to new opportunities and solutions in the field.

**d) autonomy and responsibility (o)**

1. Participates responsibly in tasks and processes. (O14,O15)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 15% | 1. t1-t3,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Written exam | 1. Vizsg1 | 1. 85% | 1. t1-t3,k1,a1,o1 |

**26. Conditions for obtaining signature / midterm grade**

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points. In the semester participation in labs is mandatory. The condition of the signature is the correspondingly qualified midterm exam, fulfilment of all lab activities.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The midterm test can be retaken twice.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Manufacturing automation and digitalization** | | | | |
| **2. … in Hungarian** | Gyártásautomatizálás és digitalizáció | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **9** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **270 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 30 hours | **Homework** | 60 hours |
| **Reading written materials** | 26 hours | **Midterm test preparation** | 40 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Hlinka József | **15. Email address** | hlinka.jozsef@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Takács János, Dr. Markovits Tamás, Dr.Hlinka József, Dr. Herczeg Szabolcs, Dr. Bánlaki Pál | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Manufacturing (strong),<br>Materials of vehicles (strong),<br>Vehicle manufacturing processes 1. (strong) |

**19. Aim of the subject**

The Course objective is to provide knowledge about the principles and history of manufacturing automation, tools for flexible manufacturing, the operating principles of NC and CNC machines, the functioning of control and regulation systems, and the integration of units into systems. Linking 3D coordinate measurement technology with automated manufacturing. Overview of surface digitization methods. Introduction to PLC controls and programming. Exploring CAD/CAM integration and additive manufacturing possibilities. Metrology (integration into manufacturing) and tool monitoring. The role of robots in integrated manufacturing. Presentation of Industry 4.0 opportunities.

**20. Thematics of lectures**

Manufacturing automation systems and components, Sensors, Actuators, CNC, PLC, Robotics, Reverse engineering, Rapid prototyping, Industry 4.0, Digital twin

**21. Thematics of practices**

Robot Programming Practicum, PLC Programming Practicum, CNC Programming Practicum

**22. Thematics of laboratories**

Robot Lab, PLC Lab, CNC Lab, Surface Digitization Lab

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the automated manufacturing tools and solutions.
2. Understands the Industry 4.0 concepts.
3. Is familiar with additive manufacturing technologies, as well as PLC, CNC, and robotics systems.

**b) skills (k)**

1. Is able to apply the knowledge elements of automated manufacturing tools and capabilities, Industry 4.0, additive manufacturing technologies, PLC, CNC and robotics and related professional skills to solve problems in the field of automated manufacturing systems.

**c) attitude (a)**

1. Strives for a deeper understanding of the curriculum, and find relationships among the different topics.
2. Strives to interpret independently what has been said in lectures, practices and laboratory (relationships, statements, diagrams), to be open to thinking together with the instructor and his / her students.
3. Strives for active participation in lectures, practices and laboratory.

**d) autonomy and responsibility (o)**

1. Accepts the frameworks for completing the subject, and performs its tasks independently and responsibly, in accordance with ethical norms.

2. Apply responsibly the knowledge acquired during the course with regard to their validity limits.
3. The completed measurement tasks are carried out independently or together with other students, in accordance with the specified conditions and ethical norms.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. mindterm exam<br>2. homework 1<br>3. homework 2 | 1. ZH<br>2. HF1<br>3. HF2 | 1. 20%<br>2. 15%<br>3. 15% | 1. t1-t3,k1,a1-a3,o1,o2<br>2. t1-t3,k1,a1-a3,o1,o2<br>3. t1-t3,k1,a1-a3,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Oral exam | 1. Vizsg1 | 1. 50% | 1. t1-t3,k1,a1-a3,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points. In the semester participation in labs is mandatory and the planning task is required to be delivered to an acceptable level. The condition of the signature is the correspondingly qualified midterm exam, fulfilment of all lab activities and homeworks' submission.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The midterm test can be retaken twice, homeworks can be supplemented during the delayed completion week.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Material science and technology** | | | | |
| **2. … in Hungarian** | Anyagismeret és anyagtechnológia | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **2 \| k** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **4 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 8 hours | **Homework** | 0 hours |
| **Reading written materials** | 30 hours | **Midterm test preparation** | 28 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Bán Krisztián | **15. Email address** | ban.krisztian@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Buza Gábor, Dr. Bán Krisztián, Dr. Markovits Tamás, Dr. Dömötör Ferenc, Dr. Bánlaki Pál, Dr. Pál Zoltán, Dr. Hlinka József, Dr. Vehovszky Balázs, Dr. Katona Géza, Dr. Varga Ferenc László, Bereczki Alexandra, Erőss László, Szabados Gergely, Székely György | | |
| **18. Indicative prerequisites** | Technical chemistry (suggested),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The objective of the course is to provide students with adequate basic knowledge of structural materials and materials technology processes used in the automotive industry. This knowledge should offer a sufficient basis for their further studies and engineering work.

**20. Thematics of lectures**

In the field of material science, topics are focused on the structure and properties of metallic materials and their testing methods applied in the vehicle industry. The main topics: ideal and real crystalline structure, thermodynamics, binary phase diagrams (phase transformations), the phase diagram of the Fe-C system, metallographic structure, non-equilibrium transformations in steels, non-ferrous alloys, destructive and non-destructive testing of materials. The subject gives knowledge about the types, properties, heat treatments and comparisons of structural metallic materials for the vehicle industry (steel, cast iron, light and non-ferrous metals), characteristics and processing of plastics and composite materials. Further areas include the main processes and characteristics of casting, plastic deformation technologies, sheet metal forming, powder metallurgy and coating. Students gain insight into the most important joining technologies used in vehicle manufacturing: welding, soldering, gluing and mechanical joints.

**21. Thematics of practices**

Students acquire more practical knowledge in the field of optical microstructural analysis of alloys (metallography), reading and interpretation of binary phase diagrams, respectively the microstructural characteristics of structural materials. We introduce and demonstrate the main non-destructive testing methods for material defects. They are introduced to the practical knowledge of the system of steel grades, standards and signing. They solve simple material selection problems. Students carry out simple technological calculations related to sheet metal forming. We demonstrate the main welding technologies used in the vehicle industry.

**22. Thematics of laboratories**

Students carry out an optical microstructural and grain structure analysis of alloys (metallography), and the most important mechanical testing. We introduce them into the non-equilibrium transformation of steels and carry out heat treatment tests. Students acquire the preparation of test result documentation based on measurement data.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knowledge of the characteristics of chemical bondings.
2. Knowledge of the description method of the crystal lattice, the types of lattice defects.
3. Knowledge of the basic concepts of thermodynamics.
4. Knowledge of the process and kinetics of crystallization of the metals.
5. Knowledge of the role, types, key ideas and important phase reactions of the equilibrium phase diagrams of biner systems with special regard to stable and metastable Fe-C systems. Knowledge of the most important concepts and elements of microstructure.

6. Knowledge of the concept of non-equilibrium transformations, non-equilibrium phase diagrams of steels.
7. Knowledge of the most important types of alloys in non-iron based systems.
8. Knowledge of the processes of diffusion.
9. Knowledge of the most important methods of structural analysis, destructive and non-destructive testing.
10. Familiar with the types, characteristics of vehicle construction materials and the main technologies that influence their properties.
11. Knows the technologies of forming processes, sheet forming, casting, powder metallurgy and coating procedures.
12. Familiar with welding, soldering, adhesive bonding and mechanical joining technologies.
13. Knows national and international requirements, regulations and guidelines to ensure that products, services and processes are of good quality and fit for purpose. (T2)
14. Knows the general and specific mathematical, natural and social science principles, rules, relationships and procedures necessary for the development of the vehicle and mobile machinery field. (T9)
15. Knows the conceptual system and problem-solving methods of the vehicle and mobile machinery field. (T10)

**b) skills (k)**

1. Able to read two-component equilibrium phase diagrams.
2. Able to read the non-equilibrium transformation diagrams of steels.
3. Able to process the data of measurement, to define the most important material characteristics and to record it in a measurement report according to the professional rules.
4. Able to select raw material on the basis of the determined criteria, understand the relationship between vehicle construction materials and production technologies.
5. Able to interpret signing of a material grade.
6. Able to perform technological calculations for sheet metal forming.
7. Able to choose joining technologies.
8. Can participate in material selection, joining technology tasks.
9. Suitable for conducting quality assessment related examinations and tests. (K15)
10. Able to understand and use specialist literature, computer science and library resources specific to vehicles and mobile machinery. (K28)

**c) attitude (a)**

1. Strives for a deeper understanding of the curriculum, and find relationships among the different topics.
2. Strives to interpret independently what has been said in lectures, practices and laboratory (relationships, statements, diagrams), to be open to thinking together with the instructor and his / her students.
3. Strives for active participation in lectures, practices and laboratory.

**d) autonomy and responsibility (o)**

1. Accepts the frameworks for completing the subject, and performs its tasks independently and responsibly, in accordance with ethical norms.
2. Apply responsibly the knowledge acquired during the course with regard to their validity limits.
3. The completed measurement tasks are carried out independently or together with other students, in accordance with the specified conditions and ethical norms.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Midterm test | 1. ZH | 1. 15% | 1.: t1-t12,k1,k2,k4-k10,a1-a3,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Written exam | 1. IRV | 1. 85% | 1. t1-t16,k1-k10,a1-a3,o1-o3 |

**26. Conditions for obtaining signature / midterm grade**

During the semester students have to pass the midterm exam with a result of 50% of the maximum points. The participation in practices and labs is compulsory. The conditions for obtaining the signature are completing the midterm test, taking part in all the practices and labs.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The midterm test can be retaken once. During the delayed completion week, an combined test for the signature can be taken from the knowledge material of the entire semester. Practices and labs can be completed during the semester till the limit of participants. One of the practices or labs can be completed during the delayed completion week.

**30. Consultation opportunities**

We provide an opportunity for consultation before the mid-term assessment, and if required, we hold a consultation during the exam period.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Materials of vehicles** | | | | |
| **2. … in Hungarian** | Járműanyagok | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **6** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 8 hours | **Homework** | 40 hours |
| **Reading written materials** | 34 hours | **Midterm test preparation** | 28 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Bán Krisztián | **15. Email address** | ban.krisztian@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Bán Krisztián, Dr. Hlinka József, Dr. Vehovszky Balázs, Bereczki Alexandra | | |
| **18. Indicative prerequisites** | Material science and technology (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to provide more comprehensive knowledge about advanced structural and functional materials respectively material technologies used in vehicle manufacturing to automotive engineering students specializing in manufacturing technology.

**20. Thematics of lectures**

The lectures provide knowledge for the appropriate in-depth study of vehicle materials, bulk and surface property modifications, and for understanding their modern instrumental testing.

Topics cover:

- thermodynamic fundamentals of solid-state,
- phase transformations in solid-state and their thermodynamics,
- non-equilibrium transformations,
- possibilities of strength enhance,
- metal-gas systems,
- fundamentals of surface thermodynamics,
- purpose, types and methods of surface modifications,

Advanced materials in the vehicle industry, properties and their modifications:

- advanced high strength steels, Al-based, Mg-based and Cu-based alloys, high-performance alloys,
- ferromagnetic materials,
- composite materials and structures,
- properties and processing of polimers,
- types of advanced ceramics, their properties and production.

**21. Thematics of practices**

The exercises are intended to deepen the topics of the lectures by interpreting practical examples (measurement results, data tables, technologies, etc.). Elaboration of professional literature and personal consultation connected with the individual task of students.

**22. Thematics of laboratories**

Material testing with advanced devices: methods of spectrometry, micro-hardness testing. Quality assurance in material processes: the practical investigation of alloy and advanced ceramic parts production. Main questions of quality assurance in raw material production.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the characteristics of metallic bonding and its role in the properties of metallic systems.
2. Knows how the phase relationships, which can be read from the phase diagram, affect the properties.

3. Knows the concept and types of metastability.
4. Knows the mechanisms of strength enhancement.
5. Knows the types and properties of structural alloys applied in the vehicle industry: advanced high strength steels, lightweight metals.
6. Knows the main properties of ferromagnetic materials.
7. Knows the phase conditions are formed in metal-gas systems.
8. Knows the concept of surface modification, main purposes and procedures.
9. Knows the types and properties of non-metallic structural material applied in the vehicle industry: polimers, ceramics, composites.

**b) skills (k)**

1. Is able to analyze the results of a material testing from the point of view its advantages and limits.
2. Is able to analyze and interpret a diagram.
3. Is able to collect professional literature on a specific topic and compile a summary based on it.

**c) attitude (a)**

1. Strives to find relationships between the different topics.
2. Strives to interpret independently the curriculum of lectures and practices, to be open to thinking together with the instructor and his / her students.
3. Strives for active participation in lectures and practices.

**d) autonomy and responsibility (o)**

1. Accepts the frameworks for completing the subject, and performs its tasks independently and responsibly, in accordance with ethical norms.
2. Applies responsibly the knowledge acquired during the course with regard to their validity limits.
3. Performs tasks independently, according to the designated conditions and ethical norms.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Midterm test<br>2. Midterm test<br>3. Student assignment | 1. ZH1<br>2. ZH2<br>3. HF | 1. 25%<br>2. 25%<br>3. 50% | 1. t1-t5,k1-k2<br>2. t6-t9,k1-k2<br>3. k1-k3,o1-o3 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Students prepare a literature research about a topic agreed with the lecturer, from which they have to prepare a written summaries and hand in to the end of the semester, or perform a subtask of the research project of the department. During the semester, we have two midterm exams for which the students will be awarded. The condition of successful completion of the semester is on passing two tests and completing the assignment.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Both midterm tests can be substituted twice, the supplementation of the written work is possible during the delayed completion week.

**30. Consultation opportunities**

We provide an opportunity for consultation before the two mid-term assessments or for consultation of student assignments based on individual appointment arrangements.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Mathematics A1a** | | | | |
| **2. … in Hungarian** | Matematika A1a | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **1 \| k** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **4 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 34 hours | **Homework** | 0 hours |
| **Reading written materials** | 6 hours | **Midterm test preparation** | 24 hours | **Exam preparation** | 32 hours |
| **13. Organisational unit in charge** | Department of Stochastics (TTK) | | | | |
| **14. Subject coordinator** | Bodrogné Dr. Réffy Júlia Anna | **15. Email address** | reffyj@math.bme.hu | | |
| **16. …department** | Department of Analysis and Operations Research (TTK) | | | | |
| **17. Lecturers** | Dr. Sándor Csaba, Dr. Mikovszki Tamás | | | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

Students will learn the basics of mathematics and the fundamental mathematical concepts needed for technical thinking. In addition to this, students will develop their problem-solving skills and develop a commitment to precise, demanding engineering work through practical tasks.

**20. Thematics of lectures**

Students will learn the basics of mathematics: the use of complex numbers, differential calculus of univariate real functions, integral calculus, the analytic geometry of three-dimensional Euclidean space.

**21. Thematics of practices**

Students will learn the basic mathematical concepts necessary for technical thinking: the use of complex numbers, differential calculus of univariate real functions, integral calculus, analytic geometry of three-dimensional Euclidean space. In addition to this, students will develop their problem-solving skills and, through practice-oriented tasks, will develop a commitment to precise, demanding engineering work.

