Budapest University of Technology and Economics

Faculty of Transportation Engineering and Vehicle Engineering

PhD Programme

Curriculum

Valid from September 2019
# PhD Curriculum

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</table>

*Complex Exam*
## Course description explanation

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Subject name</td>
<td>official name of the subject</td>
</tr>
<tr>
<td>2. Subject name in Hungarian</td>
<td>official name of the subject in Hungarian</td>
</tr>
<tr>
<td>3. Role</td>
<td>role of the subject in the curriculum: Basic course, Specific course, Mandatory</td>
</tr>
<tr>
<td>4. Code</td>
<td>Neptun code of the subject (with BME prefix)</td>
</tr>
<tr>
<td>5. Evaluation type</td>
<td>type of academic performance assessment, e – exam grade; m - mid-term grade; s – signature</td>
</tr>
<tr>
<td>6. Credits</td>
<td>credit value of the subject</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>number of weekly (term-based) teaching hours for students by lecture, practice and lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>master programs related to the subject, D – PhD curriculum</td>
</tr>
<tr>
<td>9. Working hours for fulfilling the requirements of the subject</td>
<td>contact hours – personal appearance at classes in a university preparation for seminars – preparation at home for the classes homework – preparation of homework and other assignments for the classes reading written materials – reviewing and understanding the taken lessons at home midterm preparation – recommended preparation time at home for the midterm test during the semester exam preparation – recommended preparation time at home for the exam</td>
</tr>
<tr>
<td>10. Department</td>
<td>name of responsible department for managing the subject</td>
</tr>
<tr>
<td>11. Responsible lecturer</td>
<td>name of the person in charge of the subject (subject coordinator)</td>
</tr>
<tr>
<td>12. Lecturers</td>
<td>name of all lecturers of the subject</td>
</tr>
<tr>
<td>13. Prerequisites</td>
<td>predefined criteria for registering the subject</td>
</tr>
<tr>
<td>14. Description of lectures</td>
<td>detailed content of the lecture type course</td>
</tr>
<tr>
<td>15. Description of practices</td>
<td>detailed content of the practice type course</td>
</tr>
<tr>
<td>16. Description of laboratory practices</td>
<td>detailed content of the laboratory practice type course</td>
</tr>
<tr>
<td>17. Learning outcomes</td>
<td>results to achieve at the end of the learning process, grouped by competence</td>
</tr>
<tr>
<td>18. Requirements</td>
<td>requirements for passing the subject, aspects of performance evaluation, way to determine a grade (obtain a signature)</td>
</tr>
<tr>
<td>19. Retake and delayed completion</td>
<td>opportunity for repeat/retake and delayed completion</td>
</tr>
<tr>
<td>20. Learning materials</td>
<td>notes, textbooks, suggested literature, recommended learning support materials in printed or electronic form</td>
</tr>
</tbody>
</table>
Subject description

1. Subject name: Advanced CFD in Vehicle Industry

2. Subject name in Hungarian: Járműipari áramlásmodellezés

3. Role: Basic course

4. Code: BMEKORHD005

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture, 0 practice, 2 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 56 hours

   - Contact hours: 56 hours
   - Preparation for seminars: hours
   - Midterm preparation: hours
   - Homework: hours
   - Exam preparation: hours

10. Department: Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer: Dr. Veress Árpád

12. Lecturers: Dr. Veress Árpád

13. Prerequisites: - (-), -
   - (-), -
   - (-), -

14. Description of lectures

Specific areas of the application of numerical methods in the vehicle engineering: Fluid dynamics in the vehicle industry, Supersonic internal and external flows, Secondary flows in turbo machinery and coupled flow and thermal processes, Rotors and propellers, Particle tracking, Free surface flows, Combustion in gas turbine combustor, Flow and thermal processes of PCBs, Flow in porous media. The material requires the knowledge of the next topics: Introduction to CFD (Computational Fluid Dynamics) via scientific and industrial applications, Approaches for flow modelling and conditions for applications, Flow modelling by means of continuum mechanics, System of Navier-Stokes equations, The subject of the CFD; actuality, advantages and application areas, Turbulence and simulation techniques for handling turbulence (DNS, LES and RANS), Reynolds and Favre averaged system of Navier-Stokes equations, Reynolds stress and Eddy viscosity models, Turbulence modelling, Modelling approaches close to the wall; logarithmic-based Wall function and Near-wall resolving approach, Placement of the first cell at the wall, Turbulence modelling, Introduction to discretization techniques (Finite Difference, Finite Element and Finite Volume Methods), Finite volume method for solving governing equations. The main steps of a CFD simulation tasks; geometry model preparation and simplification, meshing and mesh metrics, definition of material properties, setting of considered physics, initial and boundary conditions and their definitions, solver settings, convergence characteristics, visualization and presentation of the results in qualitative and in quantitative manner.

15. Description of practices

- 

16. Description of laboratory practices


17. Learning outcomes

a) Knowledge:

   - The student knows the advantages, conditions, application ranges and the theoretical and practical aspects of the specific CFD (Computational Fluid Dynamics) methodologies for solving industrial (R&D) problems and for having new scientific results.

b) Ability:

   - The student can solve CFD simulation tasks independently in the specific areas with especial care for the highest level approximation of the reality and/or at the best “computational cost/accuracy” ratio with verification, plausibility check and validation.

   - The student can develop and obtain new industrial and scientific results after understanding and analysing CFD results.

c) Attitude:

   - The student aims to complete his/her studies at the highest level, under the shortest time, by providing his/her knowledge and capacity at the best to obtain knowledge for deep and independent professional work.

   - The student has strong professional commitment, has developed expectations for finding new, better solutions and has agreement on doing hard work.

d) Autonomy and responsibility:

   - The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms.

   - The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints.

   - The student can friendly accept the well-established constructive criticism and can utilize that in future.

   - The student is a creative constructor, proactive, and has leadership skills and argument techniques, capabilities with responsibility during the studies, research work.
<table>
<thead>
<tr>
<th>18. Requirements, way to determine a grade (obtain a signature)</th>
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</thead>
<tbody>
<tr>
<td>The criterion of the acceptance of the semester and so getting the signature is the completeness of the solution of a defined problem in a specific area in the agreed time and quality. The exam is oral. The final mark of the exam is the mathematical average of the results for the own task and the exam.</td>
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<table>
<thead>
<tr>
<th>19. Retake and delayed completion</th>
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<table>
<thead>
<tr>
<th>20. Learning materials</th>
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</thead>
<tbody>
<tr>
<td>1. The presentation about the lectures, simulation guide lines and tutorials provided by the professor,</td>
</tr>
</tbody>
</table>
1. Subject name | Advanced theory of flight I. Aerodynamics
2. Subject name in Hungarian | Advanced theory of flight I. Aerodynamics
3. Role | Basic course
4. Code | BMEKOVRD002
5. Evaluation type | e
6. Credits | 4
7. Weekly contact hours | 2 lecture, 2 practice, 0 lab
8. Curriculum | B
9. Working hours for fulfilling the requirements of the subject | 120 hours
   | Contact hours | 56 hours
   | Preparation for seminars | 20 hours
   | Homework | 10 hours
   | Reading written materials | 10 hours
   | Midterm preparation | 0 hours
   | Exam preparation | 24 hours
10. Department | Department of Aeronautics, Naval Architecture and Railway Vehicles
11. Responsible lecturer | Dr. Rohács József
12. Lecturers | Dr. Rohács József
13. Prerequisites | - ( ), -
   | - ( ), -
14. Description of lectures
15. Description of practices
   PhD students who have not studied the aerodynamics earlier must perform aerodynamic calculation/design of an aircraft, systematic consultancy on a special project and working individually on proposal or contribution an article
16. Description of laboratory practices
   As it required for performing the practical works.
17. Learning outcomes
   a) Knowledge and Ability:
      - Increasing knowledge in aerodynamics; developing the competence in understanding, measuring, calculation and predicting the aerodynamic characteristics; developing knowledge and competence in aerodynamic design.
18. Requirements, way to determine a grade (obtain a signature)
   -
19. Retake and delayed completion
   -
20. Learning materials
   -
# Subject description

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<tr>
<th>1. Subject name</th>
<th>Advanced theory of flight II. Flight mechanics, flight dynamics and control</th>
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<td>2. Subject name in Hungarian</td>
<td>Advanced theory of flight II. Flight mechanics, flight dynamics and control</td>
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<td>3. Role</td>
<td>Basic course</td>
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<td>6. Credits</td>
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<tr>
<td>7. Weekly contact hours</td>
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<tr>
<td>8. Curriculum</td>
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<tr>
<th>9. Working hours for fulfilling the requirements of the subject</th>
<th>120 hours</th>
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<td>Contact hours</td>
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<tr>
<td>Preparation for seminars</td>
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<tr>
<td>Homework</td>
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<td>Reading written materials</td>
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<tr>
<td>Midterm preparation</td>
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<td>Exam preparation</td>
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<th>10. Department</th>
<th>Department of Aeronautics, Naval Architecture and Railway Vehicles</th>
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<tbody>
<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Rohács József</td>
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<tr>
<td>12. Lecturers</td>
<td>Dr. Rohács József</td>
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| 13. Prerequisites | - (-), -; - (-), -; - (-), - |

<table>
<thead>
<tr>
<th>14. Description of lectures</th>
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<table>
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<tr>
<th>15. Description of practices</th>
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<tbody>
<tr>
<td>PhD student have not studied the flight mechanics, flight dynamics and control earlier must perform a homework, namely calculation or simulation studies of flight performance stability and controllability of an aircraft. Systematic consultancy on a special project and working individually on proposal or contribution an article.</td>
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<tr>
<th>16. Description of laboratory practices</th>
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<td>As it required for performing the practical works.</td>
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<th>17. Learning outcomes</th>
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<tbody>
<tr>
<td>a) Knowledge and Ability:</td>
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<tr>
<td>- Increasing knowledge in flight mechanics, flight dynamics and control; developing the competence in understanding, measuring, calculation, simulation and predicting the flight performance, characteristics of flight dynamics, stability and aircraft controllability.</td>
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<th>18. Requirements, way to determine a grade (obtain a signature)</th>
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<th>20. Learning materials</th>
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</table>
# Subject description

## 1. Subject name
**Air Transport Management (PhD)**

## 2. Subject name in Hungarian
Légiközlekedési management PhD

## 3. Role
Specific course

## 4. Code
BMEKOKGD010

## 5. Evaluation type
m

## 6. Credits
3

## 7. Weekly contact hours
- 2 lecture
- 2 practice
- 0 lab

## 8. Curriculum
D

## 9. Working hours for fulfilling the requirements of the subject

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<th>Contact hours</th>
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<th>Exam preparation</th>
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## 10. Department
Department of Transport Technology and Economics

## 11. Responsible lecturer
Dr. Kővári Botond

## 12. Lecturers
Dr. Kővári Botond

## 13. Prerequisites
- ( ), ;
- ( ), ;
- ( ), ;

## 14. Description of lectures

## 15. Description of practices
Literature research in a topic discussed with the lecturer, and write and present a seminar paper.

## 16. Description of laboratory practices

## 17. Learning outcomes

a) Knowledge:
- Familiar with actors of air transportation, and with the basic principles of management and economic issues of airlines.

b) Ability:
- Ability to analyze a market, evaluate an airline with a market aspect.

c) Attitude:
- Strive to acquire the highest level of system approach.

d) Autonomy and responsibility:
- Responsible applies of acquired knowledge in individual or in team work.

## 18. Requirements, way to determine a grade (obtain a signature)
1 test, 1 shorter homework.

## 19. Retake and delayed completion
Second test possibility for those not present on the test, possibility of delayed deadline for home work.

## 20. Learning materials
Suggested books and papers.
Subject description

1. Subject name | Analytical Methods in System Technique I.
2. Subject name in Hungarian | Analitikus módszerek a rendszertechnikában I.
3. Role | Basic course
4. Code | BMEKOVJD001
5. Evaluation type | e
6. Credits | 4
7. Weekly contact hours | 2 lecture 0 practice 0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 120 hours
   Contact hours | 28 hours
   Preparation for seminars | 30 hours
   Reading written materials | 15 hours
   Midterm preparation | 0 hours
   Homework | 15 hours
   Exam preparation | 32 hours
10. Department | Department of Aeronautics, Naval Architecture and Railway Vehicles
11. Responsible lecturer | Dr. Zobory István
12. Lecturers | Dr. Zobory István
13. Prerequisites | - (-), -;
                   | - (-), -;
                   | - (-), -
14. Description of lectures
15. Description of practices
-
16. Description of laboratory practices
-
17. Learning outcomes
a) Knowledge and Ability:
   - Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: examination procedures of single variate and multivariate functions; procedures for interpolation and numerical integration; methods of linear mapping; operations of matrix algebra; methods of solution to linear system of equations.

b) Attitude, Autonomy and responsibility:
   - Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasurce activities in new fields of knowledge in an innovative way.

18. Requirements, way to determine a grade (obtain a signature)
Accepted homework sent before the deadline and written exam.

19. Retake and delayed completion
According to the TVSZ.

20. Learning materials
Subject description

1. Subject name **Analitical Methods in System Technique II.**

2. Subject name in Hungarian Analitikus módszerek a rendszertechnikában II.

3. Role Basic course

4. Code BMEKOVJD002

5. Evaluation type e

6. Credits 4

7. Weekly contact hours 2 lecture 0 practice 0 lab

8. Curriculum D

9. Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
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</thead>
<tbody>
<tr>
<td>28 hours</td>
<td>30 hours</td>
<td>0 hours</td>
<td>32 hours</td>
</tr>
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</table>

10. Department Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer Dr. Zobory István

12. Lecturers Dr. Zobory István

13. Prerequisites Analitical Methods in System Technique I. (BMEKOVJD001), recommended;

14. Description of lectures


15. Description of practices

-

16. Description of laboratory practices

-

17. Learning outcomes

a) Knowledge and Ability:

- Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: relationships in komplex function theory; analitical and numerical solution methods to linear or non linear differential equations and equation systems; methods of function variation theory.

b) Attitude, Autonomy and responsibility:

- Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasurce activities in new fields of knowledge in an innovative way.