**22. Thematics of laboratories**

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Understand the principles and methods of mathematics applied in the field of engineering (T4) 2. Know the general and specific mathematical, scientific and social principles, rules, contexts and procedures for the operation of vehicles and mobile machinery (T9)

**b) skills (k)**

1. Demonstrates an understanding of mathematical concepts and expressions and the application of basic mathematical principles and processes to the interpretation of data and facts (K11)

**c) attitude (a)**

1. Choose from several options (A4)

**d) autonomy and responsibility (o)**

-

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH1 | 1. 13% | 1. t1,k1,a1 |
| 2. midterm test | 2. ZH2 | 2. 13% | 2. t1,k1,a1 |
| 3. midterm test | 3. ZH3 | 3. 14% | 3. t1,k1,a1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Exam papers | 1. V | 1. 60% | 1. t1,k1,a1 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| At least 30% completion of each midterm tests | Excellent 86-100%, 71-85%, satisfactory 55-69%, pass 40-54%, fail 0-39% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| The midterms can only be retaken once | |

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Mathematics A2a** | | | | |
| **2. … in Hungarian** | Matematika A2a | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **2 \| k** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **4 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 34 hours | **Homework** | 0 hours |
| **Reading written materials** | 6 hours | **Midterm test preparation** | 24 hours | **Exam preparation** | 32 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Stochastics (TTK) | | |
| **14. Subject coordinator** | Dr. Rónyai Lajos | **15. Email address** | lajos@math.bme.hu |
| **16. …department** | Department of Algebra and Geometry (TTK) | | |
| **17. Lecturers** | Dr. Sándor Csaba, Dr. Mikovszki Tamás | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Mathematics A1a (strong),<br>- - -,<br>- - - |

**19. Aim of the subject**

Students will learn the basics of mathematics and the fundamental mathematical concepts needed for technical thinking. In addition to this, students will develop their problem-solving skills and develop a commitment to precise, demanding engineering work through practical tasks.

**20. Thematics of lectures**

Students will learn the basics of mathematics: the main concepts and methods of linear algebra; the fundamental properties of multivariable functions; and the important series in engineering applications.

**21. Thematics of practices**

Students will learn the basic mathematical concepts necessary for engineering thinking: the main concepts and methods of linear algebra; the basic properties of multivariable functions; and the important series for engineering applications. In addition to this, students will develop their problem-solving skills and, through practice-oriented tasks, will develop a commitment to precise, demanding engineering work.

**22. Thematics of laboratories**

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Understand the principles and methods of mathematics applied in the field of engineering (T4) 2. Know the general and specific mathematical, scientific and social principles, rules, contexts and procedures for the operation of vehicles and mobile machinery (T9)

**b) skills (k)**

1. Demonstrates an understanding of mathematical concepts and expressions and the application of basic mathematical principles and processes to the interpretation of data and facts (K11)

**c) attitude (a)**

**d) autonomy and responsibility (o)**

-

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 20%<br>2. 20% | 1. t1,k1<br>2. t1,k1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Exam papers | 1. V | 1. 60% | 1. t1,k1 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| At least 30% completion of each midterm tests | Excellent 86-100%, 71-85%, satisfactory 55-69%, pass 40-54%, fail 0-39% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| The midterms can only be retaken once | |

| 30. Consultation opportunities |
|---|
| at a time and in a form agreed with the teacher |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Mathematics A3j** | | | | |
| **2. … in Hungarian** | Matematika A3j | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **3 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 30 hours | **Homework** | 0 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 24 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Algebra and Geometry (TTK) | | |
| **14. Subject coordinator** | Dr. Millkovszki Tamás | **15. Email address** | milkovszki.tamas@ttk.bme.hu |
| **16. …department** | Department of Algebra and Geometry (TTK) | | |
| **17. Lecturers** | Dr. Mikovszki Tamás | | |
| **18. Indicative prerequisites** | Mathematics A2a (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Students will learn the basics of mathematics and the fundamental mathematical concepts needed for technical thinking. In addition to this, students will develop their problem-solving skills and develop a commitment to precise, demanding engineering work through practical tasks.

**20. Thematics of lectures**

**21. Thematics of practices**

**22. Thematics of laboratories**

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Know the general and specific mathematical, scientific and social principles, rules, contexts and procedures for the operation of vehicles and mobile machinery (T9)

**b) skills (k)**

**c) attitude (a)**

**d) autonomy and responsibility (o)**

-

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,k1<br>2. t1,k1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| **26. Conditions for obtaining signature / midterm grade** | **27. Final grade in percentage of performance** |
|---|---|
| At least 30% completion of each midterm tests | |

| | |
|---|---|
| **28. Attendance and participation requirements** | Excellent 86-100%, 71-85%, satisfactory 55-69%, pass 40-54%, fail 0-39% |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| The midterms can only be retaken once | |
| **30. Consultation opportunities** | |
| at a time and in a form agreed with the teacher | |
| **31. Validity of the subject datasheet starts from:** | |
| 01 September, 2025 | |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Mechanics 1.** | | | | |
| **2. … in Hungarian** | Mechanika 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **2 \| k** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 20 hours | **Homework** | 0 hours |
| **Reading written materials** | 0 hours | **Midterm test preparation** | 24 hours | **Exam preparation** | 20 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Béda Péter | **15. Email address** | beda.peter@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Béda Péter, Dr. Forberger Árpád, Horváth Ádám, Görögh Tamás | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to impart kinematic and kinetic knowledge used in the current field.

**20. Thematics of lectures**

Kinematics of a Material Point: Basic concepts, equation of motion, trajectory, degrees of freedom, velocity, acceleration, hodograph.

Kinematics of a Rigid Body:The concept of velocity and acceleration states, elementary and finite motions of a rigid body.

Planar Motion of a Rigid Body: Velocity pole, acceleration pole. Rolling motion of a rigid body. Determining motion characteristics in coordinate systems moving relative to each other.

Dynamics of a Material Point: Newton's axioms; the concept of an inertial frame. Deriving the law of motion from the equation of motion. Momentum and angular momentum of a material point. Theorems of momentum and angular momentum. Fundamental theorem of dynamics (for a material point). Kinetic energy of a material point. Power theorem, work-energy theorem. Conservative force field, potential. Constrained motion of a material point, constraint forces. Apparent forces in coordinate systems moving relative to an inertial frame.

Dynamics of a System of Material Points: The concept of a system of points, center of mass, momentum, angular momentum, kinetic energy.

Dynamics of a Rigid Body: Momentum, angular momentum, kinetic energy. Moment of inertia. Kinematic vector system of a rigid body and the fundamental law of dynamics. Power theorem and work-energy theorem. Dynamics of a rigid body in planar motion. Dynamics of a rigid body in spatial motion.

**21. Thematics of practices**

Solving practical problems related to the theory presented in the lecture.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the mechanical principles, rules, relationships and procedures necessary for the field of vehicles and mobile machines. (T9,T10)

**b) skills (k)**

1. the student is able to apply the mechanical principles, rules, relationships and procedures necessary for the field of vehicles and mobile machines in engineering projects. (K19,K21)

**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. (A2,A4,A7,A8,A15)

2. is receptive and proactive in the performance of the tasks assigned to him/her, self-critical of the tasks assigned to him/her (A5,A11,A12,A13,A14)

**d) autonomy and responsibility (o)**

1. Comply with standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>1. ZH2 | 1. 0%<br>1. 0% | 1. t1,k1<br>2. t1,k1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 100% | 1. t1,k1,a1,a2,o1 |

**26. Conditions for obtaining signature / midterm grade**

successful completion of the midterm tests (min. 50%)

**27. Final grade in percentage of performance**

| | | |
|---|---|---|
| 0-49 | (1) | fail |
| 50-59 | (2) | pass |
| 60-69 | (3) | satisfactory |
| 70-84 | (4) | good |
| 85- | (5) | excellent |

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

The midterm tests can be replaced with the combined replacement test written in the delayed completion week.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Mechanics 2.** | | | | |
| **2. … in Hungarian** | Mechanika 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **3 \| k** |
| **6. Credits** | **5** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 40 hours | **Exam preparation** | 24 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Veress Árpád | **15. Email address** | veress.arpad@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Faltin Zsolt István | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Structural mechanics is a branch of physics, that deals with the study of the laws necessary to determine the dimensions of machines and their structural elements under given loads. During this course, the student will become familiar with the procedures necessary for the dimensioning of machines and the relationships necessary for their structural development.

**20. Thematics of lectures**

Principal mathematical calculations (Vector and Matrix calculations and Determ), computation of deformations, deflections and internal forces or stresses of structures, the definition of a solid (but not rigid) body, equivalnt stresses, methods of structural analysis, the definition of the main structural loads, the examination of the properties of different structures, stresses and displacements. This course incudes also the discussion of the energy principles in structural mechanics, stiffness methods and also the topics of beam theory, torsion, trusses, Stiffening, the theories of Betti, Maxwell and Castigliano and also the basic Hooke law and the theorem of Mohr and the Huber-Mises-Hencky criterion for tensile stresses.

**21. Thematics of practices**

Solving and practicing exercises required by the lectures.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic physical rules of structural mechanics (T9,T10)

**b) skills (k)**

1. is able to reproduce, adapt and interpret the technologies of vehicle structural mechanics and structural planning in a meaningful way
2. is able to communicate the ideas and plans about mechanics of vehicle structures clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 50% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 50% | 1. t1,k1,k2,a1,a2,o1,o2 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| successful (min. 50%) completion of the midterm test | Excellent 91-100%<br>Good 76-90%<br>Satisfactory 61-76%<br>Pass 50-60%<br>Fail 0-49% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| Second retake from the midterm test. | |

**30. Consultation opportunities**

with the teacher at a previously agreed time and form

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Mechanics 3.** | | | | |
| **2. … in Hungarian** | Mechanika 3. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 0 hours | **Midterm test preparation** | 18 hours | **Exam preparation** | 20 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Béda Péter | **15. Email address** | beda.peter@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Béda Péter, Dr. Forberger Árpád, Horváth Ádám, Görögh Tamás | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Mechanics 1. (strong),<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to impart the basic knowledge of analytical mechanics used in the current field.

**20. Thematics of lectures**

Mechanical systems, constraints, degrees of freedom, application of the power theorem (or energy balance). General coordinates, Lagrange equation of the second kind. Application of Lagrange equation of the second kind on examples. General forces in special cases (potential, dissipative, gyroscopic, excitatory) Equilibrium position, conditions for the existence of the equilibrium position, stability. Small displacements around a stable equilibrium position.

Oscillating systems with one degree of freedom. Oscillating systems with several degrees of freedom

**21. Thematics of practices**

Solving practical problems related to the theory presented in the lecture.

**22. Thematics of laboratories**

The use of MATLAB in problem solving

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the principles, rules, relationships and procedures of analytical mechanics necessary for the field of vehicles and mobile machines. (T9,T10)

**b) skills (k)**

1. the student is able to apply the principles, rules, relationships and procedures of analytical mechanics, necessary for the field of vehicles and mobile machines in engineering projects. (K19,K21)

**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. (A2,A4,A7,A8,A15)

2. is receptive and proactive in the performance of the tasks assigned to him/her, self-critical of the tasks assigned to him/her (A5,A11,A12,A13,A14)

**d) autonomy and responsibility (o)**

1. Comply with standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>1. ZH2 | 1. 25%<br>1. 25% | 1. t1,k1<br>2. t1,k1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 50% | 1. t1,k1,a1,a2,o1 |

**26. Conditions for obtaining signature / midterm grade**

successful completion of the midterm tests (min. 50%)

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

The midterm tests can be replaced with the combined replacement test written in the delayed completion week.

**27. Final grade in percentage of performance**

| | | |
|---|---|---|
| 0-49 | (1) | fail |
| 50-59 | (2) | pass |
| 60-69 | (3) | satisfactory |
| 70-84 | (4) | good |
| 85- | (5) | excellent |

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Mobhematics mechatronikája** | | | | |
| **2. … in Hungarian** | Mobil gépek mechatronikája | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **5** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 14 hours | **Homework** | 35 hours |
| **Reading written materials** | 14 hours | **Midterm test preparation** | 31 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Aradi Szilárd | **15. Email address** | aradi.szilard@kjk.bme.hu |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | |
| **17. Lecturers** | Dr. Aradi Szilárd, Doba Dániel, Csuzdi Domonkos | | |
| **18. Indicative prerequisites** | - Vehicle on-board systems 2. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The objective of the course is to introduce students to the basic concepts and practices of robotics applications, to develop their Python programming skills, and to master the principles of object-oriented programming.

During the theoretical and practical training, students will become familiar with the system architectures used in robotics and highly automated vehicle development (Robot Operating System 2- ROS2), with particular attention to the different stages of development and practical challenges, as well as the programming techniques used during development. The goal is that by the end of the course, students will be able to develop and test simple robotics applications.

**20. Thematics of lectures**

The aim of the lectures is to familiarize students with the process and memory management of modern operating systems, the architecture of the Robot Operating System 2 framework, its basic principles of operation, the basics of IP-based network communication, and the environmental sensing and basic control algorithms of robotic applications.

**21. Thematics of practices**

The practical sessions aim to familiarise students with the Linux operating system, practical applications of terminal commands, the use of the ROS2 framework, version control systems (git), and to develop their Python programming skills in practice.

**22. Thematics of laboratories**

During the lab, students will develop various robotics applications, using and integrating their acquired knowledge of Linux, ROS2, and Python. They will learn how to handle sensors and actuators and the basics of sending and receiving messages. This will enable students to develop and test simple robotics applications.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the usage of the Python language in robotics applications.
2. Knows the principles of object-oriented programming, including classes, inheritance, and polymorphism.
3. Knows the basics of the Linux operating system, including file management, command line usage, and version control.
4. Knows the basics of the ROS2 framework, including the operation of nodes, topics, and services.
5. Knows the basics of developing robotics applications, the basics of environmental perception and controlling robots.

**b) skills (k)**

1. Able to design and implement object-oriented programs in Python in a PC environment.
2. Able to design and implement robotic functions in Linux and ROS2 environments.
3. Able to use version control systems (git) and manage code.

**c) attitude (a)**

1. Open to modern robotic solutions.

2. Interested in complex system architectures and programming environments.

**d) autonomy and responsibility (o)**

1. Able to independently review a system architecture and master a programming environment.
2. Able to work in a team and participate in the design and implementation of complex robotics systems.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. homework | 1. ZH<br>2. HF | 1. 50%<br>2. 50% | 1. t1,t2,t3,t4,t5,o1<br>2. k1,k2,k3,a1,a2,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Both the midterm test and a homework must result in at least a grade of 2.

**27. Final grade in percentage of performance**

0%-40%: fail; 41%-55%: pass; 56%-70%: satisfactory; 71-85%: good; 86%-100%: excellent

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake or delayed completion is allowed for the midterm test and homework requirements.

**30. Consultation opportunities**

After prior arrangement, meetings are possible at any time during the semester, both in person and online.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Modern locomotives** | | | | |
| **2. … in Hungarian** | Korszerű vontatójármű-rendszerek | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **5** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 28 hours | **Homework** | 0 hours |
| **Reading written materials** | 30 hours | **Midterm test preparation** | 36 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Zábori Zoltán | **15. Email address** | zabori.zoltan@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Kiss Csaba, M. Szűcs Máté | | |
| **18. Indicative prerequisites** | Diesel motion power (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

To introduce railway specialization students to the novelties and characteristics of today's modern traction vehicles, as well as the basics and characteristics of their structure, operating principle and structures.

**20. Thematics of lectures**

By mastering the knowledge material, the student knows and understands the role and task of the vehicle in rail transport, the causes and consequences of the complexity of the rail transport system, the impact of the system elements and processes of rail transport on the design and properties of the vehicle, the requirements that can be formulated for a modern rail vehicle and their impact on the design and characteristics of the vehicle, the task and main characteristics of the systems and (sub)systems used on the vehicles, the design and characteristics of the energy conversion systems used on the vehicles, the different ways of supplying energy to the vehicles, their distribution, characteristics, advantages and disadvantages, the purpose, elements and their role of the life cycle management of modern rail vehicles, and by mastering the subject, the vehicle-centered synthesis of the transport system.

**21. Thematics of practices**

Vehicle technical calculations related to modern towing vehicles, examination and comparison of energy conversion systems, efficiency and environmental calculations.