18. Requirements, way to determine a grade (obtain a signature)

Regular participation at the lectures and written exam.

19. Retake and delayed completion

According to the TVSZ.

19. Learning materials


1. Subject name | Analitical Methots in System Technique III.
---|---
2. Subject name in Hungarian | Analitikus módszerek a rendszertechnikában III.
3. Role | Basic course
4. Code | BMEKOVJD003
5. Evaluation type | e
6. Credits | 4
7. Weekly contact hours | 2 lecture 0 practice 0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 120 hours
   Contact hours | 28 hours Preparation for seminars 30 hours Homework 0 hours
   Reading written materials | 30 hours Midterm preparation 0 hours Exam preparation 32 hours
10. Department | Department of Aeronautics, Naval Architecture and Railway Vehicles
11. Responsible lecturer | Dr. Zoller Vilmos
12. Lecturers | Dr. Zoller Vilmos
13. Prerequisites | Analitical Methots in System Technique I. (BMEKOVJD001), recommended; Analitikus módszerek a rendszertechnikaban II. (BMEKOVJD002), recommended; - (-), -
14. Description of lectures
15. Description of practices
16. Description of laboratory practices
17. Learning outcomes
a) Knowledge and Ability:
   - Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: solution methods of partial differential equations; procedures of topology and distribution theory; application methods of Laplace transformation and Fourier operator.

b) Attitude, Autonomy and responsibility:
   - Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasurce activities in new fields of knowledge in an innovative way.
18. Requirements, way to determine a grade (obtain a signature)
   Regular participation at the lectures and written exam.
19. Retake and delayed completion
   According to the TVSZ.
20. Learning materials
1. Subject name  
**Analytical mechanics**

2. Subject name in Hungarian  
Analitikus mechanika

3. Role  
Basic course

4. Code  
BMEKOJS001

5. Evaluation type  
e

6. Credits  
4

7. Weekly contact hours  
2 lecture  1 practice  0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
120 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>42 hours</td>
<td>14 hours</td>
<td>28 hours</td>
<td>24 hours</td>
</tr>
</tbody>
</table>

10. Department  
Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer  
Dr. Béda Péter

12. Lecturers  
Dr. Béda Péter

13. Prerequisites  
- (-), -;
- (-), -;
- (-), -;

14. Description of lectures

15. Description of practices
Examples from the topics of the lessons.

16. Description of laboratory practices

17. Learning outcomes

a) Knowledge:
   - Methods of the analytical mechanics.

b) Ability:
   - Analytical description of a mechanical system, model building.

c) Attitude:
   - Being open to understand and learn novelties on that given domain.

d) Autonomy and responsibility:
   - Evaluation and choice of optimal model elements.

18. Requirements, way to determine a grade (obtain a signature)
Semester note upon successful realization of the homework and an oral exam.

19. Retake and delayed completion
Essay secondary deadlines precised in the lessons requirements.

20. Learning materials
Subject description

1. Subject name: Application of AI in vehicle industry PhD

2. Subject name in Hungarian: Neurális hálók járműipari alkalmazása

3. Role: Specific course

4. Code: BMEKOGGD805

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 3 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 90 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Preparation for seminars</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 hours</td>
<td>14 hours</td>
<td>12 hours</td>
<td>30 hours</td>
<td>0 hours</td>
</tr>
</tbody>
</table>

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Zöldy Máté

12. Lecturers: Dr. Zöldy Máté

13. Prerequisites:
- (\(\cdot\), \(\cdot\))
- (\(\cdot\), \(\cdot\))
- (\(\cdot\), \(\cdot\))

14. Description of lectures

Artificial Intelligence is based on applications in the automotive industry. Machine Learning and Neural Networks for Homologization. Automotive AI Use Cases. Market barriers and challenges an AI forecasts for automotive applications in neural networks.

15. Description of practices

-

16. Description of laboratory practices

-

17. Learning outcomes

a) Knowledge:
- Is familiar with the images presented in the subject and the individual procedures of the internal relationships.

b) Ability:
- Capable of all procedures and research.

c) Attitude:
- Openness to new opportunities in the field.

d) Autonomy and responsibility:
- A vehicle for solving research tasks.

18. Requirements, way to determine a grade (obtain a signature)

Knowing the curriculum and application of it. The exam is oral.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials

Autonomous Vehicle Driverless Self-Driving Cars and Artificial Intelligence: Practical Advances in AI and Machine Learning
Subject description

1. Subject name

Artificial Intelligence vehicles homologation process PhD

2. Subject name in Hungarian

Mesterséges Intelligencia alkalmazások homologációs folyamatai és mérései

3. Role

Specific course

4. Code

BMEKOGGD803

5. Evaluation type

e

6. Credits

2

7. Weekly contact hours

2 lecture 0 practice 0 lab

8. Curriculum

D

9. Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
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<tr>
<td>14 hours</td>
<td>14 hours</td>
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</table>

Total: 60 hours

10. Department

Department of Automotive Technologies

11. Responsible lecturer

Dr. Zöldy Máté

12. Lecturers

Dr. Zöldy Máté

13. Prerequisites

- ( ), -;
- ( ), -;
- ( ), -

14. Description of lectures


15. Description of practices

-

16. Description of laboratory practices

-

17. Learning outcomes

Knowledge:
- Is familiar with the images presented in the subject and the individual procedures of the internal relationships.

Ability:
- Capable of all procedures and research.

Attitude:
- Openness to new opportunities in the field.

Autonomy and responsibility:
- A vehicle for solving research tasks.

18. Requirements, way to determine a grade (obtain a signature)

Knowing the curriculum and application of it. The exam is oral.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials

Self developed materials from the department.
1. Subject name | **Automation of Production**
---|---
2. Subject name in Hungarian | Gyártásautomatizálás
3. Role | Specific course
4. Code | BMEKOGTD018
5. Evaluation type | e
6. Credits | 3
7. Weekly contact hours | 3 lecture 0 practice 0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 62 hours
   - Contact hours | 42 hours
   - Preparation for seminars | 0 hours
   - Reading written materials | 8 hours
   - Exam preparation | 12 hours
10. Department | Department of Automotive Technologies
11. Responsible lecturer | Dr. Takács János
12. Lecturers | Dr. Takács János
13. Prerequisites | - (...), -
   - (...), -
   - (...), -
14. Description of lectures
   The aim of this subject to provide high-level knowledges from history and principles of automation of production, tools of flexible production, principles of operation of NC and CNC machines, functioning of the management and control systems, integration of system units. Connection between 3D Measurement Technologies and automated production. Robots in integrated productions. PC-based factory integration.
15. Description of practices
16. Description of laboratory practices
17. Learning outcomes
   a) Knowledge:
   - Knows the concept, history, importance, effects and elements of automation.
   - Knows the machines and subsystems of inflexible and flexible automation (NC, CNC, DNC).
   - Has a deeper knowledge of NC machine construction: open and closed drive chains, control and regulation (point, ... track); positioning interpolation; absolute, incremental, mixed systems; sensors.
   - Knows the basics of NC programming; AC (adaptive control).
   - Knows material and tool management, warehousing and handling techniques (palettes, toolbars and exchangers, coding).
   - Knows the structure, classification and application of industrial robots in automated production.
   - Knows integrated manufacturing systems: CAD, CAM, CAPP, CIM, JIT group technologies; manufacturing cell, FMS (Flexible Manufacturing System).
   - Knows the possibilities of integrating measurement technology into production.
   - Has a deeper knowledge of the devices, structure, operation and accuracy of 3D measurement technology.
   b) Ability:
   - Able to overview the whole and the elements of a technological process and to plan it.
   - Capable of a deeper, causal, scientific analysis of a technological process.
   - Able to give suggestions for the development of a technological process.
   - She/he is able to gather literature on a specific research topic and compile a summary based on it.
   - Able to interpret the results found in the literature. Able to develop a suitable experimental method for a research topic and propose test methods. Able to interpret test results.
   c) Attitude:
   - She/he strives to develop his knowledge independently.
   - Strives to explore the causal relationship with scientific depth.
   - Strives to develop its own topic area.
   - Strives to find connections between topics and disciplines.
   - Strives to interpret the literature and their own research results independently and in teamwork, listening to others’ thoughts.
   - Strives to share her/his knowledge. Independence and responsibility:
   d) Autonomy and responsibility:
   - Apply responsibly the knowledge acquired during the course with regard to their validity limits.
   - Manages and communicates the results of others and their own results also in accordance with ethical standards.
   - Endeavors to perform his assigned tasks independently in accordance with ethical standards.
   - She/he knows how far his responsibilities are, informs his colleagues or his supervisor about her/his results, and when it is necessary.
### 18. Requirements, way to determine a grade (obtain a signature)

The course ends with an oral examination.

### 19. Retake and delayed completion

Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

### 20. Learning materials

Subject description

1. Subject name

Biometric identification in networked computer systems

2. Subject name in Hungarian

Biometrikai személyazonosítás számítógépes rendszerekben

3. Role

Specific course

4. Code

BMEKOALD004

5. Evaluation type

e

6. Credits

3

7. Weekly contact hours

2 lecture 0 practice 0 lab

8. Curriculum

D

9. Working hours for fulfilling the requirements of the subject

60 hours

Contact hours 28 hours

Preparation for seminars 6 hours

Homework 8 hours

Reading written materials 2 hours

Midterm preparation 6 hours

Exam preparation 10 hours

10. Department

Department of Material Handling and Logistics Systems

11. Responsible lecturer

Dr. Szirányi Tamás

12. Lecturers

Dr. Szirányi Tamás

13. Prerequisites

- (-), -

- (-), -

- (-), -

14. Description of lectures

The aim of the course is to provide students with independent observance of regularities in the following semester: principles of operation of personal identification systems, engineering feasibility and practical systems; complex identification systems for intelligent vehicles, operational interfaces, computer security systems; measurable physical characteristics of individuals; legal issues in biometrics.

15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge and Ability:

- Knowing the biometrics of persons and their mathematical description.
- Having comprehensive knowledge about the topic of fingerprint identification.
- Knowing the mathematical methods of face recognition.
- Knowing the basics of shape recognition. Knowing the basic properties of recognition based on iris and retina.
- Knowing the topic of hand and handwriting recognition.
- Knowing the identification based on DNA.
- Knowing the topics of gait recognition, identification based on typewriting and dynamic features.
- Has comprehensive knowledge about complex identification systems.
- Being able to apply the knowledge in tasks related identification and recognition.
- Application of decision making methods.
- Being able to apply of different shape recognition algorithms.
- Being able to solve recognition problems based on biometrics.
- Being able to solve the problems alone or in group and efficiently transfer the knowledge. Having original/innovative ideas.

b) Attitude, Autonomy and responsibility:

- Working efficiently alone and in group.
- Seeking for relations to other subjects.
- Being open to use mathematical and informatic tools.
- Seeking to know and learn the necessary tools.
- Seeking to solve the problems accurately and error-free.
- Finding solutions alone.
- Taking into considerations the effects of the decisions.
- Applying systematic approach.

18. Requirements, way to determine a grade (obtain a signature)

The evaluation of the learning results is based on the written (homework) and oral (oral exam) performance. The homework can be corrected until the end of the week of examinations.

19. Retake and delayed completion

The oral exam can be re-take first free of charge. The second and higher re-take of the same subject has charge regulated by the university.

20. Learning materials

**Subject description**

1. **Subject name**: Calibration and homologation of ADAS systems

2. **Subject name in Hungarian**: ADAS rendszerek kalibrációja és jöváhagyása

3. **Role**: Specific course

4. **Code**: BMEKOGGD004

5. **Evaluation type**: e

6. **Credits**: 2

7. **Weekly contact hours**: 2 lecture, 0 practice, 0 lab

8. **Curriculum**: D

9. **Working hours for fulfilling the requirements of the subject**: 60 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Midterm preparation</th>
<th>Homework</th>
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<table>
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<tr>
<th>Reading written materials</th>
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</table>

10. **Department**: Department of Automotive Technologies

11. **Responsible lecturer**: Dr. Zöldy Máté

12. **Lecturers**: Dr. Zöldy Máté

13. **Prerequisites**: *


15. **Description of practices**

16. **Description of laboratory practices**

17. **Learning outcomes**

a) **Knowledge**:

   - Is able to independently develop the procedures presented in the subject and the internal relationships within the procedures.

b) **Ability**:

   - Ability to research and develop in specific processes.

c) **Attitude**:

   - Openness to new opportunities in the field.

d) **Autonomy and responsibility**:

   - Get involved in research tasks.

18. **Requirements, way to determine a grade (obtain a signature)**

Knowing the curriculum and application of it. The exam is oral.

19. **Retake and delayed completion**

There is one occasion to retake the exam.

20. **Learning materials**

Self developed materials from the department.
### Subject description

1. **Subject name**  
   **Continuum Mechanics**

2. **Subject name in Hungarian**  
   Kontinuum mechanika

3. **Role**  
   Basic course

4. **Code**  
   BMEKOMED030

5. **Evaluation type**  
   e

6. **Credits**  
   4

7. **Weekly contact hours**  
   2 lecture, 1 practice, 0 lab

8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   120 hours
   
   **Contact hours**  
   42 hours
   **Preparation for seminars**  
   14 hours
   **Homework**  
   28 hours
   **Reading written materials**  
   12 hours
   **Midterm preparation**  
   0 hours
   **Exam preparation**  
   24 hours

10. **Department**  
    Department of Vehicle Elements and Vehicle-Structure Analysis

11. **Responsible lecturer**  
    Dr. Béda Péter

12. **Lecturers**  
    Dr. Béda Péter

13. **Prerequisites**  
   - ( ), ; 
   - ( ), ; 
   - ( ), ;

14. **Description of lectures**

15. **Description of practices**
   Examples from the topics of the lessons.

16. **Description of laboratory practices**
   -

17. **Learning outcomes**
   a) Knowledge:
      - Methods of the continuum mechanics.
   b) Ability:
      - Description of a mechanical system in time domain, model building.
   c) Attitude:
      - Being open to understand and learn novelties on that given domain.
   d) Autonomy and responsibility:
      - Evaluation and choice of optimal model elements.

18. **Requirements, way to determine a grade (obtain a signature)**
   Semester note upon successful realisation of the homework and an oral exam.

19. **Retake and delayed completion**
   Essay secondary deadlines precised in the lessons requirements.

20. **Learning materials**
   -
Subject description

1. Subject name  
Controlled vehicle system dynamics I. PhD

2. Subject name in Hungarian  
Szabályozott járműdinamikai rendszerek I. PhD

3. Role  
Specific course

4. Code  
BMEKOGJD010

5. Evaluation type  
e

6. Credits  
3

7. Weekly contact hours  
2 lecture  0 practice  0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
120 hours

Contact hours  
28 hours  Preparation for seminars  14 hours

Reading written materials  
26 hours  Midterm preparation  30 hours

Homework  
22 hours

Exam preparation  
0 hours

10. Department  
Department of Automotive Technologies

11. Responsible lecturer  
Dr. Szalay Zsolt

12. Lecturers  
Dr. Tihanyi Viktor

13. Prerequisites  
- (-), -
- (-), -
- (-), -

14. Description of lectures
"Regulated Vehicle Dynamics Systems I." students will delve deeper into the areas of development of electronically controlled vehicle dynamics systems used in motor vehicles, as well as the intelligent vehicle systems researched today and their current dynamics and control technology background. The aim is to develop control technology solutions used in modern vehicle technology. Special control technology issues and novel regularities of active and semi-active vehicle suspension systems. Critical evaluation of control strategies for ABS / ASR systems. Development of control theory problems in automotive driver assist systems (active speed control, lane departure detection)

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes
a) Knowledge:
   - Familiar with vehicle dynamics fundamentals.

b) Ability:
   - Ability to research and develop specific processes.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)
The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

19. Retake and delayed completion
There is one occasion to retake the exam.

20. Learning materials
1. Subject name: Controlled vehicle system dynamics II. PhD

2. Subject name in Hungarian: Szabályozott járműdinamikai rendszerek II. (PhD)

3. Role: Specific course

4. Code: BMEKOGJD001

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours:
   - Lecture: 2
   - Practice: 0
   - Lab: 0

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 120 hours

   - Contact hours: 28 hours
   - Preparation for seminars: 14 hours
   - Midterm preparation: 30 hours
   - Homework: 22 hours
   - Reading written materials: 26 hours
   - Exam preparation: 0 hours

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Szalay Zsolt

12. Lecturers: Dr. Szalay Zsolt

13. Prerequisites: Controlled vehicle system dynamics I. PhD (BMEKOGJD010), strong;
     - (-), -;
     - (-), -;

14. Description of lectures
   Our students can effectively use the knowledge of this subjects during their research on modern, electronically controlled vehicle dynamics systems.

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes
   a) Knowledge:
      - Familiar with vehicle dynamics fundamentals.
   b) Ability:
      - Ability to research and develop specific processes.
   c) Attitude:
      - Openness to new opportunities in the field.
   d) Autonomy and responsibility:
      - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)
   The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

19. Retake and delayed completion
   There is one occasion to retake the exam.

20. Learning materials
Subject description

1. Subject name: Data collection and evaluation systems PhD

2. Subject name in Hungarian: Mérő- és Adatgyűjtő Rendszerek PhD

3. Role: Basic course

4. Code: BMEKOGED007

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture, 2 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 120 hours

Contact hours: 56 hours, Preparation for seminars: 7 hours, Homework: 26 hours

Reading written materials: 10 hours, Midterm preparation: 0 hours, Exam preparation: 21 hours

10. Department: Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer: Dr. Lovas László

12. Lecturers: Dr. Lovas László

13. Prerequisites: -, -

14. Description of lectures

15. Description of practices
Planning and preparation of measures on structures, based on the lectures.

16. Description of laboratory practices

17. Learning outcomes
a) Knowledge:
   Measurement processes, methods.

b) Ability:
   Preparation and realisation of measurements.

c) Attitude:
   Being open to understand and learn novelties on that given domain.

d) Autonomy and responsibility:
   Evaluation and choice of optimal model elements.

18. Requirements, way to determine a grade (obtain a signature)
Semester note upon the essay, the presentation and a written exam. Presentation and essay secondary deadlines precised in the lessons requirements.

19. Retake and delayed completion
There is one occasion to retake the exam.

20. Learning materials
1. Subject name  
**Decision making methods**

2. Subject name in Hungarian  
Döntéselőkészítési módszerek a közlekedésben

3. Role  
Specific course

4. Code  
BMEKOKKD008

5. Evaluation type  
e

6. Credits  
3

7. Weekly contact hours  
3 lecture  
0 practice  
0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
90 hours

<table>
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<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
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<td>10 hours</td>
<td>12 hours</td>
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10. Department  
Department of Transport Technology and Economics

11. Responsible lecturer  
Dr. Békefi Zoltán

12. Lecturers  
Dr. Békefi Zoltán

13. Prerequisites  
( ), ( );

14. Description of lectures  
The student is able to apply linear programming, sensitivity analysis, target programming, network analysis, dynamic programming, game theory methods in a narrower field of his / her own research, and to explore new relationships with the help of these models.

15. Description of practices  
-

16. Description of laboratory practices  
-

17. Learning outcomes  
a) Knowledge:
   - The student gets acquainted with the principal mathematical modeling methods.

b) Ability:
   - The student will be able to identify and solve decision problems.

c) Attitude:
   - During the optimization processes the student strives for the integrated handling of the technical and economical aspects of the problems.

d) Autonomy and responsibility:
   - The student is able to make independent analysis and evaluation activities.

18. Requirements, way to determine a grade (obtain a signature)  
Two tests must be passed during the semester, and a presentation must be prepared and presented. The semester note is the average of these three results.

19. Retake and delayed completion  
Midterm tests can be retaken till end of delayed completion period.

20. Learning materials  
### Subject description

**1. Subject name**  
**Design and examination of materials handling machines**

**2. Subject name in Hungarian**  
Anyagmozgatógépek tervezése és vizsgálata

**3. Role**  
Specific course

**4. Code**  
BMEKOED002

**5. Evaluation type**  
e

**6. Credits**  
3

**7. Weekly contact hours**  
2 lecture  
0 practice  
0 lab

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**  
48 hours

<table>
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<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
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<td>4 hours</td>
<td>8 hours</td>
<td>4 hours</td>
<td>4 hours</td>
<td>0 hours</td>
</tr>
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**10. Department**  
Department of Material Handling and Logistics Systems

**11. Responsible lecturer**  
Dr. Bohács Gábor

**12. Lecturers**  
Dr. Bohács Gábor

**13. Prerequisites**  
- \( \cdot \), \( \cdot \);
- \( \cdot \), \( \cdot \);
- \( \cdot \), \( \cdot \);

**14. Description of lectures**  
The subject aims to present special design tasks of material handling machines. Typical sources of malfunction and the methods for examination is also discussed. Detailed presentation is made for machines of bulk materials. Further materials handling machines design methods for piece goods is also taken (forklifts, cranes). Special attention is made for the transfer and interfacing problems of the machines. Finally future development of material handling is discussed.

**15. Description of practices**  
-

**16. Description of laboratory practices**  
-

**17. Learning outcomes**

a) Knowledge:
   - Knowledge of the special structural elements of material handling machines.
   - Knowledge of the loads caused by the moving material and the operation.
   - System engineering of material handling machines.

b) Ability:
   - Is capable of correctly dimensioning mechanical handling components.
   - Able to fit material handling machine components into an optimal system.

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

d) Autonomy and responsibility:
   - Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

**18. Requirements, way to determine a grade (obtain a signature)**  
The grade is calculated from the grade of the individual work and the tests as an average.

**19. Retake and delayed completion**  
Announced at the beginning of the semester

**20. Learning materials**  
-
Subject description

1. Subject name: Design of Transport Information Systems (PhD)

2. Subject name in Hungarian: Közlekedési rendszertervezés (PhD)

3. Role: Specific course

4. Code: BMEKOKUD007

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 2 lecture 0 practice 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 90 hours

   Contact hours: 28 hours
   Preparation for seminars: 8 hours
   Reading written materials: 6 hours
   Midterm preparation: 28 hours
   Exam preparation: 12 hours

10. Department: Department of Transport Technology and Economics

11. Responsible lecturer: Dr. Mándoki Péter

12. Lecturers: Dr. Mándoki Péter

13. Prerequisites: - ( ), - ; - ( ), - ; - ( ), -

14. Description of lectures

   Transportation Information systems planning methods and techniques. Steps to survey, record, and analyze the information system. System concept and system design. Planning the change-over between information systems. Documentation of system design, presentation of documentation procedures. Analysis of complex system design procedures. SDM Methodologies, SSADM, Euromethod. Computer Supported Information System Design Procedures (CASE Tools). Agilis system planning methods.

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes

   a) Knowledge:
      - The student knows and understands transport system design process, know the different development methodologies.

   b) Ability:
      - Ability to dealing with creative problems in the field of transport information system and flexible solutions to complex tasks.
      - Able to plan a complex information system, taking into account their operational aspects.
      - Able to working in a group, sharing tasks and managing them over time.

   c) Attitude:
      - Engages in professional and ethical values related to the technical field, and works based on a system-oriented and process-oriented mindset, in a team-work.

   d) Autonomy and responsibility:
      - Make his decisions carefully, in consultation with representatives of other fields of expertise, with full responsibility.

18. Requirements, way to determine a grade (obtain a signature)

   Exam, which included the results of individual tasks 50% weighting.

19. Retake and delayed completion

   Unsuccessful task can be replaced during the replacement period.

20. Learning materials

   Uploaded materials to the Moodle System and the Department website.
### Subject description

**1. Subject name**  
Development philosophies I. problems, new sciences, technologies, solution

**2. Subject name in Hungarian**  
Development philosophies I. problems, new sciences, technologies, solution

**3. Role**  
Basic course

**4. Code**  
BMEKOVRD004

**5. Evaluation type**  
e

**6. Credits**  
4

**7. Weekly contact hours**  
2 lecture  
2 practice  
0 lab

**8. Curriculum**  
D

#### 9. Working hours for fulfilling the requirements of the subject  
**120 hours**

<table>
<thead>
<tr>
<th>Contact hours</th>
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<th>Homework</th>
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<table>
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<th>Midterm preparation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10 hours</td>
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</table>

**9. Department**  
Department of Aeronautics, Naval Architecture and Railway Vehicles

**10. Responsible lecturer**  
Dr. Rohács József

**11. Lecturers**  
Dr. Rohács József

**13. Prerequisites**  
- ( ), -
- ( ), -
- ( ), -

**14. Description of lectures**


**15. Description of practices**

Systematic consultancy and working individually on proposal or contribution an article.

**16. Description of laboratory practices**

As it required for performing the practical works.

**17. Learning outcomes**

a) Knowledge and Ability:
   - Study the major problems required new solutions, understanding the original solutions and their developments; understanding the major features of disruptive technologies, breakthrough innovation and emerging technologies, developing knowledge and competences in implementation of new sciences supporting the developments.

**18. Requirements, way to determine a grade (obtain a signature)**

- 

**19. Retake and delayed completion**

- 

**20. Learning materials**

-
Subject description

1. Subject name

Development philosophies II. Project and Competence Development

2. Subject name in Hungarian

Development philosophies II. project and competence development

3. Role

Basic course

4. Code

BMEKOVRD005

5. Evaluation type

e

6. Credits

4

7. Weekly contact hours

2 lecture 2 practice 0 lab

8. Curriculum

D

9. Working hours for fulfilling the requirements of the subject

Contact hours 56 hours Preparation for seminars 20 hours Homework 10 hours

Reading written materials 10 hours Midterm preparation 0 hours Exam preparation 24 hours

10. Department

Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer

Dr. Rohács József

12. Lecturers

Dr. Rohács József

13. Prerequisites

- (-), -;
- (-), -;
- (-), -

14. Description of lectures


15. Description of practices

Systematic consultancy and working individually on proposal or contribution an article.

16. Description of laboratory practices

As it required for performing the practical works.

17. Learning outcomes

a) Knowledge and Ability:

- Study the project development, increasing the knowledge and competences in design process management, understanding the design philosophies, developing the practical competences in project management and result disseminations

18. Requirements, way to determine a grade (obtain a signature)

-

19. Retake and delayed completion

-

20. Learning materials

-
1. Subject name

Digital Image Processing

2. Subject name in Hungarian

Képfeldolgozás

3. Role

Basic course

4. Code

BMEKOALD002

5. Evaluation type

e

6. Credits

4

7. Weekly contact hours

2 lecture 2 practice 0 lab

8. Curriculum

D

9. Working hours for fulfilling the requirements of the subject

120 hours

Contact hours 56 hours

Preparation for seminars 12 hours

Homework 15 hours

Reading written materials 5 hours

Midterm preparation 12 hours

Exam preparation 20 hours

10. Department

Department of Material Handling and Logistics Systems

11. Responsible lecturer

Dr. Szirányi Tamás

12. Lecturers

Dr. Szirányi Tamás, Rózsa Zoltán

13. Prerequisites

\(-(-),\ (-); \quad (-),\ (-); \quad (-),\ (-)\)

14. Description of lectures

The aim of the course is to give students the opportunity to discover novel laws in one of the following topics: computer analysis, correction and processing of two- and three-dimensional images and videos; recognition and classification of figurative shapes; mathematical methods of image processing and evaluation, manipulation.