**22. Thematics of laboratories**

Vehicle technical calculations related to modern towing vehicles, examination and comparison of energy conversion systems, efficiency and environmental calculations.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the characteristics and elements of railway traction vehicles.
2. Is aware of the novelties and characteristics of modern traction vehicles, and is also familiar with their structure, operating principle and the basics and characteristics of their structures.

**b) skills (k)**

1. Is able to navigate the system of physical concepts and units of measurement used in vehicle technology.
2. Is able to recognize and navigate the specifics of modern railway traction vehicles.
3. Is able to determine basic railway traction vehicle characteristics, analyze and compare different traction systems.

**c) attitude (a)**

1. Is open and receptive to new knowledge.
2. Meets the expectations of engineering work – demanding, clear and precise.

**d) autonomy and responsibility (o)**

1. Takes the first step without waiting for what others say or do.

2. Expresses own opinion on issues related to railway vehicles.
3. Solves the own task and controls it.
4. Takes responsibility for the correct documentation of the methods and procedures used.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. I. Midterm test<br>2. II. Midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,t2,k1-k3,a1-a3,o1-o4<br>2. t1,t2,k1-k3,a1-a3,o1-o4 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| | | | |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm tests

**27. Final grade in percentage of performance**

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

**28. Attendance and participation requirements**

According to the rules set out in the AER.

**29. Late completion opportunities**

The midterm tests can be made up separately in the form of one make-up and one repeated make-up.

**30. Consultation opportunities**

At a time and in a format agreed upon with the instructor.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Noise, vibration and harshness** | | | | |
| **2. … in Hungarian** | Akusztika, rezgés és komfort | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 22 hours | **Homework** | 0 hours |
| **Reading written materials** | 26 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Dömötör Ferenc | **15. Email address** | domotorf@edu.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Dömötör Ferenc | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to introduce to the basics of NVH (noise, vibration, harshness), acoustics, vibration and vehicle comfort.

**20. Thematics of lectures**

Introduction to the basics of NVH (noise, vibration, harshness), acoustics, vibration and vehicle comfort. Determining the noise characteristics of motor vehicles using a technical method. System of air and body sound excited noise sources of motor vehicles. Structural noise sources of motor vehicles, whole-vehicle acoustics. Basic concepts related to the vibrations of machines and vehicles. Basic concepts of vibration measurement and vibration analysis. Gearbox and bearing diagnostics of machines and vehicles with vibration measurement. Basic concepts related to torsional vibrations.

**21. Thematics of practices**

Instruments for noise and vibration measurement. Solving the numerical problems related to the material of the presentation.

**22. Thematics of laboratories**

Measurement of the noise level of internal combustion engine and electric vehicles in different operating conditions. Vibration measurement on the department's test bench (gearbox and bearing test). Examination of torsional vibrations with modern tools.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic concepts of NVH (noise, vibration, harshness), acoustics, vibration and vehicle comfort,
2. knows the structural noise sources of motor vehicles, and of the basic concepts of whole-vehicle acoustics.
3. get know the basic concepts related to the vibrations of machines and vehicles (measurement, analysis).
4. get know the basic concepts related to torsional vibrations.

**b) skills (k)**

1. using the knowledge about acoustics, vibration and vehicle comfort, and the related professional knowledge, is able to get involved in the solution of diagnostic tasks arising in the technical field.

**c) attitude (a)**

1. is aspired to always give the maximum of your abilities, to work accurately and error-free.
2. strives to comply with accident prevention rules and to cooperate with colleagues.

**d) autonomy and responsibility (o)**

1. feels responsible for setting an example to the peers with the quality of the work and the observance of ethical standards, responsibly applying the knowledge acquired during the subject.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,k1,a1,o1<br>2. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Passing the midterm tests.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The midterm tests can be retaken twice.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **On-board vehicle communication** | | | | |
| **2. … in Hungarian** | Járműfedélzeti kommunikáció | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 14 hours | **Homework** | 15 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 29 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Szabó Géza | **15. Email address** | szabo.geza@kjk.bme.hu |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | |
| **17. Lecturers** | Dr. Szabó Géza | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

It gives an overview about the communication techniques used in vehicles.

**20. Thematics of lectures**

The subject introduces the basic principles and basic technics of communication; and based on it, as a second step, it introduces state of the art communication systems, their features, advantages and application limits. Through complex examples it shows the system integration as well. It provides application knowledge about communication.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

Application of the principles on devices presented on lectures.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basics of the communication, the signal processing basics, the communication networks, the OSI model, the widely used vehicle communication technologies.

**b) skills (k)**

1. is able to understand the communication specifications, to identify basic communication problems and tasks and knows the basic solutions.

**c) attitude (a)**

1. participates in solving basic communication problems in vehicles.

**d) autonomy and responsibility (o)**

1. is aware of and treats the responsibility associated with the task solution during communication system problem solving.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. homework<br>3. two laboratory measurements and reports | 1. ZH<br>2. HF<br>3. JK | 1. 85%<br>2. 15%<br>3. 0% | 1. t1,k1,a1,o1<br>2. t1,k1,a1,o1<br>3. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| Successful midterm test, accepted homework and laboratory reports. | 0%-49%: fail; 50%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent |
| **28. Attendance and participation requirements** | |
| According to TVSZ | |
| **29. Late completion opportunities** | |
| The test has individual re-test and a second (paid) re-tests (in the delayed completion week). Homework can be corrected or submitted during the delayed completion week (paid). The laboratory practices can be re-taken during the delayed completion week; reports about labs can be submitted or corrected during this period (paid). | |

| 30. Consultation opportunities |
|---|
| At a time and in a form agreed with the teacher. |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Operation and diagnostics of railway vehicles** | | | | |
| **2. … in Hungarian** | Vasúti járművek üzeme és diagnosztikája | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 10 hours | **Homework** | 16 hours |
| **Reading written materials** | 24 hours | **Midterm test preparation** | 12 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Tulipánt Gergely | **15. Email address** | tulipant.gergely@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Németh István, Ferencz Péter, M.Szűcs Máté | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

To familiarize future railway vehicle engineers with the systems, processes and activities related to the homologation, operation and diagnostics of railway vehicles.

**20. Thematics of lectures**

The development of rail transportation and of its subsystems. Structure of the railway track, system of markings and signals. Markings of railway vehicles. Dangers and working conditions on the railway; special labour safety rules, fire and environmental protection in the railway operation. Accident prevention, technical rescue. EU and domestic legislation and actors of the rail transport system. System and processes of homologation of railway vehicles. Activities of Notified, Designated and Safety Assessment Bodies. Type tests of railway vehicles: bogie and vehicle body strength, brake and running dynamics tests. Establishment and mechanical equipment of depos for railway vehicle service. The role of the entities in charge of maintenance. Operational and performance indicators related to the operation of vehicles. Vehicle reliability. Application of inventory models in the operation of railway vehicles. Structure of locomotive and crew turns. Practical rules and railway instructions for train composition and train transportation. Diagnostics of the track-vehicle system. Vibration diagnostics of railway vehicles, evaluation of vibration comfort.

**21. Thematics of practices**

During the internships, students solve computational tasks in the field of traction plant processes. Calculation of the underlay required for wheel load compensation. Solve a stockpiling job. Reliability calculations. Locomotive and crew turn calculation. Determination of the power spectral density function and comfort rating number.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the structure of the railway system, its actors, the regulations and processes related to the licensing and operation of vehicles
2. Knows the type test of railway vehicles
3. Knows the safety and occupational safety rules of railway operation, the methods of technical rescu.
4. Recognizes markings used in railway operation
5. Knows the technical equipment of railway vehicle depots
6. Knows the performance and reliability characteristics related to the operation of railway vehicles
7. Knows inventory task related to the operation of railway vehicles
8. Knows the basic principle of track-vehicle system diagnosics

**b) skills (k)**

1. Able to compile and systematize relevant specifications and necessary type test measurements from the point of view of the homologation of a given railway vehicle
2. Able to explain the tasks of the different railway conformity assessment bodies and their interconnections.
3. Able to determine and analyse the reliability characteristics of railway vehicles
4. Able to use simple inventory procedures
5. Able to create computer implementations for the evaluation of vehicle diagnostic signals based on simple algorithms

**c) attitude (a)**

1. Independently interested and open to new technical solutions and procedures in the field)
2. Strives to increase the quality and reliability of railway rolling stock operation)

**d) autonomy and responsibility (o)**

1. Keeps and makes others comply with work protection and railway safety regulations.
2. Takes on responsibility for compliance of the procedures applied.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Midterm test | 1. ZH | 1. 50% | 1. t1-t3,t7,k1,k2,o1,o2 |
| 2. Railway vehicle marking system assignment | 2. F1 | 2. 10% | 2. t4,a1,a2,o1 |
| 3. Wheel load assignment | 3. F2 | 3. 10% | 3. t5,a1,a2,o2 |
| 4. Inventory assignment | 4. F3 | 4. 10% | 4. t6,k3,a1,a2,o2 |
| 5. Reliability assignment | 5. F4 | 5. 10% | 5. t7,k5,a1,a2,o2 |
| 6. Diagnostics assignment | 6. F5 | 6. 10% | 6. t8,k6,a1,a2,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Successful completion of the midterm test (min. 50%) and submission of the assignments on the lessons.

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

The midterm test can be replaced separately, and in addition, one of the mid-term requirements can be made up in the framework of repeated replacement.

**27. Final grade in percentage of performance**

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

**30. Consultation opportunities**

At a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Operation and maintenance of railway vehicles** | | | | |
| **2. … in Hungarian** | Vasúti járművek karbantartása és javítása | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 16 hours |
| **Reading written materials** | 28 hours | **Midterm test preparation** | 12 hours | **Exam preparation** | 12 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Tulipánt Gergely | **15. Email address** | tulipant.gergely@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Ferencz Péter | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

To introduce future railway vehicle engineers to railway vehicle maintenance strategies, maintenance systems, processes and activities related to maintenance, repair and production.

**20. Thematics of lectures**

The life cycle of railway vehicles, its characteristic milestones from operator tendering to scrapping and recycling. Railway vehicle operation and maintenance systems: philosophy, strategy, operational processes, theoretical foundations for the development of maintenance schedules. Service processes, locations, premises, support and service processes of vehicle operation, diagnostic stations, maintenance, repair and refurbishment. General technological processes of railway vehicle repair. Repair technological characteristics of main parts, components: technology of the frame structure, chassis and mechanical equipment (drive and brake system) elements. Operational fault detection tools for traction, towed, motorised and electric vehicles. Design of repair processes, the market environment of railway vehicle maintenance and repair, parameters influencing its possible strategy, past, present and future.

**21. Thematics of practices**

Application of knowledge learnt on lectures by practical tasks. Preparation of project task.

**22. Thematics of laboratories**

We perform laboratory measurements in the workshops of industrial partners. These include bogie load testing, wheel diameter, wheel profile, axle pin diameter, and inner dimension measurements. Carrying spring characteristics recording. Microscopic examination practice.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the main stages of the life cycle of a railway vehicle in terms of maintenance and repair.
2. knows the systems of operation and maintenance of railway vehicles, their philosophies and basic characteristics.
3. knows the technologies applicable during the maintenance and repair of railway vehicles.
4. knows the technologies applicable both in terms of main parts of railway vehicles and components.
5. knows the fault finding methods and procedures applied during the maintenance and repair of railway vehicles.

**b) skills (k)**

1. is able to recognize the maintenance and repair needs of railway vehicles.
2. is able to select the appropriate maintenance or repair technology for individual railway vehicle units.
3. is able to select and apply a fault finding method for railway vehicles.

**c) attitude (a)**

1. is interested in learning more about technical issues related to the repair and maintenance of railway vehicles.
2. is independently interested in new technical solutions in the field.

**d) autonomy and responsibility (o)**

1. expresses an independent opinion on issues related to the maintenance and repair of railway vehicles
2. takes responsibility for the adequacy of the procedures he applies.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework - essay-style compilation of a chosen topic<br>2. 10-minute presentation of a chosen topic and preparation of a presentation slide set<br>3. lab measurement reports (3 pcs) | 1. F1<br>2. F2<br>3. F3 | 1. 20%<br>2. 20%<br>3. 10% | 1. t4,a1,a2,o1<br>2. t5,a1,a2,o2<br>3. t6,k3,a1,a2,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Written exam | 1. V | 1. 50% | 1. t1-t3,t7,k1,k2,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

Submission of the assignments by the deadline or on the lessons.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

One of the mid-term requirements can be made up in the framework of repeated replacement.

**30. Consultation opportunities**

At a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Operation of ships** | | | | |
| **2. … in Hungarian** | Hajóüzemtan | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **0 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 14 hours | **Preparation for seminars** | 14 hours | **Homework** | 0 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 42 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Simongáti Győző | **15. Email address** | simongati.gyozo@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba, Dr. Simongáti Győző | | |

**18. Indicative prerequisites**

- - -,
- - -,
- - -

**19. Aim of the subject**

The aim of the course is to provide students with important information on the operation of ships.

**20. Thematics of lectures**

Types of ships. Description of navigation modes. Specialties in pushing, towing and self-propelled shipping. Knowledge of inland waterways, signs, nautical rules. Basic navigation skills. International regulatory system for inland navigation. Inland navigation authorities.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the ship operation technologies and processes

**b) skills (k)**

1. is able to reproduce, adapt and interpret the operation environment of ships in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 100% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm test

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake from the midterm test.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Pleasure craft** | | | | |
| **2. … in Hungarian** | Kishajók | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 23 hours | **Midterm test preparation** | 25 hours | **Exam preparation** | 20 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Simongáti Győző | **15. Email address** | simongati.gyozo@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Simongáti Győző | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Basic ship theory (strong),<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to introduce students to aspects of small craft not covered in other courses that deal mainly with commercial vessels and to lay the groundwork for the subsequent design course.

**20. Thematics of lectures**

Introduction, historical background. Grouping of pleasure craft, definitions, regulations for small boats. Balance of forces. Special aspects of small craft stability. Typical small ship propulsion. Speed estimation of small boats. Rudder system installations. On-board equipment.

**21. Thematics of practices**

Solving and practicing exercises required by the lectures.

**22. Thematics of laboratories**

Towing tank experiment on sailing boat - virtual laboratory by using availaable videos of towink tanks.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the pleasure craft operation technologies and processes

**b) skills (k)**

1. is able to reproduce, adapt and interpret the operation environment of pleasure craft in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 50% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. oral exam | 1. V | 1. 50% | 1. t1,k1,k2,a1,a2,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm test

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake from the midterm test.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Professional networking** | | | | |
| **2. … in Hungarian** | Szakmai kapcsolatépítés | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **7 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 20 hours | **Homework** | 22 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Lelkes Márk | **15. Email address** | lelkes.mark@edu.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Lelkes Márk | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to develop the soft skills necessary for engineering work.

**20. Thematics of lectures**

In the framework of the classes, the literature (video material, books, etc.) is processed, the individual tasks are consulted and the common task parts are discussed:

- Basics of building relationships, communication, body language, appearance, etc.,
- Conscious professional "self-branding" construction,
- Learning the basics of self-knowledge,
- Getting to know the basic logic of professional conferences,
- Types of conferences, basis for choosing between sections,
- Effective and prepared participation in conferences, both professionally and from a relational point of view, with reflection.

**21. Thematics of practices**

Based on the classes, with the help of the instructor's guidance, the students prepare professionally for a conference: by prioritizing and filtering articles and processing selected articles. This is followed by participation in a conference, followed by a professional and individual evaluation in conjunction with an instructor's consultation.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. gets familiar with the basic knowledge of self-knowledge, the basic logic of professional conferences, the basics of professional self-branding

**b) skills (k)**

1. is able to participate in a conference in a value-creating way, to increase the network of contacts

**c) attitude (a)**

1. is open to new opportunities and solutions in the field

**d) autonomy and responsibility (o)**

1. trains for a professional independent life through responsible self-development

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. reflection | 1. R | 1. 100% | 1. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Attendance at lectures and practices, participating in a pre-arranged conference within the scope of the subject, making a reflection on this in the manner learned.

**27. Final grade in percentage of performance**

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**

The basic requirement for students is attendance at lectures and practices, 30% absence is acceptable.

**29. Late completion opportunities**

The reflection can be submitted in the delayed completion week for a fee.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Prohematics Programozás** | | | | |
| **2. … in Hungarian** | Programozás | | | **3. Programme code** | jkl |
| **4. Subject code** | | | | **5. Term \| role** | **1 \| k** |
| **6. Credits** | **7** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **0 practice** | **4 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **210 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 36 hours | **Homework** | 40 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 40 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Bécsi Tamás | **15. Email address** | becsi.tamas@kjk.bme.hu |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | |
| **17. Lecturers** | Dr. Bécsi Tamás, Dr. Fehér Árpád, Dr. Szabó Ádám, Dr. Törő Olivér | | |

**18. Indicative prerequisites**

- - -,
- - -,
- - -

**19. Aim of the subject**

To develop the algorithmic thinking of engineering students through the teaching of a selected, widespread programming language.

**20. Thematics of lectures**

During the lecture, students will learn about the need for programming, control structures (branches, loops), data management, and the use of functions and data structures. The lecture introduces the fundamentals of algorithm theory and the basics of the object-oriented approach. Students will learn debugging, file management, and the application of basic algorithms (searching, sorting) through practical examples. The course prepares students for further programming and computer science studies.

**21. Thematics of practices**

-

**22. Thematics of laboratories**

The lab sessions help to deepen the practical learning of the lecture. As part of this, students perform basic programming and algorithm design tasks independently, with the help of a qualified instructor.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic concepts of computer science (K:T17;J:T21;L:T21)
2. knows the basic concepts of structured programming and the syntax of a language studied in the course (K:T17;J:T21;L:T21)
3. knows elementary algorithm design methods and their implementation options (K:T16;J:T17)
4. has knowledge of the basics of object-oriented programming (K:T16;J:T17)

**b) skills (k)**

1. Able to understand, model and measure the functioning of the physical world using digital tools, as well as to explore cause-and-effect relationships and apply them in rule-based systems. (J,K,L:K10)
2. Able to process structured data, effectively search, evaluate and manage digital content. (K:K28,K29,K30,K31;J:K36,K37,K38,K39;L:K31,K32,K33,K34)
3. Able to design, program, operate and test IT systems based on models. (K:K12,K32,K34,K35,K36;J:K12,K40,K42,K43,K44;L:K12,K35,K37,K38,K39)

**c) attitude (a)**

1. Recognizes and accepts that designing, programming, and applying digital systems involves responsibility, and strives to understand, take ownership of, and respect the consequences of professional decisions — both for themselves and others. (J,K,L:A2)
2. Strives to critically assess and select from various digital technology solutions, and to apply them in a way that achieves the desired goals with minimal use of time, effort, or resources. (J,K,L:A4,A10)

**d) autonomy and responsibility (o)**

1. Makes decisions independently and responsibly during the design and implementation of digital solutions, is capable of identifying and correcting own mistakes, and formulates proposals for optimal programming steps in a creative manner. (J,K,L:O2,O3)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test<br>3. programming homework | 1. ZH1<br>2. ZH2<br>3. HF | 1. 1/3<br>2. 1/3<br>3. 1/3 | 1. t1,t2,k1<br>2. t3,t4,k2,k3<br>3. a1,a2,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

A minimum 40% average of ZH1 and ZH2, and a minimum 40% result of HF.

**27. Final grade in percentage of performance**

Excellent: 85–100%
Good: 70–84%
Satisfactory: 55–69%
Pass: 40–54%
Fail: 0–39%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Only one of the mid-semester requirements can be made up through repeated replacement.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Propulsion and aircraft engines** | | | | |
| **2. … in Hungarian** | Propulzió és repülőgép hajtóművek | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 20 hours | **Homework** | 0 hours |
| **Reading written materials** | 30 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Rohács Dániel | **15. Email address** | rohacs.daniel@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Rohács Dániel, Dr. Veress Árpád | | |

**18. Indicative prerequisites**

- - -,
- - -,
- - -

**19. Aim of the subject**

Understanding the types, operation and systems of aircraft engines

**20. Thematics of lectures**

Propulsion (M14), gas turbine engines (M15), reciprocating engines (M16), propellers (M17/A) according to EASA Part 66.

**21. Thematics of practices**

Present practical solutions for each topic

**22. Thematics of laboratories**

Getting to know the equipment through laboratory exercises

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the aircraft engines and propulsion technologies and processes

**b) skills (k)**

1. is able to reproduce, adapt and interpret the technologies in aircraft engines and propulsion in a meaningful way
2. is able to communicate the ideas and plans about aircraft propulsion technologies clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 0% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 100% | 1. t1,k1,k2,a1,a2,o1,o2 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| successful (min. 50%) completion of the midterm tests | Excellent 88-100%<br>Good 75-87%<br>Satisfactory 63-74%<br>Pass 50-62%<br>Fail 0-49% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| Second retake from the midterm test. | |

| 30. Consultation opportunities |
|---|
| at a time and in a form agreed with the lecturers |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Propulsion of ships** | | | | |
| **2. … in Hungarian** | Hajók hajtása | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **5** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 17 hours | **Homework** | 32 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 25 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Hargitai L. Csaba | **15. Email address** | hargitai.laszlo.csaba@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba | | |
| **18. Indicative prerequisites** | Resistance of ships (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to familiarise students with the ship propulsion calculation.

**20. Thematics of lectures**

1 Types of propellers and their common operating principle.
2 Efficiency, energy loss in the propulsion system
3 Open water model experiments with propellers.
4 Concepts of thrust factor, torque factor.
5 Propeller open water characteristic curves.
6 Hull and propeller interaction.
7 Operation and selection of the propeller for a given thrust requirement or given engine power and speed.
8 Cavitation calculation.
9 Elementary propeller geometry.

**21. Thematics of practices**

Solving and practicing ship propulsion system calculations and propeller selection tasks.

**22. Thematics of laboratories**

Learn how to determine propeller thrust, required thrust, thrust deduction fraction, wake fraction and propulsion efficiency.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student
**a) knowledge (t)**
1. knows the basic physical rules about propulsion of ships
**b) skills (k)**
1. is able to reproduce, adapt and interpret the propulsion technologies of ships in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others
**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks
**d) autonomy and responsibility (o)**
1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others

2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework (making a resistance calculation and documentation) | 1. F | 1. 50% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 50% | 1. t1 |

**26. Conditions for obtaining signature / midterm grade**

submission of assignments on time or on lessons

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake from the homework.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Quality improvement methods in the automotive industry** | | | | |
| **2. … in Hungarian** | Minőségfejlesztési módszerek a járműiparban | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **0 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 22 hours | **Homework** | 0 hours |
| **Reading written materials** | 15 hours | **Midterm test preparation** | 25 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Hlinka József | **15. Email address** | hlinka.jozsef@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Hlinka József | | |
| **18. Indicative prerequisites** | Manufacturing (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The course introduces students to the fundamental concepts of quality and quality management, including the establishment, operation, review, and continuous improvement of quality management systems. Key topics include: the principles of quality management, the definition of quality, quality requirements, process modeling techniques, major process types, documentation systems for quality management activities, auditing, and relevant standards.

The corporate quality management module covers: strategic planning, management's quality-related responsibilities, quality creation methods (e.g., QFD), risk reduction techniques (fault tree analysis, FMEA), production process quality control (SPC, TPM), supplier selection, and product traceability. Measurement and inspection methodologies are also addressed, along with LEAN principles and their associated tools

**20. Thematics of lectures**

Quality Creation Methods; Control Systems, Standards, and Case Studies; Measurement and Inspection Activities, Protocols; FMEA; Auditing; LEAN and Its Tools; 8D

**21. Thematics of practices**

-

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Is familiar with fundamental quality development concepts and tools in the automotive industry.

**b) skills (k)**

1. By applying the knowledge of quality development and related professional expertise, is capable of contributing to solving tasks in automated manufacturing systems.

**c) attitude (a)**

1. Strives to identify interdisciplinary connections, independently interprets lecture content (including theories, statements, and diagrams).
2. Remains open to collaborative thinking with instructors and peers.
3. Commits to active participation in lectures.

**d) autonomy and responsibility (o)**

1. Accepts the established framework for completing the course, and within this framework, carries out tasks independently and responsibly, adhering to ethical standards.
2. Applies knowledge acquired during the course responsibly, while being mindful of its validity limits.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,k1,a1,a2,a3,o1,o2<br>2. t1,k1,a1,a2,a3,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Passing the midterm tests.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The midterm tests can be retaken twice.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Quality management** | | | | |
| **2. … in Hungarian** | Minőségügy | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 32 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Török Árpád | **15. Email address** | torok.arpad@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Török Árpád | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the lecture is to introduce students to the importance and applicability of quality management systems in different sectors of transport and the automotive industry. It also introduces students to the application of basic quality procedures.

**20. Thematics of lectures**

Topics of "Quality management in vehicle technique": the significance and importance of quality management; the development of quality systems and their characteristics in major economic regions; standards-based quality management systems and their role; quality (business excellence) awards and their role; legal frameworks for quality, regulators of quality; certification, auditing; economic aspects of quality; implementing the philosophy of 'better quality at a lower cost'; quality concepts, conformity, conformity assurance, quality characteristics, quality levels, quality creation and key phases, quality sources, quality control, organizational framework; ISO 9000 family of standards, industry quality management standards, QS 9000 and ISO TS16949 standards, environmental management system, integrated quality management systems, process integrated quality management system, quality awards, TQM; self-monitoring, team culture, project culture, project management, continuous improvement, PDCA principle, problem solving and techniques.

**21. Thematics of practices**

Students will learn about different applications of FMEA, 5S, VSM, QVSM methods.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic concepts and tools of quality in the automotive industry.

**b) skills (k)**

1. is able to apply basic quality methods.

**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 | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH1 | 1. 50% | 1. t1,k1,a1,o1 |

| | | | |
|---|---|---|---|
| 2. midterm test | 2. ZH2 | 2. 50% | 2. t1,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| Passing the midterm tests | 0-<50%: fail (1),<br>50-<62%: pass (2),<br>62-<75%: satisfactory (3),<br>75-<87%: good (4),<br>87-100%: excellent (5). |
| **28. Attendance and participation requirements** | |
| According to TVSZ | |
| **29. Late completion opportunities** | |
| The midterm tests can be retaken twice. | |

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Railway vehicle mechatronics** | | | | |
| **2. … in Hungarian** | Vasúti jármű mechatronika | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **7 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 36 hours | **Midterm test preparation** | 16 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Kemény Zsolt | **15. Email address** | kemeny.zsolt@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Kemény Zsolt | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

To prepare future railway engineers for correct interpretation and handling of legacy vehicle mechatronics solutions, as well as for technically correct solution of new mechatronics problems with a skill- and toolset that includes modern solution approaches

**20. Thematics of lectures**

Mechatronics as the integreted application of vehicle engineering, electricity, computer and control engineering. Sensors and actuators. Signal conditioning. Data display systems. Mechanical, hydraulic, pneumatic and electrical systems. System models and transfer properties: equations of motion, signal flow graph, response in time and frequency domains. Equivalence of mechanical systems and electric networks: Hähnle–Firestone analogy (mobility approach), Trent analogy ("through" and "across" quantities). Electronically controlled secondary suspension improving running characteristics. Control with electronics. Analog circuits: application of operational amplifiers. Digital circuits: logic gates, programmable logical devices, processors. Requirements of embedded systems, real-time systems. Structure and programming of microcontrollers.

**21. Thematics of practices**

Demonstration and practice of the methods presented in the lectures through practical examples.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Has comprehensive knowledge of basic facts, trends, limitations of the technical field of study and the expected core professional competencies, which include and describe knowledge, ability, attitude, as well as autonomy and responsibility.

**b) skills (k)**

1. Acquires and applies knowledge of the railway vehicle mechatronics and its principles, e.g., by making reasonable predictions regarding causes and effects, elaborating tests of the predictions, and making measurements relying on appropriate measurement units, tools, and equipment.
2. Capability of basic analysis of the chosen railway disciplines that make up the knowledge system of the field, of synthetic expression of its relationships and of adequate evaluation activities.
3. Ability of identifying routine problems, exploring the theoretical and practical backgrounds necessary for their solution, and elaborating solutions through the practical application of standard approaches in the field of railway vehicle mechatronics.
4. Ability of modeling railway vehicle mechatronics systems and processes.
5. Applies data processing methods (digital competency).
6. Elaborates control systems.

**c) attitude (a)**

1. Acquires ability of independent critical thinking.
2. Considers multiple options.
3. Strives to achieve objectives with minimal time, effort, or cost.
4. Demonstrates a positive attitude towards new, challenging needs that can only be met through life-long learning.
5. Open to learning, internalizing, and authentically sharing professional, technological development and innovation in the field of vehicles and mobile machinery.

**d) autonomy and responsibility (o)**

1. Critically evaluates authenticity and trustworthiness of information before using it or sharing it with others.
2. Uncovers the shortcomings of technologies used, the risks of related processes, and takes actions to reduce or mitigate them.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Midterm test (1st)<br>2. Midterm test (2nd) | 1. ZH-1<br>2. ZH-2 | 1. 50%<br>2. 50% | 1. t1,k1-k6,a1-a5,o1,o2<br>1. t1,k1-k6,a1-a5,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Successful (min. 50%) completion of both midterm tests

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Both midterm tests can be retaken once. Second retake is only for one midterm requirement.

**30. Consultation opportunities**

1. During the lecture preceding each midterm test
2. At a time and in a form agreed upon with the lecturer

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Railway vehicle structures 1.** | | | | |
| **2. … in Hungarian** | Vasúti járműszerkezetek 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 28 hours | **Homework** | 24 hours |
| **Reading written materials** | 14 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 24 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Tulipánt Gergely | **15. Email address** | tulipant.gergely@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Tulipánt Gergely | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

To introduce railway specialization students to the basics and specifics of the construction, operation, and structure of railway vehicles and track/vehicle systems.

**20. Thematics of lectures**

Classification an basic characteristics of railway vehicles and trains. Characteristics of railway tarck and track-vehicle connection. Excitation from the track. Dynamic effect of the curve and transmission curve tracks. Mechanics of the accelerating and the braking, speed-timing diagrams. Variation in axle-load. Motion of railway vehicles on straight an curved track. Running safety. Running comfort. Computation of the restricting of lateral geometry, of variation in axle-load, of the turn-force in curving.

**21. Thematics of practices**

Basic calculations in railway engineering: calculation of vehicle running characteristics; narrowing calculation; deflection calculation; determining the change in wheel load during traction; flow chart calculation, calculation of suspension and damping characteristics.