15. Description of practices

During the computer practice the students are programming and solving examples about the topic of the lectures.

16. Description of laboratory practices

-

17. Learning outcomes

a) Knowledge and Ability:

- Knowing the processes and basic elements of image processing, enhancement and manipulation.
- Having comprehensive knowledge about the different topics of image acquisition.
- Knowing the computer description of images and basic properties.
- Knowing the basics of shape recognition. Knowing the basic properties of human vision.
- Knowing the principles of decision making.
- Having comprehensive about convolution and application areas.
- Knowing the methods of motion-analysis and tracking.
- Knowing the basic methods of texture characterization.
- Being able to apply the knowledge in tasks related to image processing, enhancement and manipulation.
- Application of decision making methods.
- Being able to apply of different shape recognition algorithms. Being able to solve tracking and motion analysis problems.
- Being able to solve the problems alone or in group and efficiently transfer the knowledge.
- Having original/innovative ideas.

b) Attitude, Autonomy and responsibility:

- Working efficiently alone and in group.
- Seeking for relations to other subjects.
- Being open to use mathematical and informatic tools.
- Seeking to know and learn the neccessary tools.
- Seeking to solve the problems accurately and error-free.
- Finding solutions alone.
- Taking into considereations the effects of the decisions.
- Applying systematic approach.

18. Requirements, way to determine a grade (obtain a signature)

The evaluation of the learning results is based on the written (homework) and oral (oral exam) performance. The homework can be corrected until the end of the week of examinations.

19. Retake and delayed completion

The oral exam can be re-take first free of charge. The second and higher re-take of the same subject has charge regulated by the university.

20. Learning materials

Subject description

1. Subject name: Discrete event systems with traffic applications (PhD)

2. Subject name in Hungarian: Diszkrét eseményű rendszerek és közlekedési alkalmazásaik (PhD)

3. Role: Specific course

4. Code: BMEKOKAD015

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours:
   - 2 lecture
   - 0 practice
   - 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 90 hours
   - Contact hours: 28 hours
   - Preparation for seminars: 6 hours
   - Reading written materials: 6 hours
   - Midterm preparation: 16 hours
   - Exam preparation: 10 hours

10. Department: Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer: Dr. Hangos Katalin

12. Lecturers: Dr. Hangos Katalin

13. Prerequisites:
   - (-), -;
   - (-), -;
   - (-), -;

14. Description of lectures
   Basic concepts and techniques for describing discrete-event systems: discrete-event systems theory, Petri nets and automatons, qualitative difference equations, rules and rule systems with time-dependent predicates, inference and search; graph-type models, effect graphs. Solving discrete-event system models, availability graph. Dynamic analysis of discrete-event systems: constraint, availability analysis, dead ends. Model-based generation and verification of discrete control sequences. Direct and prediction diagnostics based on discrete-event system models. Generalization of discrete-event system models to describe different classes of hybrid systems.

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes
   a) Knowledge and Ability:
      - The subject knowledge provides high-level theoretical knowledge to PhD students intending to delve into transport science to solve modeling, dynamic analysis, diagnostic, and control tasks in transport systems that can be described as discrete events.

18. Requirements, way to determine a grade (obtain a signature)
   An individual task for modeling and dynamic analysis of a simple discrete event transport system. The prerequisite for obtaining the signature and for passing the exam is the complete and timely submission of the individual student assignment. The exam is oral.

19. Retake and delayed completion

20. Learning materials
1. Subject name: Drive techniques PhD

2. Subject name in Hungarian: Hajtástechnika PhD

3. Role: Specific course

4. Code: BMEKOGED006

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 3 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject:
   
   Contact hours: 42 hours
   Preparation for seminars: 7 hours
   Homework: 20 hours
   Reading written materials: 7 hours
   Midterm preparation: 0 hours
   Exam preparation: 14 hours

   Total: 90 hours

10. Department: Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer: Dr. Lovas László

12. Lecturers: Dr. Lovas László

13. Prerequisites:
   - 
   - 
   - 

14. Description of lectures:

15. Description of practices:

16. Description of laboratory practices:

17. Learning outcomes:
   a) Knowledge:
      - Problems and solutions in driveline technics.
   b) Ability:
      - Design of a driveline with internal combustion engine.
   c) Attitude:
      - Being open to understand and learn novelties on that given domain.
   d) Autonomy and responsibility:
      - Evaluation and choice of elements for an optimal solution.

18. Requirements, way to determine a grade (obtain a signature):
Semester note upon successful realisation of the homework and an oral exam.

19. Retake and delayed completion:
Secondary deadline for the homework precised in the lessons requirements.

20. Learning materials:
Subject description

1. **Subject name**
   **Electronic control of aircraft engines PhD**

2. **Subject name in Hungarian**
   Repülőgép hajtóművek elektronikus szabályozása PhD

3. **Role**
   Specific course

4. **Code**
   BMEKOVRD001

5. **Evaluation type**
   e

6. **Credits**
   3

7. **Weekly contact hours**
   2 lecture 0 practice 1 lab

8. **Curriculum**
   D

9. **Working hours for fulfilling the requirements of the subject**
   120 hours

   - **Contact hours**
     42 hours

   - **Preparation for seminars**
     14 hours

   - **Midterm preparation**
     0 hours

   - **Homework**
     28 hours

   - **Exam preparation**
     28 hours

10. **Department**
    Department of Aeronautics, Naval Architecture and Railway Vehicles

11. **Responsible lecturer**
    Dr. Beneda Károly

12. **Lecturers**
    Dr. Beneda Károly

13. **Prerequisites**
    - (-), -
    - (-), -
    - (-), -

14. **Description of lectures**

15. **Description of practices**
   -

16. **Description of laboratory practices**
   Measurements on gas turbine engines, testing of control algorithms

17. **Learning outcomes**
   a) Knowledge:
   - The student is familiar with the theoretical background of electronic control systems for advanced gas turbine aircraft engines, current industry control solutions, and LQR, LQG / LTR, adaptive model-based controls.

   b) Ability:
   - The student is able to investigate the operating characteristics of different engines on a theoretical level by performing simulations. Able to perform identification and control measurements to test control algorithms. The student is able to design, develop and achieve new industrial and scientific results after analyzing and evaluating the obtained test data.

   c) Attitude:
   - The student aims to complete his/her studies at the highest level, under the shortest time, by providing his/her knowledge and capacity at the best to obtain knowledge for deep and independent professional work; The student has strong professional commitment, has developed expectations for finding new, better solutions and has agreement on doing hard work.

   d) Autonomy and responsibility:
   - The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms. The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints. The student can friendly accept the well-established constructive criticism and can utilize that in future. The student is a creative constructor, proactive, and has leadership skills and argument techniques, capabilities with responsibility during the studies, research work.

18. **Requirements, way to determine a grade (obtain a signature)**
   The criterion of the acceptance of the semester and so getting the signature is the completeness of the solution of a defined problem in a specific area in the agreed time and quality. The exam is oral. The final mark of the exam is the mathematical average of the results for the own task and the exam.

19. **Retake and delayed completion**
   According to the TVSZ.

20. **Learning materials**
Subject description

1. Subject name
Electronically controlled vehicle systems PhD

2. Subject name in Hungarian
Elektronikusan szabályozott járműrendszerek PhD

3. Role
Basic course

4. Code
BMEKOGJD003

5. Evaluation type
e

6. Credits
4

7. Weekly contact hours
4 lecture 0 practice 0 lab

8. Curriculum
D

9. Working hours for fulfilling the requirements of the subject
120 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 hours</td>
<td>14 hours</td>
<td>22 hours</td>
<td>0 hours</td>
</tr>
</tbody>
</table>

10. Department
Department of Automotive Technologies

11. Responsible lecturer
Dr. Tihanyi Viktor

12. Lecturers
Dr. Tihanyi Viktor

13. Prerequisites
- (-), -
- (-), -
- (-), -

14. Description of lectures
Our students can effectively use the knowledge of this subjects during their research on modern, electronically controlled vehicle dynamics systems. Topics: design problem of electronically controlled vehicle dynamics systems used in modern vehicles; different types of suspension control systems; electronically controlled levelling systems of commercial vehicles; electronically controlled steering, braking and driving systems; stability control system.

15. Description of practices
-

16. Description of laboratory practices
-

17. Learning outcomes
a) Knowledge:
   - Familiar with vehicle dynamics fundamentals.

b) Ability:
   - Ability to research and develop specific processes.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)
The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

19. Retake and delayed completion
There is one occasion to retake the exam.

20. Learning materials
1. **Subject name**: Environmental effects of transport

2. **Subject name in Hungarian**: Közlekedési rendszerek környezeti hatásai

3. **Role**: Specific course

4. **Code**: BMEKOKUD020

5. **Evaluation type**: e

6. **Credits**: 2

7. **Weekly contact hours**: 2 lecture, 0 practice, 0 lab

8. **Curriculum**: D

9. **Working hours for fulfilling the requirements of the subject**: 88 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
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</thead>
<tbody>
<tr>
<td>56 hours</td>
<td>5 hours</td>
<td>6 hours</td>
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<table>
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<tr>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>5 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 hours</td>
<td>5 hours</td>
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</table>

10. **Department**: Department of Transport Technology and Economics

11. **Responsible lecturer**: Dr. Török Ádám

12. **Lecturers**: Dr. Mészáros Péter

13. **Prerequisites**: - (-), -;

14. **Description of lectures**: Transport-environment, factors of environmental impact, the problem of sustainability. Mitigation of environmental impacts of transport, regulations, policies, tendencies, practices. Local and international case studies. EIA, decision making, preparation of decisions on the field of transport infrastructure development. Integration of transport and land use policies. Environmental conflicts of freight transport, intermodality and transit policies. Environmental costs of transport, the case of externalities, prices and charges. Urban transport, opportunities of sustainable urban environmental management, integration of environmentally sound mobility forms. Sustainable Urban Mobility Plans. Demand management, parking and road charges. Requirements of fuel efficiency, alternative fuels, energy efficient and environmentally enhanced vehicles.

15. **Description of practices**: -

16. **Description of laboratory practices**: -

17. **Learning outcomes**: a) Knowledge and Ability:

   - The student gets acquainted with the environmental factors of the environment, its impact processes, the problem of sustainability. It will be able to identify, quantify and mitigate the environmental impacts of transport. Learn about the direction of regulations, policies, and trends. With the help of domestic and international examples, case studies open their minds.

18. **Requirements, way to determine a grade (obtain a signature)**: It is required to fulfill in time the individual student work.

19. **Retake and delayed completion**: The attendance requirements cannot be delayed completed. The individual case study report can be delayed submitted in the delayed completion period.

20. **Learning materials**: YOSHITSUGU HAYASHI, JOHN ROY: Transport, Land-Use and the Environment - Springer
1. Subject name | Experimental Modal Analysis I.
2. Subject name in Hungarian | Kisérleti modálelemzés I.
3. Role | Specific course
4. Code | BMEK0EAD016
5. Evaluation type | e
6. Credits | 2
7. Weekly contact hours | 2 lecture, 0 practice, 1 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 60 hours
   | Contact hours | 42 hours
   | Preparation for seminars | 0 hours
   | Midterm preparation | 0 hours
   | Homework | 6 hours
   | Reading written materials | 6 hours
   | Preparation for seminars | 0 hours
   | Reading written materials | 0 hours
   | Midterm preparation | 0 hours
   | Exam preparation | 6 hours
10. Department | Department of Vehicle Elements and Vehicle-Structure Analysis
11. Responsible lecturer | Dr. Pápai Ferenc
12. Lecturers | Dr. Pápai Ferenc
13. Prerequisites | - ( ), -
   | - ( ), -
   | - ( ), -
14. Description of lectures
15. Description of practices
   -
16. Description of laboratory practices
   Measurements on parts and small assemblies, as learnt on the lessons.
17. Learning outcomes
   a) Knowledge:
      - Basics of modal analysis theory. Basics of measurement technics.
   b) Ability:
      - Measurement and parameter identification of parts and simple structures.
   c) Attitude:
      - Being open to understand and learn novelties on that given domain.
   d) Autonomy and responsibility:
      - Evaluation and choice of elements for an optimal solution.
18. Requirements, way to determine a grade (obtain a signature)
   Semester note upon succesful realisation of the homeworks, realisation of the measurement reports, and a written exam.
19. Retake and delayed completion
   Homework and measurement report secondary deadlines precised in the lessons requirements.
20. Learning materials
   -
1. Subject name  Experimental Modal Analysis II.

2. Subject name in Hungarian  Kisérleti modálelemzés II.

3. Role  Specific course

4. Code  BMEKOEAD017

5. Evaluation type  e

6. Credits  2

7. Weekly contact hours  2 lecture  0 practice  1 lab

8. Curriculum  D

9. Working hours for fulfilling the requirements of the subject  60 hours

- Contact hours  42 hours
- Preparation for seminars  0 hours
- Homework  6 hours
- Reading written materials  6 hours
- Midterm preparation  0 hours
- Exam preparation  6 hours

10. Department  Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer  Dr. Pápai Ferenc

12. Lecturers  Dr. Pápai Ferenc

13. Prerequisites  Experimental Modal Analysis I. (BMEKOEAD016), strong:
- (-), -
- (-), -

14. Description of lectures

15. Description of practices

16. Description of laboratory practices
Measurements on parts and small assemblies, as learnt on the lessons.

17. Learning outcomes
a) Knowledge:
- Deep knowledge of modal analysis.

b) Ability:

18. Requirements, way to determine a grade (obtain a signature)
Semester note upon succesful realisation of the homeworks, realisation of the measurement reports, and a written exam.

19. Retake and delayed completion
Homework and measurement report secondary deadlines precised in the lessons requirements.

20. Learning materials
Subject description

1. Subject name
Financing Transport Infrastructure

2. Subject name in Hungarian
Financing Transport Infrastructure

3. Role
Basic course

4. Code
BMEKOKKD007

5. Evaluation type
e

6. Credits
4

7. Weekly contact hours
4 lecture 0 practice 0 lab

8. Curriculum
D

9. Working hours for fulfilling the requirements of the subject
120 hours

Contact hours 56 hours
Preparation for seminars 8 hours
Homework 14 hours
Reading written materials 28 hours
Midterm preparation 4 hours
Exam preparation 10 hours

10. Department
Department of Transport Technology and Economics

11. Responsible lecturer
Dr. Bárány Zoltán

12. Lecturers
Dr. Bárány Zoltán

13. Prerequisites
- 
- 
- 

14. Description of lectures
The student is able to independently develop innovative solutions for the cost of using transport. It is capable of critically analyzing new research results in the field of fees, flexibility, and time saving. It is able to interpret PPP structures independently in the context of the project, and is able to distinguish the characteristics of different funding structures in a structured way. It is capable of structured risk analysis.

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes
a) Knowledge:
   - The student becomes familiar with the significant financial and economical aspects of the development projects in transportation and logistics.

b) Ability:
   - The student can evaluate and increase the financial-economical efficiency of projects.

c) Attitude:
   - The student strives for the integrated handling of the technical, economical, social, financial and environmental aspects of transportation projects.

d) Autonomy and responsibility:
   - The student is able to make independent analysis and evaluation activities.

18. Requirements, way to determine a grade (obtain a signature)
Preparing and presenting the presentation, participation on the lectures and computer labs.

19. Retake and delayed completion
The written homework and presentation can be delayed till end of delayed completion period.

20. Learning materials
European Strategies: White paper 2011; Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system.

References used for the presentations prepared by the students
### Subject description

**1. Subject name**  
Flight Safety, PhD

**2. Subject name in Hungarian**  
Repülésbiztonság PhD

**3. Role**  
Specific course

**4. Code**  
BMEKORHD017

**5. Evaluation type**  
e

**6. Credits**  
2

**7. Weekly contact hours**  
2 lecture 0 practice 0 lab

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Midterm preparation</th>
<th>Homework</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>28 hours</td>
<td>30 hours</td>
<td>0 hours</td>
<td>15 hours</td>
<td>32 hours</td>
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</table>

**10. Department**  
Department of Aeronautics, Naval Architecture and Railway Vehicles

**11. Responsible lecturer**  
Dr. Rohács Dániel

**12. Lecturers**  
Dr. Rohács Dániel

**13. Prerequisites**  
\( \cdot (\cdot, \cdot); \)  
\( \cdot (\cdot, \cdot); \)  
\( \cdot (\cdot, \cdot); \)

**14. Description of lectures**

The subject gives a brief overview of the aviation system, its most important elements. Then he deals with opportunities for improvement of aviation safety, interpretation of safety, indicators of aviation safety, risk, flight situations, their classification, risk management, development of methods of risk analysis, regularities of reliability models.

**15. Description of practices**

- 

**16. Description of laboratory practices**

- 

**17. Learning outcomes**

a) Knowledge and Ability:

- Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: the basics of the safety of the prepulse, the indicators of flight safety, the flight situations and their classification, the methods of risk management and risk analysis.

b) Attitude, Autonomy and responsibility:

- Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasource activities in new fields of knowledge in an innovative way.

**18. Requirements, way to determine a grade (obtain a signature)**

Accepted homework and oral exam.

**19. Retake and delayed completion**

According to the TVSZ.

**20. Learning materials**

1. **Subject name**
   **Functional analysis for Engineers**

2. **Subject name in Hungarian**
   Funkcionálanalízis mérnököknek

3. **Role**
   Basic course

4. **Code**
   BMEKOVD018

5. **Evaluation type**
   e

6. **Credits**
   4

7. **Weekly contact hours**
   2 lecture, 0 practice, 0 lab

8. **Curriculum**
   D

9. **Working hours for fulfilling the requirements of the subject**
   120 hours

   - **Contact hours**
     28 hours

   - **Preparation for seminars**
     30 hours

   - **Homework**
     0 hours

   - **Reading written materials**
     30 hours

   - **Midterm preparation**
     0 hours

   - **Exam preparation**
     32 hours

10. **Department**
    Department of Aeronautics, Naval Architecture and Railway Vehicles

11. **Responsible lecturer**
    Dr. Zobory István

12. **Lecturers**
    Dr. Zobory István

13. **Prerequisites**
    - (-), -
    - (-), -
    - (-), -

14. **Description of lectures**

15. **Description of practices**
    -

16. **Description of laboratory practices**
    -

17. **Learning outcomes**
    a) Knowledge and Ability:
        - Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: theory of linear functionals and operators; application of the functional analysis in numerical methods.
    b) Attitude, Autonomy and responsibility:
        - Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasource activities in new fields of knowledge in an innovative way.

18. **Requirements, way to determine a grade (obtain a signature)**
    Regular participation at the lectures and written exam.

19. **Retake and delayed completion**
    According to the TVSZ.

20. **Learning materials**
Subject description

1. Subject name
Informatics in Logistics (PhD)

2. Subject name in Hungarian
Logisztikai informatika (PhD)

3. Role
Basic course

4. Code
BMEKOKUD014

5. Evaluation type
e

6. Credits
4

7. Weekly contact hours
4 lecture 0 practice 0 lab

8. Curriculum
D

9. Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Preparation for seminars</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 hours</td>
<td>7 hours</td>
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<td>0 hours</td>
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<table>
<thead>
<tr>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 hours</td>
<td>0 hours</td>
<td>0 hours</td>
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</table>

10. Department
Department of Material Handling and Logistics Systems

11. Responsible lecturer
Dr. Kovács Gábor

12. Lecturers
Dr. Kovács Gábor

13. Prerequisites
- (-), -
- (-), -
- (-), -

14. Description of lectures
The subject gives advanced knowledge of information technology in logistics systems, including modelling and enterprise resource planning systems. One of the main aims is to help the own research of PhD students, which is connected with logistics information systems.

15. Description of practices
-

16. Description of laboratory practices
-

17. Learning outcomes

a) Knowledge:
   - Knowledge of the modular structure and operation of the logistics information systems.
   - Knowledge of related optimum search tasks and solutions.

b) Ability:
   - Able to study the logistics information systems, taking into account the scientific requirements.
   - Able to carry out research and development tasks related to the logistics information systems.

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

d) Autonomy and responsibility:
   - Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

18. Requirements, way to determine a grade (obtain a signature)
The grade of the PhD student is based on the semester activity and the evaluation of the paper (publishing), in consultation with the supervisor.

19. Retake and delayed completion
Announced at the beginning of the semester.

20. Learning materials
Slides and examples in electronic format.
Subject description

1. Subject name **Innovative methods for the demand planning**
2. Subject name in Hungarian A kereslettervezés korszerű módszerei
3. Role Specific course
4. Code BMEKOALD003
5. Evaluation type e
6. Credits 3
7. Weekly contact hours 3 lecture 0 practice 0 lab
8. Curriculum D
9. Working hours for fulfilling the requirements of the subject 90 hours
   - Contact hours 42 hours
     - Preparation for seminars 7 hours
     - Midterm preparation 0 hours
   - Reading written materials 11 hours
     - Homework 30 hours
   - Midterm preparation 0 hours
   - Exam preparation 0 hours
10. Department Department of Material Handling and Logistics Systems
11. Responsible lecturer Dr. Bóna Krisztián
12. Lecturers Dr. Bóna Krisztián
13. Prerequisites Operational Research in Logistics (BMEKOALD001), recommended;
   - (·), ·;
   - (·), ·

14. Description of lectures

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes
   a) Knowledge:
      - Knowledge of the tasks and problems of the demand planning.
      - Knowledge of the mathematical modelling techniques.
      - Knowledge of the related optimum searching and statistical data mining tasks and solutions.
   b) Ability:
      - Able to study the demand planning tasks, taking into account the scientific requirements.
      - Able to carry out research and development tasks related to the demand planning.
   c) Attitude:
      - Strive to maximize their abilities to make their studies at the highest possible level, with a profound and independent knowledge, accurate and error-free, in compliance with the rules of the applicable tools, in collaboration with the instructors.
   d) Autonomy and responsibility:
      - Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

18. Requirements, way to determine a grade (obtain a signature)
The grade of the PhD student is based on the research activity, and the quality of the developed model, and the scientific white paper.

19. Retake and delayed completion
Announced at the beginning of the semester.

20. Learning materials
C. Chatfield: The Analysis of Time Series, Chapman & Hall/CRC, 2004
http://www.neural-forecasting.com/
1. Subject name: Innovative methods for the inventory planning

2. Subject name in Hungarian: A készlettervezés korszerű módszerei

3. Role: Specific course

4. Code: BMEKOALD008

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 3 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 90 hours

Contact hours: 42 hours
Preparation for seminars: 7 hours
Homework: 30 hours
Reading written materials: 11 hours
Midterm preparation: 0 hours
Exam preparation: 0 hours

10. Department: Department of Material Handling and Logistics Systems

11. Responsible lecturer: Dr. Bóna Krisztián

12. Lecturers: Dr. Bóna Krisztián

13. Prerequisites: Operational Research in Logistics (BMEKOALD001), recommended;


15. Description of practices:

16. Description of laboratory practices:

17. Learning outcomes:

a) Knowledge:
   - Knowledge of the tasks and problems of the inventory planning.
   - Knowledge of the mathematical modelling techniques.
   - Knowledge of the related optimum searching and statistical data mining tasks and solutions.

b) Ability:
   - Able to study the inventory planning tasks, taking into account the scientific requirements.
   - Able to carry out research and development tasks related to the inventory planning.

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

d) Autonomy and responsibility:
   - Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

18. Requirements, way to determine a grade (obtain a signature):
The grade of the PhD student is based on the research activity, and the quality of the developed model, and the scientific white paper. Announced at the beginning of the semester.

19. Retake and delayed completion:
Announced at the beginning of the semester.

20. Learning materials:
Waters, D.: Inventory Control and Management, John Wiley & Sons, 2007
Axsäter, S.: Inventory Control, Springer, 2006
1. Subject name | Intelligent and autonomous vehicle control system
2. Subject name in Hungarian | Intelligens és autonóm járműirányítási rendszerek
3. Role | Basic course
4. Code | BMEKOKAD019
5. Evaluation type | e
6. Credits | 4
7. Weekly contact hours | 2 lecture 0 practice 0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 120 hours
   | Contact hours | 28 hours | Preparation for seminars | 30 hours | Homework | 10 hours
   | Reading written materials | 10 hours | Midterm preparation | 0 hours | Exam preparation | 42 hours
10. Department | Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer | Dr. Németh Balázs
12. Lecturers | Dr. Németh Balázs
13. Prerequisites | (-, (-), (-)
14. Description of lectures
15. Description of practices
16. Description of laboratory practices
17. Learning outcomes
18. Requirements, way to determine a grade (obtain a signature)
Final exam and homework.
19. Retake and delayed completion
20. Learning materials
**Subject description**

1. **Subject name**
   Intelligent vehicle-road systems PhD

2. **Subject name in Hungarian**
   Intelligens jármű-út renszerek PhD

3. **Role**
   Specific course

4. **Code**
   BMEKOGJD005

5. **Evaluation type**
   e

6. **Credits**
   2

7. **Weekly contact hours**
<table>
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<th>Practice</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

8. **Curriculum**
   D

9. **Working hours for fulfilling the requirements of the subject**
   120 hours

<table>
<thead>
<tr>
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<th>Homework</th>
<th>Exam preparation</th>
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<tr>
<td>28 hours</td>
<td>14 hours</td>
<td>22 hours</td>
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10. **Department**
    Department of Automotive Technologies

11. **Responsible lecturer**
    Dr. Tihanyi Viktor

12. **Lecturers**
    Dr. Tihanyi Viktor

13. **Prerequisites**
    - (-), (-)
    - (-), (-)
    - (-), (-)

14. **Description of lectures**

   Our students can effectively use the knowledge of this subject during their research on intelligent vehicle / highway systems, driver assist systems. The course discusses the design of the systems mounted on vehicle and on its surrounding, the simulation of transportation systems.

15. **Description of practices**

16. **Description of laboratory practices**

17. **Learning outcomes**

   a) Knowledge:
      - Familiar with vehicle dynamics fundamentals.

   b) Ability:
      - Ability to research and develop specific processes.

   c) Attitude:
      - Openness to new opportunities in the field.

   d) Autonomy and responsibility:
      - Participate in independent research tasks.

18. **Requirements, way to determine a grade (obtain a signature)**

   The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

19. **Retake and delayed completion**

   There is one occasion to retake the exam.