**22. Thematics of laboratories**

Basic calculations in railway engineering: calculation of vehicle running characteristics; narrowing calculation; deflection calculation; determining the change in wheel load during traction; flow chart calculation, calculation of suspension and damping characteristics.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1 - Knows the characteristics and main elements of railway vehicles. (T7, T9-T13)

2 - Knows the basic connections of the track/vehicle system and their application possibilities. (T3, T4, T9, T13)

**b) skills (k)**

1. Able to navigate the system of physical concepts and units used in vehicle technology. (K17,K26-K30)

2. Able to recognize and navigate in the field of specifics related to railway vehicles. (K19-20, K22-23)

3 - Able to determine basic railway track/vehicle characteristics. (K17, K27-K30)

**c) attitude (a)**

1 - His/her attitude is characterized by openness and receptiveness to new knowledge; (A16-A17)

2 - His/her work meets the expectations of engineering work – demanding, clear and precise; (A3-A5)

**d) autonomy and responsibility (o)**

1. - Takes the first step without waiting for what others say or do. (O1) 2 - Expresses his/her own opinion on issues related to railway vehicles. (O12) 3 - Solves his/her own task and controls it. (O12, O13)

4. - Takes responsibility for the correct documentation of the methods and procedures used. (O15)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. I. Term paper<br>2. II. Term paper<br>3. Semester assignment | 1. ZH1<br>2. ZH2<br>3. F | 1. 20%<br>2. 20%<br>3. 20% | 1. t1, t2, t4, t5, t9, t13, k1, k2, k3, a1, a2, o1, o2<br>2. t1, t2, t4, t5, t9, t13, k1, k2, k3, a1, a2, o1, o2 3. t1, t3, k1, a1, a2, o1, o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Exam | 1. V | 1. 40% | 1. t1, t2, t4, t5, t9, t13, k1, k2, k3, a1, a2, o1, o2 |

**26. Conditions for obtaining signature / midterm grade**

The end-of-year grade is the average of the grades of the two semester papers (which must account for the learning outcomes achieved during the semester, at least at an appropriate level) with a weight of 20% each, the exam with a weight of 40%, and the grade received for the semester assignment with a weight of 20%. A satisfactory grade is conditional on the full achievement of the expected learning outcomes!

**27. Final grade in percentage of performance**

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

**28. Attendance and participation requirements**

According to the rules set out in the AER.

**29. Late completion opportunities**

The midterm tests can be retaken separately, with one retake and one retake, and the exam can be retaken once. The semester assignment can be corrected.

**30. Consultation opportunities**

At a time and in a format agreed upon with the instructor.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Railway vehicle structures 2.** | | | | |
| **2. … in Hungarian** | Vasúti járműszerkezetek 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **5** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 28 hours | **Homework** | 24 hours |
| **Reading written materials** | 14 hours | **Midterm test preparation** | 28 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Tulipánt Gergely | **15. Email address** | tulipant.gergely@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Tulipánt Gergely, Krémer Miklós | | |
| **18. Indicative prerequisites** | Railway vehicle structures 1. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

To introduce railway specialization students to the basics and specifics of the construction, operation, and structure of railway vehicles and track/vehicle systems.

**20. Thematics of lectures**

Railway running gears. Construction and dimensioning of wheel sets. Layaut of runnig gear and spring suspension. Bogies. Buffers and draw gears. Brake systems of railway vehicles. Underframes and suoerstructures of railway cars and carriages. Internal equipment of passanger carriages. Heating, air conditioning and electric devices. Special freight car equipments. Special railway vehicles. Main characters of the braking of railway vehicles. Layut and operation of the mechanical-, pneumatical- and electro-mechanical brake systems. Block-, disc- and drum brake systems. Layout and dimensioning of the brake linkage. Hand brakes. Central brake valves, and brake valves for driver. Pneumatical load changeovers. Location of the brake devices in the vehicle. Electro-magnetic and eddy current track brakes. Anti-sleep systems. Heat-action and heating during the braking. Operation of the braking, compotation of the stoppint distance. Train formation on the basis of braking considerations. Braking of the long trains. Braking of the hight-speed trains. Longitudinal dynamics of braking.

**21. Thematics of practices**

Strength control calculations for railway vehicle structures

**22. Thematics of laboratories**

Strength control calculations for railway vehicle structures

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1 - Knows the characteristics and elements of railway vehicles. (T7, T9-T13)

2 - Knows the basic relationships of the track/vehicle system and their application possibilities. (T3, T4, T9, T13) 3 - Knows the factors and forces determining the main motion of railway vehicles. (T3, T7, T9-T13)

4 - Knows the characteristics of the force transfer between the driven vehicle wheel and the supporting surface. (T3, T7, T9-T13)

5 - Knows the methods for solving the equations of motion of the vehicle. (T7, T9, T10)

6 - Knows the parasitic motion forms of vehicles and their determination methods. (T3, T7, T9-T13) 7- Knows the structure and operating principles of railway braking systems. (T7, T9-T13)

**b) skills (k)**

1. Able to navigate the system of physical concepts and units used in vehicle technology. (K17,K26-K30)

2. Able to recognize and navigate in the field of specifics related to railway vehicles. (K19-20, K22-23)

3. Able to determine basic railway track/vehicle characteristics. (K17, K27-K30) 4. Able to recognize and determine basic kinetic and dynamic characteristics related to railway vehicles. (K17, K26-K30)

**c) attitude (a)**

1 - His/her attitude is characterized by openness and receptiveness to new knowledge; (A16-A17)

2 - His/her work meets the expectations of engineering work – demanding, clear and precise; (A3-A5) 3 - He/she is also independently interested in new technical solutions in the subject area. (A17,A18)

**d) autonomy and responsibility (o)**

1. - Takes the first step without waiting for what others say or do. (O1) 2 - Expresses his/her own opinion on issues related to railway vehicles. (O12) 3 - Solves his/her own task and controls it. (O12, O13)

4. - Takes responsibility for the correct documentation of the methods and procedures used. (O15)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. I. Term paper<br>2. II. Term paper<br>3. Semester assignment | 1. ZH1<br>2. ZH2<br>3. F | 1. 40%<br>2. 40%<br>3. 20% | 1. t1, t2, t4, t5, t9, t13, k1, k2, k3, a1, a2, o1, o2<br>2. t1, t2, t4, t5, t9, t13, k1, k2, k3, a1, a2, o1, o2 3. t1, t3, k1, a1, a2, o1, o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

The mid-term grade: the average of the grades of the two mid-term papers (in which the learning outcomes achieved during the semester must be reported, at least at an appropriate level) with a weight of 40% each and the grade received for the mid-term assignment with a weight of 20%. The condition for a satisfactory grade is the full fulfillment of the expected learning outcomes!

**27. Final grade in percentage of performance**

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

**28. Attendance and participation requirements**

According to the rules set out in the AER.

**29. Late completion opportunities**

The midterm test can be made up separately in the form of one make-up and one repeated make-up. The semi-annual assignment can be corrected.

**30. Consultation opportunities**

At a time and in a format agreed upon with the instructor.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Reliability and safety** | | | | |
| **2. … in Hungarian** | Megbízhatóság és biztonság | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **7 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 28 hours | **Midterm test preparation** | 24 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Bartha Tamás | **15. Email address** | bartha.tamas@kjk.bme.hu |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | |
| **17. Lecturers** | Dr. Bartha Tamás, Dr. Baranyi Edit, Lövétei István Ferenc, Farkas Balázs | | |
| **18. Indicative prerequisites** | Electrotechnics - Electronics (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to familiarise students with the assessment and management of the risks posed by the threats to road safety. It introduces the options and strategies for managing faults and achieving as well as maintaining safety. Provides insight into the development process of safety-critical traffic systems.

**20. Thematics of lectures**

The purpose and place of traffic automation in the transport system. The role of vehicle control devices in creating and maintaining traffic safety. Sources of danger in traffic. The concept and calculation of risk in transport systems. The concept of technical safety, risk reduction, risk tolerance. The relationship between reliability and safety. Fault management and safety strategies. Development processes for safety critical systems. Safety integrity levels.

**21. Thematics of practices**

The concept and parameters of dependability. Reliability of elements and systems. Methods to increase reliability. The concept and types of redundancy. Dependability of repairable systems. Availability. Comparison of different redundancy and repair methods. Reliability calculations. Reliability parameter calculations for serial, parallel and other reliability system structures. Markov models and calculations.

**22. Thematics of laboratories**

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**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the key terminology, the key relationships and the theoretical background related to safety

**b) skills (k)**

1. can apply the principles and methods of analysis, calculation and modelling of safety-critical traffic systems
2. can assess threats to traffic systems, the risk they pose and their impact on safety
3. Students can identify faults in the traffic systems and select a strategy to deal with them
4. can apply basic safety engineering methods and solutions, designing a system architecture to meet specific requirements

**c) attitude (a)**

1. monitors the best practice, and the legislative, technical, technological and administrative changes in the field of safety critical traffic systems

**d) autonomy and responsibility (o)**

1. identifies technology gaps and process risks and initiates mitigating actions

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test 1<br>2. midterm test 2 | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,k1,k2,k3,k4,a1,o1<br>2. t1,k1,k2,k3,k4,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Successful (min. 50%) completion of the midterm tests.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The two midterms can be retaken during the semester or the late completion period.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Resistance of ships** | | | | |
| **2. … in Hungarian** | Hajók ellenállása | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 12 hours |
| **Reading written materials** | 12 hours | **Midterm test preparation** | 0 hours | **Exam preparation** | 14 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Hargitai L. Csaba | **15. Email address** | hargitai.laszlo.csaba@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba | | |
| **18. Indicative prerequisites** | Fluid dynamics, thermodynamics and heat transfer 1. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to familiarise students with the ship resistance calculation.

**20. Thematics of lectures**

Flow and wave pattern around the ship. Floatation of ships during motion. Planing. Resistance of the ships. Methods for determination of resistance and thrust. Model testing.

**21. Thematics of practices**

Determination of ship total resistance by different computation methods. Practicing on worked out example calculations.

**22. Thematics of laboratories**

Determination of ship total resistance experimentally and by computer (computer laboratory).

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic physical rules about resistance of ships

**b) skills (k)**

1. is able to reproduce, adapt and interpret the resistance of ships in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework (making a resistance calculation and documentation) | 1. F | 1. 50% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 50% | 1. t1 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| submission of assignments on time or on lessons | Excellent 88-100%<br>Good 75-87%<br>Satisfactory 63-74%<br>Pass 50-62%<br>Fail 0-49% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| Second retake from the homework. | |

| 30. Consultation opportunities |
|---|
| at a time and in a form agreed with the teacher |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Sensors and actuators** | | | | |
| **2. … in Hungarian** | Érzékelők és beavatkozók | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **5** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 14 hours | **Homework** | 0 hours |
| **Reading written materials** | 49 hours | **Midterm test preparation** | 31 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Aradi Szilárd | **15. Email address** | aradi.szilard@kjk.bme.hu |
| **16. …department** | Department of Control for Transport and Vehicle Systems | | |
| **17. Lecturers** | Dr. Aradi Szilárd, Dr. Soumelidis Alexandros | | |
| **18. Indicative prerequisites** | Electrotechnics - Electronics (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to develop a comprehensive systems-oriented perspective in which measurement, signal processing, and control are understood and applied as an integrated whole.

**20. Thematics of lectures**

The aim of the lectures is to provide a theoretical foundation for understanding the key concepts and methods related to sensing, signal processing, and control in mechatronic systems. The first part of the course covers the basics of analog and digital measurement techniques, the effects of measurement errors and noise, as well as the theory of sampling, quantization, and analog-to-digital conversion. The operation of sensors commonly used in mechatronic systems is introduced, with a focus on temperature, pressure, force, torque, and MEMS-based inertial sensors. This is followed by the mathematical fundamentals of signal processing, including filtering, noise reduction, spectral analysis, and digital filters (FIR, IIR). In the second part of the course, the operation and control principles of electrical actuators—particularly DC, BLDC, PMS, AC, and stepper motors—are discussed. Through modeling and control strategies, the course presents methods for implementing position and speed control in microcontroller-based systems. The lectures aim to give students a comprehensive understanding of the entire measurement and control chain in modern mechatronic systems.

**21. Thematics of practices**

The aim of the practice sessions is to apply the theoretical knowledge gained during the lectures to real-world mechatronic problems. Students start with basic measurement tasks, working with different sensors (e.g., temperature, pressure, inertial) to perform signal conditioning and data acquisition in a microcontroller-based environment. They then carry out sampling, A/D conversion, and implement digital filters in real time. During the sessions, students also develop and test signal processing algorithms—such as simple decision-making, estimation, and filtering procedures—on microcontroller platforms. In the second half of the semester, the focus shifts to motor control: students implement speed and position control for DC motors and explore the control of BLDC, PMS, and stepper motors using various circuit solutions. The connection between control system design in Matlab and microcontroller-based implementation is also emphasized. The goal of the practical work is to integrate sensing, signal processing, and actuation into a functional mechatronic system.

**22. Thematics of laboratories**

The aim of the laboratory sessions is to deepen and organize the knowledge acquired during the exercises through more complex, real-world vehicle mechatronics measurement tasks. Working in small groups, students learn the precise execution of measurement procedures, data collection, and the proper preparation of measurement reports. During the labs, they apply various sensors, signal processing methods, and motor control techniques in a microcontroller-based environment. A key focus of the sessions is to develop teamwork, strengthen engineering thinking, and enhance practical skills.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Understands the theoretical foundations of measurement, signal processing, and control methods used in vehicle mechatronic systems.

2. Has insight into the operation of various sensors, data acquisition steps, and the principles of analog and digital signal processing.
3. Possesses the knowledge required for modeling and controlling electric motors.
4. Is familiar with the possibilities of microcontroller-based implementation.

**b) skills (k)**

1. Able to design and implement measurement and control tasks in a microcontroller environment.
2. Applies digital signal processing techniques (e.g., filtering, estimation, decision-making) in real-time systems.
3. Capable of controlling and regulating various types of electric motors (DC, BLDC, PMS, AC, stepper).
4. Analyzes the behavior of vehicle mechatronic systems and evaluates control performance both in simulation and in real applications.

**c) attitude (a)**

1. Open to applying modern measurement and control technologies.
2. Strives to implement precise, reliable, and efficient systems.
3. Shows interest in the interdisciplinary connections between sensing, signal processing, and control.
4. Committed to systems-oriented and integrated thinking.

**d) autonomy and responsibility (o)**

1. Capable of independently solving complex sensing and control tasks.
2. Takes responsibility for the operation, reliability, and quality of the designed systems.
3. Demonstrates initiative in system design and debugging tasks.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test 1.<br>2. midterm test 2. | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,t2,k1,k2,a1,a2,a3,a4,o1,o2,o3<br>2. t3,t4,k3,k4,a1,a2,a3,a4,o1,o2,o3 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Students are required to complete midterm tests during the semester. To earn a midterm grade, each test must be passed with a minimum grade of 2 (sufficient).

**27. Final grade in percentage of performance**

0%-50%: fail; 51%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake or delayed completion is allowed for both midterm requirements (two midterm tests).

**30. Consultation opportunities**

After prior arrangement, meetings are possible at any time during the semester, both in person and online.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Ship construction** | | | | |
| **2. … in Hungarian** | Hajóépítés | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 10 hours | **Homework** | 0 hours |
| **Reading written materials** | 48 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | | | |
| **14. Subject coordinator** | Dr. Hargitai L. Csaba | **15. Email address** | hargitai.laszlo.csaba@kjk.bme.hu | | |
| **16. …department** | Department of Aeronautics and Naval Architecture | | | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba | | | | |
| **18. Indicative prerequisites** | Ship structures (strong),<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

**20. Thematics of lectures**

Structure and organisation of shipyards. Special requirements of technologies of shipyards.

Loftwork. Model fabrication and shell expansion. Material handling. Pate and section preparation. Prefabrication in workshops, manufacturing of sections. Cutting, bending and embossing technologies. Welding technology. Works on slipway. Technologies for watertight check of joints. Shaft laying technology. Painting and corrosion protection. Launching works.

Manufacturing by bank. Ship repair. Ship tests. The role of classification associations during shipbuilding.

**21. Thematics of practices**

Solving and practicing numerical examples necessary for the acquisition of the theoretical part of the curriculum.