20. **Learning materials**

Subject description

1. Subject name: Joining Technologies in Vehicle Industry

2. Subject name in Hungarian: Járműipari kötéstechnológiák

3. Role: Specific course

4. Code: BMEKOGTD015

5. Evaluation type: e

6. Credits: 2

7. Weekly contact hours: 2 lecture 0 practice 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 34 hours

- Contact hours: 10 hours
- Preparation for seminars: 0 hours
- Midterm preparation: 0 hours
- Homework: 10 hours
- Exam preparation: 4 hours

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Markovits Tamás

12. Lecturers: Dr. Markovits Tamás

13. Prerequisites: (- (-), -;
- (-, -);
- (-, -)

14. Description of lectures


15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
   - Familiar with modern automotive joining technologies and the internal relations of some specific processes.

b) Ability:
   - Ability to research and develop specific processes.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)

It is necessary to prepare and submit an independent homework within the subject. The course ends with an oral exam.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials

Subject description

1. Subject name  Laser Technology

2. Subject name in Hungarian  Lézertechnológiák

3. Role  Specific course

4. Code  BMEKOGTD003

5. Evaluation type  e

6. Credits  3

7. Weekly contact hours  2 lecture  0 practice  0 lab

8. Curriculum  D

9. Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>10 hours</td>
<td>0 hours</td>
<td>20 hours</td>
<td>0 hours</td>
<td>4 hours</td>
</tr>
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</table>

Reading written materials  10 hours

Midterm preparation  0 hours

10. Department  Department of Automotive Technologies

11. Responsible lecturer  Dr. Markovits Tamás

12. Lecturers  Dr. Markovits Tamás

13. Prerequisites  - (-), -;
                 - (-), -;
                 - (-), -;

14. Description of lectures


15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
   - Familiar with modern laser technologies and the internal relations of some specific processes.

b) Ability:
   - Ability to research and develop specific processes.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)

It is necessary to prepare and submit an independent homework within the subject. The course ends with an oral exam.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials

Machine Vision PhD

1. Tárgy neve: Machine Vision PhD
2. Tárgy angol neve: Gépi látás PhD
3. Szerep: Basic course
4. Tárgykód: KOALD009
5. Kötetlémény: m
6. Kredit: 5
7. Óraszám (levelcező): 2 (28) lecture 0 (0) practice 2 (28) lab
8. Tanterv: D

9. A tantárgy elvégzéséhez szükséges tanulmányt munkaóra összesen: 150 hours
   Kontakt óra: 56 hours
   Órás készülés: 16 hours
   Házi feladat: 50 hours
   Irásos tananyag: 18 hours
   Zárthelyire készülés: 10 hours
   Vizsgafelfüggesztés: 0 hours
10. Felelős tanszék: Department of Material Handling and Logistics Systems
11. Felelős oktató: Dr. Szirányi Tamás
12. Oktatók: Dr. Szirányi Tamás, Rózsa Zoltán
13. Előtanulmány: Képfeldolgozás; (BMEKOALD002); ajánlott

14. Előadás tematikája
   Machine vision is the most important measure of intelligent road transport. Allows you to track the complex movement and traffic participants, continuously analyze situations and locations. The processing and semantic evaluation of the video stream extracted through the camera gives basic information to the autonomous driving. The subject is about capturing, analyzing and interpreting visual information: extracting high-level image descriptors from lower-level visual characteristics.
   1. Machine vision in the society of autonomous robots (e.g. autonomous driving): technology, devices, system requirements, software tools and environment; overview of main tasks and related mathematical and algorithmic background; summary of basic image processing methods applied in the following.
   2. Shape representation and description (regions, active contours, shape description, region decomposition, superpixel); definitions of shapes in 2D, 3D and 3D point-clouds.
   3. Scale Space axioms of image understanding (Lindeberg’s edge/ridge definition: multiscale segmentation and skeletonization, SIFT and similar feature detectors, anisotropic diffusion, RANSAC fitting)
   4. Energy optimization based image analysis (Markov Random Field, simulated annealing, region segmentation) for remote sensing and change detection; MRF as preprocessing in motion segmentation and active layer in Deep Convolutional Neural Nets.
   6. Video processing and analysis; Background/ foreground/ Shadow segmentation (mixture of Gaussian models, shadow models, foreground fitting); Motion Analysis (Optical flow, interest point detection and tracking, video tracking);
   7. Pattern recognition in 2D and 3D (Statistical-, Neural-, Syntactic- pattern recognition, graph based comparison); Principal Component Analysis; Kernel Methods;
   9. Image- and video-features; Generating and using annotated data sets: training-, test- and validation-sets. Content based image and video-analysis; -indexing and -retrieval; the curse of dimensionality;
   10. Reconstruction of the scanned environment from monocular and multiple-view vision; Image based Simultaneous Localization and Mapping (I-SLAM) for automatic driving localization.
   11. Multimodal/multiview fusion: fusion of sensors and cameras of different positions and spectra: optical-, infra- and depth-cameras. Motion tracking in multiple-view; Traffic surveillance and control from street cameras and on-board moving devices.
   15. Demonstration of the participants’ project development during the semester.

15. Gyakorlat tematikája

16. Labor tematikája
   Computer exercises; MATLAB programming.

17. Tanulási eredmények
   a) Knowledge:
   - Knows advanced image processing algorithms.
   - Knows three-dimensional shape recognition methods.
   - Is familiar with environmental reconstruction technologies.
   - Is familiar with modern, neural network-based approaches to image processing.
   b) Ability:
   - Design of image object and shape recognition algorithm.
   - Can see the architectural issues of a machine vision system.
- Is able to select a suitable tool and algorithm for a given task.

c) Attitude:
- Open to learn about modern vision systems.
- Open to automatic use of machine vision in vehicle control.

d) Autonomy and responsibility:
- Can participate in image processing projects independently or in a team.
- Is able to design a vision system that meets the given task and safety requirements.

| 18. Követelmények, az osztályzat (aláírás) kialakításának módja |
| Two midsemester exam and an individual homework. The final grade is the average of the two midterm exam. |

| 19. Pótlási lehetőségek |
| One Midterm exam and the homework can be retried. |

| 20. Jegyzet, tankönyv, felhasználható irodalom |
| Lecture notes. |
1. Subject name | Management methods in transportation
---|---
2. Subject name in Hungarian | Menedzsment módszerek a közlekedésben
3. Role | Specific course
4. Code | BMEKOKKD004
5. Evaluation type | m
6. Credits | 3
7. Weekly contact hours | 0 lecture  2 practice  0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 90 hours
   - Contact hours | 28 hours
   - Preparation for seminars | 14 hours
   - Midterm preparation | 4 hours
   - Homework | 30 hours
   - Exam preparation | 0 hours
10. Department | Department of Transport Technology and Economics
11. Responsible lecturer | Dr. Kővári Botond
12. Lecturers | Dr. Kővári Botond
13. Prerequisites | - (-), -;
   - (-), -;
   - (-), -
14. Description of lectures
15. Description of practices
   Literature research in a topic discussed with the lecturer, and write and present a seminar paper.
16. Description of laboratory practices
17. Learning outcomes
   a) Knowledge:
      - Familiar with economic issues of a company and its marketing activities.
   b) Ability:
      - Ability to overview a company in an economic way, to evaluate the market position.
   c) Attitude:
      - Strive to acquire the highest level of system approach.
   d) Autonomy and responsibility:
      - Responsible applies of acquired knowledge in individual or in team work.
18. Requirements, way to determine a grade (obtain a signature)
   1 test, 1 shorter homework.
19. Retake and delayed completion
   Second test possibility for those not present on the test, possibility of delayed deadline for home work.
20. Learning materials
   Suggested books and papers.
### Subject description

#### 1. Subject name

**Materials Science**

#### 2. Subject name in Hungarian

Anyagtudomány

#### 3. Role

Basic course

#### 4. Code

BMEKOGGD001

#### 5. Evaluation type

e

#### 6. Credits

4

#### 7. Weekly contact hours

<table>
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<th>Lecture</th>
<th>Practice</th>
<th>Lab</th>
</tr>
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<tr>
<td>Contact hours</td>
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<tr>
<td>Reading written materials</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

#### 9. Working hours for fulfilling the requirements of the subject

- **Contact hours:** 56 hours
- **Preparation for seminars:** 0 hours
- **Midterm preparation:** 0 hours

#### 10. Department

Department of Automotive Technologies

#### 11. Responsible lecturer

Dr. Bán Krisztián

#### 12. Lecturers

Dr. Bán Krisztián

#### 13. Prerequisites

Advanced materials and technologies (BMEKOGGM601), recommended;

- (.), .
- (.), .

#### 14. Description of lectures


#### 15. Description of practices

-

#### 16. Description of laboratory practices

-

#### 17. Learning outcomes

**a) Knowledge:**

- Recognizes new regularities in the types of chemical bonds. It recognizes new laws of crystalline and amorphous structure.
- It recognizes new regularities in the field of thermodynamics. It recognizes new laws of diffusion.
- It recognizes new regularities about the thermodynamic background, types, energetic relations of phase transitions, and the importance of the interface in phase transitions. Recognizes new regularities about types of non-equilibrium systems.
- It recognizes new regularities about the role of the interface in material properties.
- Recognizes new regularities in the properties of amorphous and nanostructured materials.
- Recognizes new regularities about the effects of different bonds, error structures (real structures) in transport, optical, magnetic and mechanical properties. Recognizes new regularities with major direct structural analysis methods: XRD, texture, SEM, TEM, optical microscopy. It recognizes new regularities in major spectroscopic examination procedures.
- Recognizes new laws regarding the DSC test method.
- Recognizes new laws through the application of major mechanical and non-destructive material testing methods.

**b) Ability:**

- It is capable of understanding the entire process and its elements, or of a process plan.
- It is capable of deeper, causal, scientific analysis of a technological or measurement process.
- Can formulate suggestions for the development of a technological or measurement process.
- He / she is able to collect literature on a specific research topic for a focus question and to compile a summary based on it.
- They are able to interpret the results found in the literature.
- He / she is able to design experimental designs and research methods on a research topic. Able to interpret test results.

**c) Attitude:**

- It strives to develop its knowledge independently. It strives to ensure that each topic area and/or theme. look for relationships between disciplines. It seeks to share its knowledge.
- It seeks to ensure that the literature and literature. interpret your own research results individually and in teamwork, listening to the thoughts of others.

**d) Autonomy and responsibility:**

- Responsibly apply the knowledge gained in the subject subject to its limitations. It manages according to ethical standards and communicates the results to others and itself. It seeks to carry out the task entrusted to it independently, in accordance with ethical standards. You are aware of the extent to which your responsibilities extend to informing your colleagues or supervisors of the results and if needed.
18. Requirements, way to determine a grade (obtain a signature)

The course ends with an oral examination.

19. Retake and delayed completion

Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

20. Learning materials

Charles Kittel: Introduction to solid state physics,
Flinn, Trojan: Engineering Materials and Their Applications,
Auxiliary materials and ppt's downloadable from the department website.
1. Subject name **Mathematical methods I.**
2. Subject name in Hungarian Matematikai módszerek I.
3. Role Basic course
4. Code BMEKOKAD003
5. Evaluation type e
6. Credits 4
7. Weekly contact hours 2 lecture 0 practice 0 lab
8. Curriculum D
9. Working hours for fulfilling the requirements of the subject
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<tr>
<td>56 hours</td>
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<td>24 hours</td>
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<td>Reading written materials</td>
<td>10 hours</td>
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10. Department Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer Dr. Péter Tamás
12. Lecturers Dr. Péter Tamás
13. Prerequisites - (-), -; - (-), -; - (-), -
14. Description of lectures
   1.) Extreme value theorem.
15. Description of practices
   -
16. Description of laboratory practices
   -
17. Learning outcomes
   -
18. Requirements, way to determine a grade (obtain a signature)
   The credits are obtained by completing the assignment and by passing the oral exam.
19. Retake and delayed completion
   -
20. Learning materials
   -
Subject description

1. Subject name
   Mathematical methods II.

2. Subject name in Hungarian
   Matematikai módszerek II.

3. Role
   Basic course

4. Code
   BMEKOKAD007

5. Evaluation type
   e

6. Credits
   4

7. Weekly contact hours
   1 lecture 0 practice 0 lab

8. Curriculum
   D

9. Working hours for fulfilling the requirements of the subject
   120 hours
   - Contact hours: 28 hours
   - Preparation for seminars: 28 hours
   - Midterm preparation: 20 hours
   - Homework: 12 hours
   - Reading written materials: 16 hours
   - Midterm preparation: 20 hours
   - Exam preparation: 16 hours

10. Department
    Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer
    Dr. Péter Tamás

12. Lecturers
    Dr. Péter Tamás

13. Prerequisites
    - ( ), ;
    - ( ), ;
    - ( ), ;

14. Description of lectures
    3.) The notable equations and their applications. Euler equation. Euler-Lagrange equation. The Lagrange's equations of the first kind. The Lagrange's equations of the second kind.
    4.) Designing Optimum Linear Systems. To solve the Riccati equation by Anderson's iteration method. Kalman-Bucy filter by Maple. Design of nonlinear systems. Maple Analysis of Lyapunov Functions

15. Description of practices
    -

16. Description of laboratory practices
    -

17. Learning outcomes
    -

18. Requirements, way to determine a grade (obtain a signature)
    The credits are obtained by completing the assignment and by passing the oral exam.

19. Retake and delayed completion
    -

20. Learning materials
    -
### Subject description

1. **Subject name**  
   **Measurement technologies of heat engines I.**

2. **Subject name in Hungarian**  
   Hőerőgépek méréstechnikája I.

3. **Role**  
   Specific course

4. **Code**  
   BMEKOGJD011

5. **Evaluation type**  
   e

6. **Credits**  
   3

7. **Weekly contact hours**  
<table>
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<th>Lab</th>
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<td>2</td>
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</table>

8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   **90 hours**

   - **Contact hours**  
     14 hours

   - **Preparation for seminars**  
     14 hours

   - **Midterm preparation**  
     30 hours

   - **Reading written materials**  
     20 hours

   - **Homework**  
     12 hours

   - **Reading written materials**  
     14 hours

   - **Preparation for seminars**  
     14 hours

   - **Midterm preparation**  
     30 hours

   - **Reading written materials**  
     20 hours

10. **Department**  
    Department of Automotive Technologies

11. **Responsible lecturer**  
    Dr. Zöldy Máté

12. **Lecturers**  
    Dr. Zöldy Máté

13. **Prerequisites**  
    - (-), -;
    - (-), -;
    - (-), -;

14. **Description of lectures**  
    Objective of the subject is the description of laboratory test of heat-engines, especially the internal combustion engine, its propellant and lubricants.

15. **Description of practices**

16. **Description of laboratory practices**

17. **Learning outcomes**

   a) **Knowledge:**
      - Is familiar with the images presented in the subject and the individual procedures of the internal relationships.

   b) **Ability:**
      - Capable of all procedures and research.

   c) **Attitude:**
      - Openness to new opportunities in the field.

   d) **Autonomy and responsibility:**
      - A vehicle for solving research tasks.

18. **Requirements, way to determine a grade (obtain a signature)**
    Knowing the curriculum and application of it. The exam is oral.

19. **Retake and delayed completion**
    There is one occasion to retake the exam.

20. **Learning materials**
Subject description

1. Subject name: Measurement technologies of heat engines II.

2. Subject name in Hungarian: Hőerőgépek méréstechnikája II

3. Role: Specific course

4. Code: BMEKOGJD014

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 3 lecture 0 practice 2 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 90 hours

   Contact hours: 14 hours

   Preparation for seminars: 14 hours

   Homework: 12 hours

   Reading written materials: 20 hours

   Midterm preparation: 30 hours

   Exam preparation: 0 hours

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Zöldy Máté

12. Lecturers: Dr. Zöldy Máté

13. Prerequisites: Measurement technologies of heat engines I. (BMEKOGJD011), strong;

   - (-), -;

   - (-), -;

14. Description of lectures

   Objective of the subject is the description of laboratory test of heat-engines, especially the internal combustion engine, its propellant and lubricants. (continuation of Measurement technologies of heat engines I.)

15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

   a) Knowledge:

      - Is familiar with the images presented in the subject and the individual procedures of the internal relationships.

   b) Ability:

      - Capable of all procedures and research.

   c) Attitude:

      - Openness to new opportunities in the field.

   d) Autonomy and responsibility:

      - A vehicle for solving research tasks.

18. Requirements, way to determine a grade (obtain a signature)

   Knowing the curriculum and application of it. The exam is oral.

19. Retake and delayed completion

   There is one occasion to retake the exam.

20. Learning materials


Subject description

1. Subject name **Mechanics of plastic deformations**

2. Subject name in Hungarian Képlékeny alakváltozások mechanikája

3. Role Basic course

4. Code BMEKOJS002

5. Evaluation type e

6. Credits 4

7. Weekly contact hours
   - 2 lecture
   - 1 practice
   - 0 lab

8. Curriculum D

9. Working hours for fulfilling the requirements of the subject 120 hours
   - Contact hours 42 hours
   - Preparation for seminars 12 hours
   - Midterm preparation 0 hours
   - Homework 28 hours
   - Reading written materials 14 hours
   - Exam preparation 24 hours

10. Department Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer Dr. Béda Péter

12. Lecturers Dr. Béda Péter

13. Prerequisites –\( (-, -) \)
    –\( (-, -) \)
    –\( (-, -) \)

14. Description of lectures

15. Description of practices
    Examples from the topics of the lessons.

16. Description of laboratory practices

17. Learning outcomes
    a) Knowledge:
       – Methods of the theory of plasticity.
    b) Ability:
       – Description of the plastic material behaviour, model building.
    c) Attitude:
       – Being open to understand and learn novelties on that given domain.
    d) Autonomy and responsibility:
       – Evaluation and choice of optimal model elements.

18. Requirements, way to determine a grade (obtain a signature)
    Semester note upon succesful realisation of the homework and an oral exam.

19. Retake and delayed completion
    Essay secondary deadlines precised in the lessons requirements.

20. Learning materials


## Subject description

### 1. Subject name

Modern 3D Design PhD

### 2. Subject name in Hungarian

Korszerű 3D ábrázolás PhD

### 3. Role

Specific course

### 4. Code

BMEKOJSD006

### 5. Evaluation type

e

### 6. Credits

2

### 7. Weekly contact hours

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<thead>
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<th>Practice</th>
<th>Lab</th>
</tr>
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<tbody>
<tr>
<td>0 hours</td>
<td>2 hours</td>
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</table>

### 8. Curriculum

D

### 9. Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
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<th>Preparation for seminars</th>
<th>Homework</th>
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<tbody>
<tr>
<td>28 hours</td>
<td>10 hours</td>
<td>62 hours</td>
<td>20 hours</td>
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### 10. Department

Department of Vehicle Elements and Vehicle-Structure Analysis

### 11. Responsible lecturer

Dr. Ficzere Péter

### 12. Lecturers

Dr. Ficzere Péter

### 13. Prerequisites

- (-)
- (-)
- (-)

### 14. Description of lectures


### 15. Description of practices

Exercising theoretical knowledge with examples and case studies.

### 16. Description of laboratory practices

- 

### 17. Learning outcomes

**a) Knowledge:**
- Knowledge of modeling, simulation and testing capabilities provided by 3D design software.
- Knows the conditions for interoperability between CAD models.
- He understands the basic conditions of finite element analysis and can define the necessary conditions. He can define the conditions, variables, target functions needed for shape optimization.

**b) Ability:**
- Able to create a 3D model of any complex part. Able to receive and modify any 3D model made in another CAD system.
- Able to perform physical examinations of the designed parts (determination of the center of volume and mass. Determination of the area of the surfaces).
- Able to assemble parts and to constrain to function properly.
- Able to test and control assemblies (Fit investigation, exploded view, motion simulation).
- Able to produce proper 3D documentation (use of 3D sections, labels, pointing lines, colors) and assembly instructions. Able to create drawings and videos of structures.
- Able to create rendered, realistic graphs and place them in their real environment (virtual reality). Able to produce high quality marketing materials.
- Able to generate the necessary views, sections with the help of the prepared solid models. Able to produce correct technical drawings according to standard rules.
- Able to create a 3D solid model based on 2D drawings.
- Able to produce formats required for CAM software.
- Able to make finite element analysis on parts or on complex structures, assemblies. Able to define the needed constraints, loads, boundary conditions. Able to evaluate the results and to document them at the appropriate level.
- Able to perform shape optimization using finite element simulation results. Able to define the constraints, thresholds, design variables, convergence criteria and target function required for the optimisation process.
- Able to implement generative design in practice.

**c) Attitude:**
- Strive to maximize their abilities to make their studies at the highest possible level, with a profound and independent knowledge, accurate and error-free, in compliance with the rules of the applicable tools, in collaboration with the instructors.

**d) Autonomy and responsibility:**
- Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.
### 18. Requirements, way to determine a grade (obtain a signature)

It is required to fulfill in time the individual student work.

### 19. Retake and delayed completion

According to the TVSZ.

### 20. Learning materials

-
## Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Modern control theory II.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Modern irányításelmélet II</td>
</tr>
<tr>
<td>3. Role</td>
<td>Basic course</td>
</tr>
<tr>
<td>4. Code</td>
<td>BMEKOKAD002</td>
</tr>
<tr>
<td>5. Evaluation type</td>
<td>e</td>
</tr>
<tr>
<td>6. Credits</td>
<td>5</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>4 lecture 0 practice 0 lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. Working hours for fulfilling the requirements of the subject</th>
<th>56 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact hours</td>
<td>56 hours</td>
</tr>
<tr>
<td>Preparation for seminars</td>
<td>0 hours</td>
</tr>
<tr>
<td>Homework</td>
<td>0 hours</td>
</tr>
<tr>
<td>Reading written materials</td>
<td>0 hours</td>
</tr>
<tr>
<td>Midterm preparation</td>
<td>0 hours</td>
</tr>
<tr>
<td>Exam preparation</td>
<td>0 hours</td>
</tr>
</tbody>
</table>

| 10. Department | Department of Control for Transportation and Vehicle Systems |
| 11. Responsible lecturer | Dr. Bokor József |
| 12. Lecturers | Dr. Bokor József, Dr. Szabó Zoltán |

<table>
<thead>
<tr>
<th>13. Prerequisites</th>
<th></th>
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<tbody>
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</tbody>
</table>

| 14. Description of lectures | This course provides an introduction to robust control theory. Starting from basics, i.e., signal and system norms, stability, stabilizability and performance measures we develop first the classical LQ theory, followed by the H2 design. We emphasise the role of the small gain approach in the robust analysis and synthesis. The main part of the course is dedicated to the Hinfinity design, both the two Riccati and the LMI approach. Finally the structured singular value with mu analysis and synthesis is presented. |

<table>
<thead>
<tr>
<th>15. Description of practices</th>
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<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>16. Description of laboratory practices</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>17. Learning outcomes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 18. Requirements, way to determine a grade (obtain a signature) | The credits are obtained by completing the design task and by passing the oral exam. Prior to be accepted for the exam, students should fulfil the design task and should summarize their results in a report. |

<table>
<thead>
<tr>
<th>19. Retake and delayed completion</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>20. Learning materials</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Subject description

**1. Subject name**  
**Nonlinear control**

**2. Subject name in Hungarian**  
Nemlineáris irányítások

**3. Role**  
Basic course

**4. Code**  
BMEKOKAD018

**5. Evaluation type**  
e

**6. Credits**  
4

**7. Weekly contact hours**  
3 lecture  0 practice  0 lab

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**  
42 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Midterm preparation</th>
<th>Homework</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>42 hours</td>
<td>hours</td>
<td>hours</td>
<td>hours</td>
<td>hours</td>
</tr>
</tbody>
</table>

**10. Department**  
Department of Control for Transportation and Vehicle Systems

**11. Responsible lecturer**  
Dr. Szabó Zoltán

**12. Lecturers**  
Dr. Szabó Zoltán

**13. Prerequisites**  
- ( ), -
- ( ), -
- ( ), -

**14. Description of lectures**

This course provides an initialization in nonlinear control theory. We introduce the basic concepts related to the geometric approach to nonlinear geometric system theory based on invariant distributions and provide solutions for the most fundamental design problems. As an illustration switched systems are presented. Linearization techniques are presented. It follows Lyapunov based stability theory, passivity based approaches and backstepping design. We provide some methods for nonlinear observer design. The course ends with gain scheduling and LPV techniques.

**15. Description of practices**

-

**16. Description of laboratory practices**

-

**17. Learning outcomes**

-

**18. Requirements, way to determine a grade (obtain a signature)**

a) Knowledge and Ability:

- The credits are obtained by completing the design task and by passing the oral exam. Prior to be accepted for the exam, students should fulfil the design task and should summarize their results in a report.

**19. Retake and delayed completion**

-

**20. Learning materials**

-
1. Subject name: **Nonlinear mechanical oscillations**

2. Subject name in Hungarian: Nemlineáris mechanikai lengések

3. Role: Basic course

4. Code: BMEKOJSD003

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture, 1 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 120 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Midterm preparation</th>
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<tbody>
<tr>
<td>42 hours</td>
<td>12 hours</td>
<td>28 hours</td>
<td>0 hours</td>
<td>24 hours</td>
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</tbody>
</table>

10. Department: Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer: Dr. Béda Péter

12. Lecturers: Dr. Béda Péter

13. Prerequisites:

- ( ), ;
- ( ), ;
- ( ), ;

14. Description of lectures


15. Description of practices

Examples from the topics of the lessons.

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
- Methods of the nonlinear mechanics.

b) Ability:
- Description of a nonlinear mechanical system behaviour, model building.

c) Attitude:
- Being open to understand and learn novelties on that given domain.

d) Autonomy and responsibility:
- Evaluation and choice of optimal model elements.

18. Requirements, way to determine a grade (obtain a signature)

Semester note upon successful realisation of the homework and an oral exam.

19. Retake and delayed completion

Essay secondary deadlines precised in the lessons requirements.

20. Learning materials

-
1. Subject name  
**Numerical Methods for Fluid Flows I.**

2. Subject name in Hungarian  
Numerikus módszerek az áramlástanban I.

3. Role  
Specific course

4. Code  
BMEKORHD006

5. Evaluation type  
e

6. Credits  
2

7. Weekly contact hours  
2 lecture 0 practice 0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
28 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
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<tr>
<td>28 hours</td>
<td>hours</td>
<td>hours</td>
<td>hours</td>
<td>hours</td>
<td>hours</td>
</tr>
</tbody>
</table>

10. Department  
Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer  
Dr. Veress Árpád

12. Lecturers  
Dr. Veress Árpád

13. Prerequisites  
- (-), -;
- (-), -;
- (-), -

14. Description of lectures  

15. Description of practices  
-

16. Description of laboratory practices  
-

17. Learning outcomes  
a) Knowledge:  
- The student knows the governing equations of the numerical methods for fluid flows, the most widespread discretization methods, their characteristics, the relevant numerical schemes and algorithms and their mathematical analysis in the state of the art manner;

b) Ability:  
- The student can perform and/or develop numerical discretization of the governing equations according to the requirements and the mathematical analysis of numerical schemes and algorithms resulted by the numerical discretization.

c) Attitude:  
- The student aims to complete his/her studies at the highest level, under the shortest time, by providing his/her knowledge and capacity at the best to obtain knowledge for deep and independent professional work. The student has strong professional commitment, has developed expectations for finding new, better solutions and has agreement on doing hard work.

d) Autonomy and responsibility:  
- The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms. The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints. The student can friendly accept the well-established constructive criticism and can utilize that in future. The student is a creative constructor, proactive, and has leadership skills and argument techniques, capabilities with responsibility during the studies, research work.

18. Requirements, way to determine a grade (obtain a signature)  
The criterion of the acceptance of the semester and so getting the signature is the completeness of the solution of a defined problem in a specific area in the agreed time and quality. The exam is oral. The final mark of the exam is the mathematical average of the results for the own task and the exam.

19. Retake and delayed completion  
-

20. Learning materials  
Subject description

1. Subject name
Numerical Methods for Fluid Flows II.

2. Subject name in Hungarian
Numerikus módszerek az áramlástanban II.

3. Role
Specific course

4. Code
BMEKORHD002

5. Evaluation type
e

6. Credits
2

7. Weekly contact hours
2 lecture 0 practice 0 lab

8. Curriculum
D

9. Working hours for fulfilling the requirements of the subject
28 hours

Contact hours 28 hours
Preparation for seminars hours
Midterm preparation hours
Homework hours
Exam preparation hours

10. Department
Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer
Dr. Veress Árpád

12. Lecturers
Dr. Veress Árpád

13. Prerequisites
Numerical Methods for Fluid Flows I. (KORHD006), strong;

14. Description of lectures
Introduction to CFD (Computational Fluid Dynamics) via scientific and industrial applications, Numerical solution of the system of the Euler equations, Numerical solution of the system of the Navier-Stokes equations. (book by Hirsch II.)