Shipyard visits.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the ship construction technologies and processes

**b) skills (k)**

1. is able to reproduce, adapt and interpret the steps and measures of ship construction in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 100% | 1. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

successful (min. 50%) completion of the midterm test

**27. Final grade in percentage of performance**

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. Late completion opportunities**

Second retake from the midterm test.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Ship electronics systems** | | | | |
| **2. … in Hungarian** | Hajó-elektronikai rendszerek | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **7 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 28 hours | **Preparation for seminars** | 15 hours | **Homework** | 0 hours |
| **Reading written materials** | 24 hours | **Midterm test preparation** | 23 hours | **Exam preparation** | 0 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Hargitai L. Csaba | **15. Email address** | hargitai.laszlo.csaba@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba | | |

**18. Indicative prerequisites**

- - -,
- - -,
- - -

**19. Aim of the subject**

The aim of the course is to familiarize students with the electronic systems used in shipping.

**20. Thematics of lectures**

Onboard power supply and power distribution systems. Fundamentals of ship automation

Electronic navigation and communication equipment. Design considerations for integrated bridge and deck systems. Integration of electronic systems into the ship structure. Safety and redundancy factors in the design of electronic systems. Application of standards and regulations

**21. Thematics of practices**

Solving and practicing numerical examples necessary for the acquisition of the theoretical part of the curriculum.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the electronic systems of ships

**b) skills (k)**

1. is able to reproduce, adapt and interpret the content of ship electronics systems in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test | 1. ZH | 1. 100% | 1. t1,k1,k2,a1,a2,o1,o2 |

| | | | |
|---|---|---|---|
| **25. Exam assessments** | | | |
| **Name** | **Code** | **Share in final grade** | **Assessed learning outcomes** |
| - | - | - | - |

| | |
|---|---|
| **26. Conditions for obtaining signature / midterm grade** | **27. Final grade in percentage of performance** |
| successful (min. 50%) completion of the midterm test | Excellent 88-100%<br>Good 75-87%<br>Satisfactory 63-74%<br>Pass 50-62%<br>Fail 0-49% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| Second retake from the midterm test. | |
| **30. Consultation opportunities** | |
| at a time and in a form agreed with the teacher | |
| **31. Validity of the subject datasheet starts from:** | |
| 01 September, 2025 | |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Ship machinery** | | | | |
| **2. … in Hungarian** | Hajógépek | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 14 hours | **Homework** | 15 hours |
| **Reading written materials** | 15 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Simongáti Győző | **15. Email address** | simongati.gyozo@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba, Dr. Simongáti Győző | | |
| **18. Indicative prerequisites** | Heat engines and fluid machines 1. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to familiarise students with the main and auxiliary power systems of ships.

**20. Thematics of lectures**

Typical drive-train systems. Main engine types in general. Criteria for selecting the drive train system. Main characteristics of marine diesel engines, gas cycle processes, performance and efficiency, structural design and characteristic curves. Suction, charge and injection systems, auxiliary and starter equipment, fuel consumption, environmental pollution and protection. Construction details of diesel engines.

Typical gearbox designs. Gearbox, thrust bearing types. Elements of the shaft system. Design of the stern tube. Stern tube bearings.

Types of Auxiliary Machines. Control of the main and auxiliary plant.

**21. Thematics of practices**

Design of a main machinery system of a vessel, selecting the parts of the system, drawing a scheme.

**22. Thematics of laboratories**

Hull-Engine-Propeller interaction simulation with software.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the ship machinery technologies and processes

**b) skills (k)**

1. is able to reproduce, adapt and interpret the operation of ship machinary in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. homework (specification and drawing of propulsion system) | 1. ZH<br>2. F1 | 1. 75%<br>2. 25% | 1. t1,k1,k2,a1,a2,o1,o2<br>2. t1,k1,k2,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| submission of assignments on time or on lessons and successful (min. 50%) completion of the midterm test | Excellent 88-100%<br>Good 75-87%<br>Satisfactory 63-74%<br>Pass 50-62%<br>Fail 0-49% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| Second retake or delayed completion is only from one midterm requirement. | |

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Ship structures** | | | | |
| **2. … in Hungarian** | Hajószerkezettan | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 18 hours | **Homework** | 20 hours |
| **Reading written materials** | 16 hours | **Midterm test preparation** | 24 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Aeronautics and Naval Architecture | | |
| **14. Subject coordinator** | Dr. Simongáti Győző | **15. Email address** | simongati.gyozo@kjk.bme.hu |
| **16. …department** | Department of Aeronautics and Naval Architecture | | |
| **17. Lecturers** | Dr. Hargitai L. Csaba, Dr. Simongáti Győző | | |
| **18. Indicative prerequisites** | Mechanics 2. (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to introduce the main aspects of the structural design of ships.

**20. Thematics of lectures**

Shipbuilding materials. Midship section types. The most important structural elements. Models of hull strength. Framing systems. The forces acting on the ship. The concept of longitudinal strength and its calculation methods. Local stresses. Bulkhead strength. Classification society regulations. Verification of the conformity of structural elements according to regulations. Calculation of cross section inertia of a midship section.

**21. Thematics of practices**

Verification of the conformity of structural elements according to regulations. Calculation of cross section inertia of a midship section.

**22. Thematics of laboratories**

Drawing of ship structures in 2D and 3D. Longitudnial strength calculation by using a dedicated software.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic physical rules about ship structures

**b) skills (k)**

1. is able to reproduce, adapt and interpret the technologies of ship structures in a meaningful way
2. is able to communicate the ideas and plans about ships clearly and visually to others

**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 the team
2. is receptive and proactive in the performance of the tasks assigned to itself, self-critical towards the assigned tasks

**d) autonomy and responsibility (o)**

1. comply with and enforce environmental and social standards in their chosen field of work, and are able to self-monitor and correct errors independently, while listening to the professional opinions of others
2. makes responsible decisions in solving tasks in the chosen field of activity, formulating independent proposals to solve the challenges identified

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. homework (midship section drawing) | 1. ZH<br>2. F1 | 1. 60%<br>2. 40% | 1. t1,k1,k2,a1,a2,o1,o2<br>2. t1,k1,k2,a1,a2,o1,o2 |

| | | | |
|---|---|---|---|
| | | | |

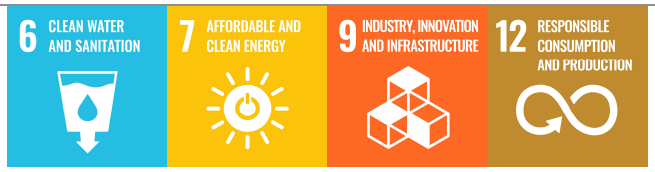
| 25. Exam assessments | | | |
|---|---|---|---|
| **Name** | **Code** | **Share in final grade** | **Assessed learning outcomes** |
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| submission of assignments on time or on lessons and successful (min. 50%) completion of the midterm test | Excellent 88-100%<br>Good 75-87%<br>Satisfactory 63-74%<br>Pass 50-62%<br>Fail 0-49% |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| Second retake or delayed completion is only from one midterm requirement. | |

| 30. Consultation opportunities |
|---|
| at a time and in a form agreed with the teacher |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Technical chemistry** | | | | |
| **2. … in Hungarian** | Műszaki kémia | | | **3. Programme code** | jkl |
| **4. Subject code** | **BMEVEKTAKO1** | | | **5. Term \| role** | **1 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **0 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 11 hours | **Homework** | 3 hours |
| **Reading written materials** | 20 hours | **Midterm test preparation** | 4 hours | **Exam preparation** | 10 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Chemical and Environmental Process Engineering (VBK) | | |
| **14. Subject coordinator** | Dr. Kun Róbert | **15. Email address** | kun.robert@vbk.bme.hu |
| **16. …department** | Department of Chemical and Environmental Process Engineering (VBK) | | |
| **17. Lecturers** | Dr. Kun Róbert | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to provide students with fundamental chemical knowledge related to energy production, technical fluids, and structural materials, and to apply this knowledge in practice. Students will gain insight into the chemistry of energy carriers, fuels, water treatment, lubricants, corrosion protection, and electrochemical power sources, along with relevant laboratory testing methods.

**20. Thematics of lectures**

An overview of general chemistry knowledge to understand the curriculum. Chemical aspects of energy production, environmental issues: Basic concepts of combustion technology, Coal (in brief), Petroleum and natural gas as energy and chemical raw materials (overview), Properties of motor fuels, production, combustion, exhaust gas cleaning, Principle of nuclear energy release, nuclear reactors (in brief), Characterization of alternative energy sources (in general), Alternative motor fuels, Chemical power sources (galvanic cells, batteries, fuel cells). Technical fluids: Characterization, preparation, wastewater and treatment of waters used in industrial practice, Characterization, production, grouping, wear of lubricants (mainly motor oils). Chemistry of structural materials: General properties of structural materials, Main types of ceramics, their properties, Structure and properties of metals, production (in brief), corrosion and corrosion protection of major metals, metals, Characterization of macromolecules, main types, properties of plastics, their production (in brief).

**21. Thematics of practices**

.

**22. Thematics of laboratories**

Catalytic cleaning of Otto engine exhaust, engine energy balance, Ion exchange water treatment, Lubricants (engine oils and machine greases), Electrochemistry (chemical power sources, electrolysis), Corrosion of metals

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the basic thermodynamic laws of chemical transformations, electrochemical relations related to electrochemical corrosion, (J,K,L:T7)
2. is familiar with the content, context and environmental impact of basic technical terms related to combustion technology, (J,K,L:T2)
3. knows the types of crude oil and the names of the fractions that can be obtained from them, the most important properties of each type of fuel and lubricant (J,K,L:T7)
4. is familiar with drinking water and wastewater treatment sub-technologies (J,K,L:T7)

**b) skills (k)**

1. is able to detect the possibility of electrochemical corrosion and intervene in the case of metallic structural materials, (J,K,L:K10,K17;J:36;K:28;L:31)
2. is able to assess the energy content and quality of each fuel and lubricant, the technical consequences of their use and the environmental impact, (J,K,L:K10,K17;J:36;K:28;L:31)

3. is able to perform simpler operational tasks with the knowledge of wastewater and drinking water treatment procedures. (J,K,L:K10,K17;J:36;K:28;L:31)

**c) attitude (a)**

1. cooperates with the lecturer and fellow students in expanding the knowledge, expands his / her knowledge by continuous acquisition of knowledge,

2. open to the use of information technology tools, sensitive to environmental issues,

3. strives for the accurate and error-free solution of tasks, in its work it purposefully co-operates with experts in border area topics. (J,K,L:A2)

**d) autonomy and responsibility (o)**

1. solves tasks and problems independently or together with experts in other fields, openly receives well-founded critical remarks (J,K,L:O3)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. laboratory measurements' reports<br>2. midterm test<br>3. optional: five homeworks issued on lectures | 1. LJ<br>2. ZH<br>3. FHF | 1. 30%<br>2. 0%<br>3. 0% | 1. t1-t4,k1-k3,a1-a3,o1<br>2. t1-t4,k1-k3<br>3. k1-k3,a1-a3,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 1. 70% | 1. t1-t4,k1-k3,a1-a3,o1 |

**26. Conditions for obtaining signature / midterm grade**

Required: Write a report on laboratory measurements. Optional: 5 homework assignments issued at the lecture, chemical calculation related to the curriculum (max. 5 * 2 extra points), independent processing of the topic related to the material in a dissertation, max. 20 extra points. One grade (score) in each lab. Conditions for admission to the exam: at least 50% midterm test and max. at least 50% of the laboratory score, or the max. at least 60% of the laboratory score.

**27. Final grade in percentage of performance**

0%-45%: fail; 46%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

One midterm test can be re-taken once in the study period or in the delayed completion week.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Technological diagnostics** | | | | |
| **2. … in Hungarian** | Technológiai diagnosztika | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **3** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 25 hours | **Homework** | 0 hours |
| **Reading written materials** | 8 hours | **Midterm test preparation** | 15 hours | **Exam preparation** | 0 hours |
| **13. Organisational unit in charge** | Department of Automotive Technologies | | | | |
| **14. Subject coordinator** | Dr. Hlinka József | **15. Email address** | hlinka.jozsef@kjk.bme.hu | | |
| **16. …department** | Department of Automotive Technologies | | | | |
| **17. Lecturers** | Dr. Hlinka József, Dr. Dömötör Ferenc, Dr. Bánlaki Pál | | | | |
| **18. Indicative prerequisites** | Manufacturing (strong),<br>- - -,<br>- - - | | | | |

**19. Aim of the subject**

This university course provides comprehensive knowledge in vehicle technical diagnostics, starting with fundamental concepts, fault detection objectives and methodologies, as well as vehicle inspection techniques aimed at ensuring traffic safety and cost-effective operation. The curriculum thoroughly covers the foundations of technical diagnostics, presenting various diagnostic methods and their associated tools' operational principles and usage characteristics—including visual inspection techniques (such as photo and video analysis, high-speed camera recordings, endoscopy), thermographic inspection, vibration analysis, acoustic emission testing, and ultrasonic flaw detection. Furthermore, the course addresses expert diagnostic systems used in vehicle diagnostics and the methodology for evaluating and professionally documenting test results. In addition to theoretical knowledge, the course includes hands-on exercises using industrial-grade diagnostic equipment, enabling students to master the application of modern vehicle diagnostic techniques in real-world conditions.

**20. Thematics of lectures**

The course covers fundamental concepts; fault detection objectives and methodologies; vehicle inspections to ensure traffic safety, reliable and cost-effective operation; principles of technical diagnostics; various diagnostic methods and their corresponding tools - including photo/video analysis, high-speed cameras, endoscopy, thermography, vibration analysis, acoustic emission testing, and ultrasonic flaw detection for typical inspection scenarios; automotive expert diagnostic systems; and the evaluation/documentation of test results.

**21. Thematics of practices**

Vibration diagnostics, endoscopy, thermovision, ultrasonic troubleshooting, engine diagnostics, running gear test, brake performance test, shock absorber test.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the diagnostic systems applied in technical practice, including knowledge of condition-based maintenance.
2. Knows the reliable prediction of machinery lifespan, ultrasonic testing methods, thermographic inspection techniques, vibration diagnostics, and the application possibilities of high-speed camera analysis in industrial diagnostics.

**b) skills (k)**

1. By applying the above knowledge and related professional expertise, is capable of contributing to solving tasks in automated manufacturing systems.

**c) attitude (a)**

1. Is aspired to always give the maximum of your abilities, to work accurately and error-free.
2. Strives to comply with accident prevention rules and to cooperate with colleagues.

**d) autonomy and responsibility (o)**

1. feels responsible for setting an example to the peers with the quality of the work and the observance of ethical standards, responsibly applying the knowledge acquired during the subject.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. midterm test | 1. ZH1<br>2. ZH2 | 1. 50%<br>2. 50% | 1. t1,t2,k1,a1,a2,o1<br>2. t1,t2,k1,a1,a2,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

Passing the midterm tests.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The midterm tests can be retaken twice.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle and drive elements 1.** | | | | |
| **2. … in Hungarian** | Jármű- és hajtáselemek 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| k** |
| **6. Credits** | **6** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **3 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 20 hours | **Homework** | 40 hours |
| **Reading written materials** | 14 hours | **Midterm test preparation** | 36 hours | **Exam preparation** | 0 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Lovas László | **15. Email address** | lovas.laszlo@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Lovas László, Dr. Török István, Devecz János, Győri Márk | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

Explaining future engineers the simple machine elements applied in vehicles

**20. Thematics of lectures**

Classification of vehicle structure elements. Structural material properties. Fatigue. Load models, load carrying capacity parameters. Basics of dimensioning. Bolted links, bolted link behavior under pretension. Dimensioning of welded structures and weldings. Principles of welded constructions. Basics of adhesive links. Hub-shaft links with shape closing and force closing. Construction principles, dimensioning. Spring types. Coil springs, stiffness diagrams. Clutch types. Special clutches in vehicle industry. Power transmission of a friction clutch. Basics of tribology. Principle and construction of journal bearings.

**21. Thematics of practices**

Practice by solving individual machine construction problems.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the national and international requirements, regulations, and guidelines to ensure that products, services and processes are of good quality and fit for purpose. (T9)
2. Knows the concepts and problem solving methods in the field of vehicles and mobile machines. (T10)
3. Knows the basic design principles, methods, models, quality systems, regulations and standards used in automotive engineering, manufacturing technology, control procedures and operational processes. (T15)

**b) skills (k)**

1. Able to read and interpret technical drawings and documentation prepared by other engineers (K13)
2. Able to build, repair, model, or operate a product from a technical drawing or technical documentation. (K14)
3. Creates technical plans and drawings using special software. (K18,S1)
4. Able to interpret and characterise the construction and operation of the structural units and components of vehicles and mobile machines, the design and interconnection of the system components used (K22)
5. Able to apply the technical specifications related to the operation of vehicle systems and mobile machines, the principles and economic context of the adjustment and operation of machines and mechanical equipment. (K23)
6. Able to identify, formulate and solve routine technical problems (K26)
7. Able to apply the acquired IT knowledge to the solution of tasks in the field of vehicles and mobile machines (K29)
8. Uses computer-aided design software. (K45)

**c) attitude (a)**

1. Monitors legislative, technical, technological and administrative changes in the field. (A16)
2. Open to learn about, adopt and authentically communicate professional, technological development and innovation in the field of vehicles and mobile machines. (A17)

**d) autonomy and responsibility (o)**

1. Identifies the shortcomings of the technologies used, the risks of the processes and initiates measures to reduce them. (O14)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework<br>2. homework<br>3. midterm test<br>4. midterm test | 1. HF1<br>2. HF2<br>3. ZH1<br>4. ZH2 | 1. 25%<br>2. 25%<br>3. 25%<br>4. 25% | 1. t1,t2,t3,k1,k2,k3,k4,k5,k6,k7,k8,a1,a2,o1,o2<br>2. t1,t2,t3,k1,k2,k3,k4,k5,k6,k7,k8,a1,a2,o1,o2<br>3. t1,t2,t3,k1,k2,k4,k6,a1,a2,o1,o2<br>4. t1,t2,t3,k1,k2,k4,k6,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

**26. Conditions for obtaining signature / midterm grade**

The two midterm tests and both homeworks written during the semester are evaluated by a point system, the sum of which results in the semester mark; the semester mark is determined on the basis of the semester points.

The conditions for obtaining a semester mark are:

- attendance of 70% of the practice classes;
- 40% of the sum of test points;
- each homework is submitted and accepted;
- the sum of the homeworks and midterm test points reaches 40% of the total.

**27. Final grade in percentage of performance**

Excellent 80-100%
Good 68-79%
Satisfactory 54-67%
Pass 40-53%
Fail 0-39%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Combined retake test from the topics of all the midterm tests.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle and drive elements 2.** | | | | |
| **2. … in Hungarian** | Jármű- és hajtáselemek 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| k** |
| **6. Credits** | **3** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **90 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 5 hours | **Homework** | 18 hours |
| **Reading written materials** | 5 hours | **Midterm test preparation** | 10 hours | **Exam preparation** | 10 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **14. Subject coordinator** | Dr. Lovas László | **15. Email address** | lovas.laszlo@kjk.bme.hu |
| **16. …department** | Department of Railway Vehicles and Vehicle System Analysis | | |
| **17. Lecturers** | Dr. Lovas László, Dr. Török István, Devecz János | | |
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - | | |

**19. Aim of the subject**

Explaining future engineers the complex machine elements applied in vehicles

**20. Thematics of lectures**

Classification of vehicle structure elements.

Rolling bearing. Types of rolling bearing. Bearing design considerations, bearing selection and installation.

Types of gear drive pairs, main characteristics and parameters. Basic properties and characteristics of involute gearing: gearing systems. Cylindrical gears. Power and torque characteristics. Gear failure modes, principles of gear sizing.

Physical principles of operation of belt drives, parameters, forces, torques. V-belt, toothed belt and chain drives.

**21. Thematics of practices**

Practice by solving individual machine construction problems.

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the national and international requirements, regulations, and guidelines to ensure that products, services and processes are of good quality and fit for purpose. (T9)
2. Knows the concepts and problem solving methods in the field of vehicles and mobile machines. (T10)
3. Knows the basic design principles, methods, models, quality systems, regulations and standards used in automotive engineering, manufacturing technology, control procedures and operational processes. (T15)

**b) skills (k)**

1. Able to read and interpret technical drawings and documentation prepared by other engineers (K13)
2. Able to build, repair, model, or operate a product from a technical drawing or technical documentation. (K14)
3. Creates technical plans and drawings using special software. (K18,S1)
4. Able to interpret and characterise the construction and operation of the structural units and components of vehicles and mobile machines, the design and interconnection of the system components used (K22)
5. Able to apply the technical specifications related to the operation of vehicle systems and mobile machines, the principles and economic context of the adjustment and operation of machines and mechanical equipment. (K23)
6. Able to identify, formulate and solve routine technical problems (K26)
7. Able to apply the acquired IT knowledge to the solution of tasks in the field of vehicles and mobile machines (K29)
8. Uses computer-aided design software. (K45)

**c) attitude (a)**

1. Monitors legislative, technical, technological and administrative changes in the field. (A16)
2. Open to learn about, adopt and authentically communicate professional, technological development and innovation in the field of vehicles and mobile machines. (A17)

**d) autonomy and responsibility (o)**

1. Identifies the shortcomings of the technologies used, the risks of the processes and initiates measures to reduce them. (O14)

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. homework<br>2. homework<br>3. midterm test | 1. HF1<br>2. HF2<br>3. ZH | 1. 17%<br>2. 17%<br>3. 16% | 1. t1,t2,t3,k1,k2,k3,k4,k5,k6,k7,k8,a1,a2,o1,o2<br>2. t1,t2,t3,k1,k2,k3,k4,k5,k6,k7,k8,a1,a2,o1,o2<br>3. t1,t2,t3,k1,k2,k4,k6,a1,a2,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. exam | 1. V | 1. 50% | 1. t1,t2,t3,k1,k2,k4,k6,a1,a2,o1,o2 |

**26. Conditions for obtaining signature / midterm grade**

The midterm test and both homeworks written during the semester are evaluated by a point system, the sum of which results in the semester points.

The conditions for obtaining a semester signature:

- attendance of 70% of the practice classes;
- each homework is submitted and accepted;
- the sum of the homeworks and the midterm test point reaches 40% of the total.

**27. Final grade in percentage of performance**

Excellent 80-100%
Good 68-79%
Satisfactory 54-67%
Pass 40-53%
Fail 0-39%

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

One retake test for those who did not make the test.

**30. Consultation opportunities**

at a time and in a form agreed with the teacher

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle control 1.** | | | | |
| **2. … in Hungarian** | Járműirányítás 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 8 hours | **Homework** | 5 hours |
| **Reading written materials** | 53 hours | **Midterm test preparation** | 12 hours | **Exam preparation** | 0 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Gáspár Péter | **15. Email address** | gaspar.peter@kjk.bme.hu |
| **16. …department** | Department of Control for Transportation and Vehicle Systems | | |
| **17. Lecturers** | Dr. Gáspár Péter, Dr. Németh Balázs, Dr. Hegedűs Tamás, Dr. Fényes Dániel, Lelkó Attila | | |

**18. Indicative prerequisites**

- - -,
- - -,
- - -

**19. Aim of the subject**

Learning about the modeling tasks of vehicles and mobile machines, and understanding control design principles based on the theoretical background.

**20. Thematics of lectures**

Methods of vehicle dynamics analysis, modeling paradigms. Basics of model identification. Modeling for control purposes in vehicle dynamics tasks. Formalized description of vehicle requirements. Consideration of actuators and sensors in vehicle control. Analysis of the effect of vehicle maneuvers (turning, evading, acceleration, braking, ascent, descent). Dynamic analysis of progress in a platoon or formation. Overview of control methods, state-space and combinatorical controls. Realization of the designed control.

**21. Thematics of practices**

Solving problems detailed in lectures, through examples in a simulated environment

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

Knows the methods of vehicle dynamics analysis and paradigms of modelling.

**b) skills (k)**

Understands the control modeling for a given vehicle dynamics task.

**c) attitude (a)**

He/she is interested in the analysis of effects of vehicle maneuver.

**d) autonomy and responsibility (o)**

He/she can independently realize a vehicle control problem.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test 1.<br>2. midterm test 2.<br>3. homework | 1. ZH1<br>2. ZH2<br>3. HF | 1. 40%<br>2. 40%<br>3. 20% | 1. t1,k1<br>2. t1,k1<br>3. a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| Both midterm tests must result in at least a grade of 2, and the homework must be submitted during the semester (in three parts with different deadlines). | 0%-50%: fail; 51%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| There is one retake option for the midterm till the end of delayed completion period. Homework submission is possible until the end of the delayed completion period. | |

| 30. Consultation opportunities |
|---|
| After prior arrangement, meetings are possible at any time during the semester, both in person and online. |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle control 2.** | | | | |
| **2. … in Hungarian** | Járműirányítás 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **0 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 14 hours | **Homework** | 0 hours |
| **Reading written materials** | 25 hours | **Midterm test preparation** | 15 hours | **Exam preparation** | 24 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Gáspár Péter | **15. Email address** | gaspar.peter@kjk.bme.hu |
| **16. …department** | Department of Control for Transportation and Vehicle Systems | | |
| **17. Lecturers** | Dr. Gáspár Péter, Dr. Németh Balázs, Dr. Hegedűs Tamás, Dr. Fényes Dániel, Lelkó Attila | | |

**18. Indicative prerequisites**

- Vehicle control 1. (strong),
- Control engineering (strong),
- - -

**19. Aim of the subject**

Understanding specific vehicle control problems of vehicles and mobile machines and exploring possible solutions, with particular attention to the automation of road vehicles.

**20. Thematics of lectures**

Overview of vehicle control tasks. Investigation of road vehicle interventions: braking (ABS / ESP), engine control, drive (ASR), steering, chassis suspension. Railway vehicle control problems: drive, non-slip braking. Aircraft control: climb, descent, turn. Robot pilot design considerations. Control tasks of robots and unmanned vehicles. Control principles for hybrid vehicles. Integrated steering design: chassis steering, adaptive cruise control.

**21. Thematics of practices**

Solving problems detailed in lectures, through examples in a simulated environment

**22. Thematics of laboratories**

-

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

Knows the basics of vehice conrol model identification.

**b) skills (k)**

Is able to apply the calculation, modelling principles and methods related to vehicle.

**c) attitude (a)**

He/she is interested in the control problems of different transport means.

**d) autonomy and responsibility (o)**

He/she can design integrated vehicle control.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. homework | 1. ZH<br>2. HF | 1. 30%<br>2. 20% | 1. t1,k1<br>2. a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. written exam | 1. V | 0,5 | 1. t1,k1,a1,o1 |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| The midterm test must result in at least a grade of 2, and the homework must be submitted during the semester (in three parts with different submission deadlines). | 0%-50%: fail; 51%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent |
| **28. Attendance and participation requirements** | |
| according to the rules of CoS | |
| **29. Late completion opportunities** | |
| There is a retake option for the midterm till the end of delayed completion period. Homework submission is possible until the end of the delayed completion period. | |
| **30. Consultation opportunities** | |
| After prior arrangement, meetings are possible at any time during the semester, both in person and online. | |
| **31. Validity of the subject datasheet starts from:** | |
| 01 September, 2025 | |

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle manufacturing processes 1.** | | | | |
| **2. … in Hungarian** | Járműgyártás folyamatai 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **8** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **240 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 30 hours | **Homework** | 30 hours |
| **Reading written materials** | 36 hours | **Midterm test preparation** | 30 hours | **Exam preparation** | 30 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Markovits Tamás | **15. Email address** | markovits.tamas@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Bán Krisztián, Dr. Markovits Tamás, Dr. Vehovszky Balázs, Dr. Varga Ferenc László | | |
| **18. Indicative prerequisites** | Material science and technology (strong),<br>- - -,<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to deepen the knowledge of metal forming technologies and various automotive bonding technologies among the processes of vehicle manufacturing.

**20. Thematics of lectures**

Topics of the presentation: basic principles of metal forming, mechanical cutting of sheets, cutting, punching, bending and deep drawing and presentation of their main characteristics. Within joining technologies, mechanical joints, glued joints and their characteristics. Welding and related technologies (thermal and beam cutting processes, arc welding processes and their characteristics).

**21. Thematics of practices**

During the internship, semi-annual homework assignments related to metal forming and welding technology will be given, during which the practical application of the theoretical material can be mastered.

**22. Thematics of laboratories**

In the field of metal forming, students participate in laboratory visits, where they can observe the various processes and characteristics learned in theory. In the field of welding and related technologies, there are laboratory visits related to thermal and radial cutting, and welding as a technological process can be learned in practice.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knows the theoretical background of metal forming, the tools of the main processes, their operation, the main process characteristics and the basic relationships with the output characteristics.

2. Knows the process of thermal and beam cutting, its main system elements.

3. Knows the principle of the main welding processes, system elements and relationships, the welding process and the main influencing factors.

**b) skills (k)**

1. Is able to operate the system elements and processes of the described procedures and participate in solving minor problems in a value-creating manner.

**c) attitude (a)**

1. Is open to new opportunities and solutions in the field.

**d) autonomy and responsibility (o)**

1. Participates responsibly in tasks and processes.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1. mindterm exam<br>2. homework 1<br>3. homework 2 | 1. ZH<br>2. HF1<br>3. HF2 | 1. 20%<br>2. 15%<br>3. 15% | 1. t1-t3,k1,a1,o1<br>2. t1-t3,k1,a1,o1<br>3. t1-t3,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Written exam | 1. Vizsg1 | 1. 50% | 1. t1-t3,k1,a1,o1 |

**26. Conditions for obtaining signature / midterm grade**

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points. In the semester participation in labs is mandatory and the planning task is required to be delivered to an acceptable level. The condition of the signature is the correspondingly qualified midterm exam, fulfilment of all lab activities and task submission.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

The midterm test and the semester assignment can be retaken once.

**30. Consultation opportunities**

Consultation is possible at a pre-arranged time.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle manufacturing processes 2.** | | | | |
| **2. … in Hungarian** | Járműgyártás folyamatai 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **6** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **2 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **180 hours** |
| **Contact hours** | 84 hours | **Preparation for seminars** | 25 hours | **Homework** | 45 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 5 hours | **Exam preparation** | 11 hours |

| | | | |
|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Varga Ferenc László | **15. Email address** | varga.ferenc.laszlo@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Dr. Takács János, Dr. Markovits Tamás, Dr.Hlinka József, Dr. Herczeg Szabolcs | | |

| | |
|---|---|
| **18. Indicative prerequisites** | Manufacturing (strong),<br>Vehicle manufacturing processes 1. (suggested),<br>- - - |

**19. Aim of the subject**

The course provides engineering-focused knowledge and practical foundations for vehicle and component manufacturing/repair processes, covering machining and precision surface treatment technologies along with their associated equipment, tools, devices, and their productive, cost-effective operation. It examines manufacturing technologies for vehicle components and the fundamentals of process planning. Key topics include machining technologies, operational characteristics of specialized tools, material selection, tool refurbishment, and design principles. Tool management systems are addressed alongside the role of fixtures in vehicle production - detailing their construction, alignment, clamping, and fastening methods, plus fundamentals of machining fixture design and CNC applications. The curriculum also covers plant installation objectives, factory layout design principles, investment strategies, Lean manufacturing characteristics, and the design of machining, welding, stamping, and assembly plants.

**20. Thematics of lectures**

The lectures provides engineering-focused knowledge and practical foundations for vehicle and component manufacturing/repair processes, covering machining and precision surface treatment technologies along with their associated equipment, tools, devices, and their productive, cost-effective operation. It examines manufacturing technologies for vehicle components and the fundamentals of process planning. Key topics include machining technologies, operational characteristics of specialized tools, material selection, tool refurbishment, and design principles. Tool management systems are addressed alongside the role of fixtures in vehicle production - detailing their construction, alignment, clamping, and fastening methods, plus fundamentals of machining fixture design and CNC applications. The curriculum also covers plant installation objectives, factory layout design principles, investment strategies, Lean manufacturing characteristics, and the design of machining, welding, stamping, and assembly plants.

**21. Thematics of practices**

During the practical sessions, students work on tasks related to technological process planning and fixture design, including consultations. These activities are complemented by knowledge related to plant installation.

**22. Thematics of laboratories**

During the laboratory sessions, we demonstrate tool inspection and the measurement, testing, and implementation activities related to manufacturing processes.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Knowledge of manufacturing repair processes.
2. Knowledge of cutting tools and their geometry.
3. Knows the processes and properties of the machine tool installation in different cases.
4. Knows the technology of equipment design.

**b) skills (k)**

1. Is able to participate in solving problems in the field of component manufacturing and installation, using the relevant professional knowledge and applying the relevant skills, with knowledge of manufacturing and repair processes, cutting tools, installation processes and equipment design technology, is able to design the manufacturing process of a component, tooling variations, design a device, participate in the design of a plant installation.

**c) attitude (a)**

1. Cooperates with instructors in their studies to develop knowledge of manufacturing systems.

**d) autonomy and responsibility (o)**

1. Is aware of the responsibility to set an example to your colleagues by the quality of your work and by adhering to ethical standards, applying the knowledge acquired in the subject with responsibility.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. mindterm exam<br>2. homework 1<br>3. homework 2 | 1. ZH<br>2. HF1<br>3. HF2 | 1. 20%<br>2. 15%<br>3. 15% | 1. t1-t4,k1,a1,o1<br>2. t1-t4,k1,a1,o1<br>3. t1-t4,k1,a1,o1 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Oral exam | 1. Vizsg1 | 1. 50% | 1. t1-t4,k1,a1,o1 |

**26. Conditions for obtaining signature / midterm grade**

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points. In the semester participation in labs is mandatory and the planning task is required to be delivered to an acceptable level. The condition of the signature is the correspondingly qualified midterm exam, fulfilment of all lab activities and task submission.

**27. Final grade in percentage of performance**

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. Late completion opportunities**

One midterm test can be retaken twice, homeworks can be supplemented during the delayed completion week.

**30. Consultation opportunities**

Every lecture

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle on-board systems 1.** | | | | |
| **2. … in Hungarian** | Járműfedélzeti rendszerek 1. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **4 \| sp** |
| **6. Credits** | **5** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **2 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 56 hours | **Preparation for seminars** | 14 hours | **Homework** | 0 hours |
| **Reading written materials** | 25 hours | **Midterm test preparation** | 31 hours | **Exam preparation** | 24 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Aradi Szilárd | **15. Email address** | aradi.szilard@kjk.bme.hu |
| **16. …department** | Department of Control for Transportation and Vehicle Systems | | |
| **17. Lecturers** | Dr. Aradi Szilárd, Dr. Bécsi Tamás, Dr. Fehér Árpád | | |
| **18. Indicative prerequisites** | Electrotechnics - Electronics (strong),<br>Programming (strong),<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to provide students with a solid foundation in the C programming language and to introduce them to the basics and practical aspects of microcontroller development. Through both theoretical and practical sessions, students will become familiar with the structure of C programs, essential programming techniques, computer architecture concepts, and the operation of microcontrollers, with a particular focus on the AVR architecture and the ATmega128 microcontroller. The course also aims to equip students with the skills necessary to develop and test simple microcontroller-based applications.

**20. Thematics of lectures**

The lectures cover the fundamentals of the C programming language, including data types, constants, variables, operators, control structures, the C preprocessor, loop control, and functions. The curriculum also includes pointers, string formatting and output, as well as structures, unions, string handling functions, and mathematical operations.

The lectures also cover the history of integrated circuit technology, manufacturing processes, basic concepts of CPUs and memory, and the general architecture of microcontrollers. A detailed introduction to the AVR architecture and the ATmega128 microcontroller includes clock management and the operation of I/O ports. Timer management and different microcontroller architectures are also discussed.

**21. Thematics of practices**

The practical curriculum includes number system conversions, handling fractional numbers, two's complement representation, character encoding methods, and floating-point representation. During the practice of binary operations, BCD and Stibitz addition, as well as binary multiplication and division, are emphasized.

Students learn to use the Visual Studio C development environment, familiarize themselves with program structure, input/output handling, macros, control structures, and functions, which they practice through small exercises.

The application of pointers is reinforced through practical tasks, and the introduction and practice of linked lists are also part of the curriculum. After assessing their knowledge of the C language, students are introduced to microcontroller development, gaining experience with the Microchip Studio environment and development boards. Practical tasks further enhance their understanding of port handling.

The curriculum also covers timer management, task execution, and microcontroller-based C programming structures. Throughout the semester, practical assignments such as measuring the time between two button presses and implementing a simple calculator are included.

**22. Thematics of laboratories**

During the laboratory sessions, students design, build, and test simple circuits that are also used in vehicles and can be interfaced with microcontrollers. The practical work includes documenting and evaluating measurements, as well as gaining in-depth knowledge and experience with diagnostic tools such as oscilloscopes and logic analyzers. The exercises are based on the components available on the BIGAVR6 development board (LEDs, buttons, sensors, etc.), allowing students to gain hands-on experience in a microcontroller-based environment.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Understands number representation methods, binary arithmetic, and logical operations.
2. Has a solid foundation in C programming, including data types, control structures, functions, and pointers.
3. Understands the architecture of microcontrollers, including AVR architecture and ATmega128 components.
4. Knows how timers, interrupts, and low-level programming function.
5. Is familiar with microcontroller development environments and programming structures

**b) skills (k)**

1. Able to design and implement console applications in C language in a PC environment.
2. Able to manage and program the hardware resources of microcontrollers at a basic level.

**c) attitude (a)**

1. Open to the development of vehicle electronic systems.
2. Interested in hardware-oriented and low-level programming.

**d) autonomy and responsibility (o)**

1. Able to independently learn new microcontroller architectures and development environments.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test 1.<br>2. midterm test 2. | 1. ZH1<br>2. ZH2 | 1. 25%<br>2. 25% | 1. t1,t2,k1<br>2. t4,k2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. exam | 1. V | 0,5 | 1. t3,t5,a1,a2,o1 |

**26. Conditions for obtaining signature / midterm grade**

Both midterm test results shall in at least a grade of 2.

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake or delayed completion is allowed for both midterm requirements (2 midterm exams).

**27. Final grade in percentage of performance**

0%-50%: fail; 51%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent

**30. Consultation opportunities**

After prior arrangement, meetings are possible at any time during the semester, both in person and online.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle on-board systems 2.** | | | | |
| **2. … in Hungarian** | Járműfedélzeti rendszerek 2. | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **5 \| sp** |
| **6. Credits** | **5** | **7. Evaluation type** | **e** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **2 lecture** | **1 practice** | **2 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **150 hours** |
| **Contact hours** | 70 hours | **Preparation for seminars** | 7 hours | **Homework** | 23 hours |
| **Reading written materials** | 10 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 20 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Control for Transport and Vehicle Systems | | |
| **14. Subject coordinator** | Dr. Aradi Szilárd | **15. Email address** | aradi.szilard@kjk.bme.hu |
| **16. …department** | Department of Control for Transportation and Vehicle Systems | | |
| **17. Lecturers** | Dr. Aradi Szilárd, Dr. Bécsi Tamás, Dr. Fehér Árpád | | |
| **18. Indicative prerequisites** | Vehicle on-board systems 1. (strong),<br>- - - | | |

**19. Aim of the subject**

The aim of the course is to provide students with comprehensive theoretical and practical knowledge of embedded systems and in-vehicle communication technologies, including their operation, development, and application, supported by individual project work.

**20. Thematics of lectures**

The lectures cover the topics of embedded systems and in-vehicle communication technologies. The curriculum begins with the operation and handling of interrupts, with particular focus on timer-based and button handling solutions. In addition to the use of analog-to-digital conversion and analog comparators, the UART, I2C, and SPI communication interfaces are also introduced.

Within the framework of the course, students acquire comprehensive knowledge of automotive communication networks, with a special emphasis on CAN, FlexRay, and LIN technologies. Through lectures and practical sessions, they learn about the operation, application areas, and implementation possibilities of these systems. In the second half of the semester, independent project assignments replace the lectures, allowing students to apply their acquired theoretical knowledge in practical development tasks. The work is supported by individual and group consultations, ensuring effective problem-solving and the deepening of development skills.

**21. Thematics of practices**

The practical sessions begin with the implementation of interrupts, timer management, button debouncing, and analog-to-digital conversion. After covering the theoretical and practical aspects of LCD programming, students develop their own LCD libraries and practice EEPROM handling.

In the practical application of communication interfaces, the primary focus is on establishing a connection between the microcontroller and the PC, while the implementation of the CAN protocol is deepened through the development of a CAN library and the use of the CANalyzer tool.

Midway through the semester, a test assesses students' knowledge in timer management, A/D conversion, interrupts, and LCD programming. In the subsequent classes, the emphasis shifts to the implementation of group project tasks. Students also acquire GIT version control skills and implement the hardware and software components specific to their assigned projects.

The practical work is supported by consultations, ensuring the successful execution of both individual and group projects. At the end of the semester, students present their completed developments through a presentation that includes a brief description of the task, a demonstration of the functionality, the software structure, and the solutions to the challenges encountered.

**22. Thematics of laboratories**

The aim of the laboratory sessions is to deepen students' microcontroller-related knowledge in the context of embedded systems and in-vehicle communication. Students implement and test interrupt handling, A/D conversion, as well as UART, I2C, SPI, and CAN communication in practice. The sessions are based on the BIGAVR6 development board, and students use oscilloscopes and the CANalyzer tool for measurements and debugging. They prepare measurement reports and learn to effectively use diagnostic tools for examining microcontroller-based systems. In the second half of the semester, the focus shifts to individual and group project work, during which students develop, test, and document their own solutions.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. Understands the operation, peripherals, and programming of microcontrollers.
2. Has knowledge of UART, I2C, SPI, CAN, LIN, and FlexRay communication protocols.
3. Is familiar with the handling of LCD displays, EEPROM memories, and sensors.
4. Acquires knowledge of software modularization.
5. Learns to use version control (GIT) and development environments.

**b) skills (k)**

1. Is capable of programming microcontrollers and handling peripherals.
2. Is capable of implementing and debugging communication protocols.
3. Is capable of independently and collaboratively completing project-based development tasks.
4. Is capable of presenting the solutions developed during teamwork.

**c) attitude (a)**

1. Shows interest in embedded systems and automotive technologies.
2. Demonstrates precision and a problem-solving attitude in development tasks.
3. Is open to learning new technologies and development tools.

**d) autonomy and responsibility (o)**

1. Is capable of independently learning new microcontroller architectures and development environments.
2. Takes responsibility for the operation of the software and systems they develop.
3. Effectively contributes to the development of complex embedded systems in a team environment.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. midterm test<br>2. team project assignment | 1. ZH<br>2. PF | 1. 35%<br>2. 35% | 1: t4,k1,k2,o1<br>2: t5,k3,k4,a2,a3,o2,o3 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. exam | 1. V | 0,3 | 1. t1,t2,t3,a1 |

**26. Conditions for obtaining signature / midterm grade**

To obtain the course signature, the midterm test and the team project assignment must be completed with at least a passing grade (2).

**27. Final grade in percentage of performance**

0%-50%: fail; 51%-60%: pass; 61%-70%: satisfactory; 71-80%: good; 81%-100%: excellent

**28. Attendance and participation requirements**

according to the rules of CoS

**29. Late completion opportunities**

Second retake or delayed completion is allowed for both the midterm test and the team project assignment.

**30. Consultation opportunities**

After prior arrangement, meetings are possible at any time during the semester, both in person and online.

**31. Validity of the subject datasheet starts from:**

01 September, 2025

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

**Subject datasheet**

| | | | | | |
|---|---|---|---|---|---|
| **1. Subject name** | **Vehicle operation** | | | | |
| **2. … in Hungarian** | Gépjárművek üzeme | | | **3. Programme code** | j |
| **4. Subject code** | | | | **5. Term \| role** | **6 \| sp** |
| **6. Credits** | **4** | **7. Evaluation type** | **m** | **8. Form** | **with contact hours** |
| **9. Weekly contact hours** | **1 lecture** | **1 practice** | **1 laboratory** | **10. Language** | **English** |
| **11. SDG Learning outcomes' contribution to EU/UN Sustainable Development Goals** |   | | | | |
| **12. Working hours for fulfilling the requirements of the subject** | | | | | **120 hours** |
| **Contact hours** | 42 hours | **Preparation for seminars** | 28 hours | **Homework** | 14 hours |
| **Reading written materials** | 16 hours | **Midterm test preparation** | 20 hours | **Exam preparation** | 0 hours |

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|---|---|---|---|
| **13. Organisational unit in charge** | Department of Automotive Technologies | | |
| **14. Subject coordinator** | Dr. Harth Péter | **15. Email address** | harth.peter@kjk.bme.hu |
| **16. …department** | Department of Automotive Technologies | | |
| **17. Lecturers** | Virt Márton, Dr. Nyerges Ádám, Dr. Harth Péter, Dr. Szabó Bálint, Tollner Dávid, Dr. Hanula Barna | | |

| | |
|---|---|
| **18. Indicative prerequisites** | - - -,<br>- - -,<br>- - - |

**19. Aim of the subject**

The aim of the course is to introduce students to the systematic diagnosis and operation of vehicles.

**20. Thematics of lectures**

Overview of the main systems and other subsystems of a vehicle for system diagnostics and system-level understanding.

**21. Thematics of practices**

Specific diagnostics of vehicle systems (braking system, shock absorbers, lighting, etc.).

**22. Thematics of laboratories**

Supporting practice activities in laboratory environment.

**23. Subject learning outcomes (lowercase letters) and their connection to programme level learning outcomes (capital letters)**

The student

**a) knowledge (t)**

1. knows the motor vehicle systems on system-level

**b) skills (k)**

1. is able to understand the operation of the systems that make up the vehicle, and is able to independently troubleshoot and perform diagnostics.

**c) attitude (a)**

1. seeks to find the relationships between the different subject areas.
2. strives to interpret the content (lectures, statements, diagrams) of the lectures and exercises independently, and is open to thinking with the lecturer and other students.
3. strives for active participation in lectures and exercises.

**d) autonomy and responsibility (o)**

1. accepts the framework for the completion of the subject matter and carries out its tasks independently and responsibly within the framework of ethical standards.
2. responsibly applies the knowledge gained in the subject subject to its limitations.

**24. Midterm assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| 1. Midterm test<br>2. Homework | 1. ZH<br>2. HF | 1. 50%<br>2. 50% | 1. t1,k1,a1,o1,o2<br>2. t1,k1,a2,a3,o1,o2 |

**25. Exam assessments**

| Name | Code | Share in final grade | Assessed learning outcomes |
|---|---|---|---|
| - | - | - | - |

| 26. Conditions for obtaining signature / midterm grade | 27. Final grade in percentage of performance |
|---|---|
| Passing the midterm test with at least a pass grade, accepted homework. | Excellent: 81-100%; Good: 71-80%; Satisfactory: 61-70%; Pass: 50-60%; Fail: 0-49% |
| **28. Attendance and participation requirements** | |
| According to TVSZ | |
| **29. Late completion opportunities** | |
| Combined verbal replacement of the midterm test and the homework is possible. | |

| 30. Consultation opportunities |
|---|
| Every lecture |
| **31. Validity of the subject datasheet starts from:** |
| 01 September, 2025 |