15. Description of practices
-

16. Description of laboratory practices
-

17. Learning outcomes
a) Knowledge:
   – The student knows the different forms of the system of the Euler and Navier-Stokes equations, their numerical solutions and the developments of the Euler equations based inverse design method.

b) Ability:
   – The student can perform and develop numerical discretizations and solutions of the Euler and Navier-Stokes equations. The student can complete Euler equation based inverse design method.

c) Attitude:
   – The student aims to complete his/her studies at the highest level, under the shortest time, by providing his/her knowledge and capacity at the best to obtain knowledge for deep and independent professional work. The student has strong professional commitment, has developed expectations for finding new, better solutions and has agreement on doing hard work.

d) Autonomy and responsibility:
   – The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms. The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints. The student can friendly accept the well-established constructive criticism and can utilize that in future. The student is a creative constructor, proactive, and has leadership skills and argument techniques, capabilities with responsibility during the studies, research work.

18. Requirements, way to determine a grade (obtain a signature)
The criterion of the acceptance of the semester and so getting the signature is the completeness of the solution of a defined problem in a specific area in the agreed time and quality. The exam is oral. The final mark of the exam is the mathematical average of the results for the own task and the exam.

19. Retake and delayed completion
-

20. Learning materials
The presentation about the lectures, simulation guide lines and tutorials provided by the professor,
Veress, Á.: Introduction to CFD, BME, Department of Aeronautics, Naval Architecture and Railway Vehicles, Lecture notes, (2002),
Subject description

1. Subject name: Operation of construction machines

2. Subject name in Hungarian: Építőgépek üzemé

3. Role: Specific course

4. Code: BMEKOEAD004

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 2 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 48 hours

- Contact hours: 28 hours
- Preparation for seminars: 4 hours
- Homework: 8 hours

- Reading written materials: 4 hours
- Midterm preparation: 4 hours
- Exam preparation: 0 hours

10. Department: Department of Material Handling and Logistics Systems

11. Responsible lecturer: Dr. Bohács Gábor

12. Lecturers: Dr. Bohács Gábor

13. Prerequisites: -, ( ), ;

14. Description of lectures

The subject aims to survey the advanced construction machine systems and their components. Related optimization problems are presented as well. First specific machines and processes are surveyed. Further possibilities for automation is discussed. These include not only hardware devices but the necessary software as well. The subjects deals with construction machines as system components, where supervision and control is an important issue. During the semester two tests are written and an individual students essay is developed.

15. Description of practices

-  

16. Description of laboratory practices

-  

17. Learning outcomes

a) Knowledge:
   - Modern construction processes and automation possibilities.
   - Software to support modern construction engineering.
   - System engineering characteristics of construction engineering.

b) Ability:
   - Ability to develop construction engineering system and process concepts.
   - Ability to optimize construction engineering systems..

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

d) Autonomy and responsibility:
   - Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

18. Requirements, way to determine a grade (obtain a signature)

The grade is calculated from the grade of the individual work and the tests as an average.

19. Retake and delayed completion

Announced at the beginning of the semester.

20. Learning materials

Mahesh Varma: Construction equipment and its planning and application
Subject description

1. Subject name: Operational Research in Logistics

2. Subject name in Hungarian: Operációkutatás a logisztikában

3. Role: Basic course

4. Code: BMEKOALD001

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 4 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 120 hours

Contact hours: 56 hours
Preparation for seminars: 7 hours
Homework: 37 hours
Reading written materials: 20 hours
Midterm preparation: 0 hours
Exam preparation: 0 hours

10. Department: Department of Material Handling and Logistics Systems

11. Responsible lecturer: Dr. Bóna Krisztián

12. Lecturers: Dr. Bóna Krisztián

13. Prerequisites: - (-, -)

14. Description of lectures

15. Description of practices
- 

16. Description of laboratory practices
- 

17. Learning outcomes
a) Knowledge:
- Knowledge of the logistics oriented operational research problems.
- Knowledge of the mathematical modelling tools.
- Knowledge of the related journals and literatures to analyse the state of the art.

b) Ability:
- Able to study the operational researching problems, taking into account the scientific requirements.
- Able to create and design mathematical models related to the real problems and effects.

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

d) Autonomy and responsibility:
- Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

18. Requirements, way to determine a grade (obtain a signature)
The grade of the PhD student is based on the research activity, and the quality of the developed model, and the scientific white paper.

19. Retake and delayed completion
Announced at the beginning of the semester.

20. Learning materials
Operational research related e-books and websites
1. Subject name: Optimal Control

2. Subject name in Hungarian: Optimális Irányítások

3. Role:

4. Code: 

5. Evaluation type: e

6. Credits:

7. Weekly contact hours: 2 lecture 0 practice 0 lab

8. Curriculum:

9. Working hours for fulfilling the requirements of the subject:
- 75 hours
  - Contact hours: 28 hours
  - Preparation for seminars: 5 hours
  - Midterm preparation: 0 hours
  - Reading written materials: 8 hours
  - Homework: 20 hours
  - Exam preparation: 14 hours

10. Department: Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer: Tamás Luspay, PhD

12. Lecturers: Tamás Luspay, PhD

13. Prerequisites: () ; () ; () .

14. Description of lectures

The course covers the theory of optimal control with practical engineering applications. During the course several different approaches will be discussed for computing optimal solutions for various control problems. We will emphasize the connection between these approaches and also give an outlook on how the principles can be applied for other engineering problems. Our aim is to present this essential topic with accurate mathematical tools and from a practical engineering viewpoint. Therefore, simple numerical examples and MATLAB exercises are included to illustrate the application of the theory. The students will be assigned a special homework, which has to be solved by combining analytic and numerical methods and accordingly it will develop a systematic approach for solving problems.

1. Introduction to system theory, basic notions. The problem of optimal control.
3. Calculus of variation and optimal control.
4. Pontrjagins maximum principle and the transversality condition.
5. Dynamic programming, the principle of optimality.
6. Hamilton Jacobi Bellman equations.
7. Linear quadratic problems.
8. Infinite horizon problems and their connection with stability.
11. Optimal control and the receding horizon principle.

15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
- The notion of optimality and optimal control.
- Different approaches for determining a solution in an engineering process, where quality or quantity requirements are important.
- Open- and closed-loop optimal control methods.

b) Ability:
- Able to formulate an engineering management task mathematically.
- Able to set up criterion functions knowing the system and the process.
- Able to design and implement optimal controls.

c) Attitude:
- Thinking on a system level.
- Problem solver and constructive.

d) Independence and responsibility:
- Analyzing the behaviour of an engineering system, based on its qualitative and quantitative parameters.
- Setting up criterias for engineering processes.
- Decision making regarding the methodologies for controlling engineering systems.
18. Requirements, way to determine a grade (obtain a signature)

During the semester an individual home work is assigned to each student, which are related to the interest, research field of the student. At the end of the semester students make their presentation about their work.

The requirements for obtaining the signature is: presence at least 70% of the lectures and the successful accomplishment of the home work.

At the end of the semester there will be an oral exam.

Grades are determined based on the result of the exam and home work.

19. Opportunity for repeat/retake and delayed completion

The home work can be complement during the exam period.

20. Learning materials

D. Bertsekas: Reinforcement Learning and Optimal Control, Athena Scientific, 2019
1. Subject name | Packaging Technologies

2. Subject name in Hungarian | Csomagolástechnika

3. Role | Specific course

4. Code | BMEKOALD005

5. Evaluation type | e

6. Credits | 3

7. Weekly contact hours | 3 lecture 0 practice 0 lab

8. Curriculum | D

9. Working hours for fulfilling the requirements of the subject

| Contact hours | 42 hours | Preparation for seminars | 7 hours | Homework | 30 hours |
| Reading written materials | 11 hours | Midterm preparation | 0 hours | Exam preparation | 0 hours |

10. Department | Department of Material Handling and Logistics Systems

11. Responsible lecturer | Dr. Kovács Gábor

12. Lecturers | Dr. Kovács Gábor

13. Prerequisites | - (-), -;
- (-), -;
- (-), -;

14. Description of lectures

The optimization process of unit load (pallet, container, intermodal units e.g.) creation. Computerized packaging design. Optimization of the used packaging materials. The automatized unit-load creation. The used packaging and unit load optimization algorithm.

15. Description of practices

-

16. Description of laboratory practices

-

17. Learning outcomes

a) Knowledge:
   - Knowledge of the tasks and problems of the packaging design.
   - Knowledge of related optimum search tasks and solutions.

b) Ability:
   - Able to study the packaging design tasks, taking into account the scientific requirements.
   - Able to carry out research and development tasks related to the packaging technology.

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

d) Autonomy and responsibility:
   - Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

18. Requirements, way to determine a grade (obtain a signature)

The grade of the PhD student is based on the semester activity and the evaluation of the paper (publishing), in consultation with the supervisor.

19. Retake and delayed completion

Announced at the beginning of the semester.

20. Learning materials

Slides and examples in electronic format
Subject description

1. Subject name  
Passenger Transport Systems (PhD)

2. Subject name in Hungarian  
Személyközlekedési rendszerek (PhD)

3. Role  
Specific course

4. Code  
BMEKOKUD021

5. Evaluation type  
e

6. Credits  
3

7. Weekly contact hours  
2 lecture 2 practice 0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
150 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 hours</td>
<td>15 hours</td>
<td>34 hours</td>
<td>10 hours</td>
</tr>
</tbody>
</table>

10. Department  
Department of Transport Technology and Economics

11. Responsible lecturer  
Dr. Csizsár Csaba

12. Lecturers  
Dr. Csizsár Csaba, Csonka Bálint, Földes Dávid

13. Prerequisites  
- ( ), -;
- ( ), -;
- ( ), -;

14. Description of lectures  

15. Description of practices  
Learn and practice the measurement, analysis and planning methods. Case studies. Independent literature research supported by consultations. Student presentations. The students elaborate four (individually and/or in teamwork) assignments. The task should be presented.

16. Description of laboratory practices  
-

17. Learning outcomes  
a) Knowledge and Ability:
- The students know structure and operation of passenger transportation systems.
- They are able to analyse and design passenger transportation systems and operational processes.
- The students strive for precise and errorless task accomplishment.
b) Attitude, Autonomy and responsibility:
- They apply the knowledge with responsibility.
- They are able to work independently or in a team according to the situation.

18. Requirements, way to determine a grade (obtain a signature)  
The students write 2 midterms (with theoretical and practical parts). The mid-semester signature is obtained if both midterms are passed (at least half of the maximal scores) and all four student assignments are submitted and accepted (at least half of the maximal scores). The semester is finished by oral exam.

19. Retake and delayed completion  
The midterms can be retaken according to TVSZ (study code). The student assignments can be submitted after deadline (if extra fee is paid).

20. Learning materials  
1. Subject name: Planning of Transport Databases (PhD)

2. Subject name in Hungarian: Közlekedési adatbázisok tervezése (PhD)

3. Role: Specific course

4. Code: BMEKOKUD004

5. Evaluation type: e

6. Credits: 2

7. Weekly contact hours: 0 lecture, 2 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 60 hours

  Contact hours: 28 hours
  Preparation for seminars: 0 hours
  Midterm preparation: 0 hours
  Reading written materials: 8 hours
  Homework: 20 hours
  Exam preparation: 4 hours

10. Department: Department of Transport Technology and Economics

11. Responsible lecturer: Dr. Juhász János

12. Lecturers: Dr. Juhász János

13. Prerequisites:
  - 
  - 
  - 

14. Description of lectures

The aim of the course is to learn how to capture, store, collect and analyse traffic-related data, to get to know, choose and apply the most common methods:

- Methods of collecting and storing traffic data. Sources of error.
- Questionnaire data collection forms, ways of storing and processing data, transport applications.
- Description of data model types, presentation of their usage possibilities.
- Structure, characteristics and comparison of OLAP, MOLAP, ROLAP, OLTP systems.
- Big Data's theoretical background, overview of transport examples.
- Characteristics and methods of analysis of GIS databases. Traffic location identification systems.
- The system of registration, construction, information content of road accidents involved injured persons.

15. Description of practices

Exercising theoretical knowledge with examples and case studies.

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
  - Knows the methods of collecting traffic data.
  - Knows the different data model types.
  - Knows the structure, characteristics and peculiarities of OLAP, MOLAP, ROLAP, and OLTP systems.
  - Knows the Big Data's theoretical background. Knows the structure and main characteristics of GIS systems.
  - Knows the structure of the road accident database.

b) Ability:
  - Able to design and execute data collection. Able to design and build a data storage structure.
  - Able to select the most suitable data model type for the purpose.
  - Able to design and prepare a geospatial database, to map data, to create spatial queries.
  - Able to retrieve information from a personal road accident database.

c) Attitude:
  - The student attends the lectures, prepare independent study on time.
  - During the lectures, he is actively involved in processing the current topic.
  - During the independent study the student strives to develop new technical solutions.
  - Interested in international and domestic developments in the field. Open to learn new knowledge and learn.

d) Autonomy and responsibility:
  - Apply responsibility the knowledge acquired in the course of the course. Can independently develop new technical solutions.
  - Accepts the framework of collaboration, can perform its work independently or as part of a team, depending on the task.

18. Requirements, way to determine a grade (obtain a signature)

Exam. Evaluation of individual study.

19. Retake and delayed completion

Retake exam. Study repair.

20. Learning materials

Supported by downloadable documents from the Department website.
Subject description

1. Subject name

Processes of Vehicle Production

2. Subject name in Hungarian

Járműgyártás és javítás

3. Role

Basic course

4. Code

BMEKOGGD003

5. Evaluation type

e

6. Credits

4

7. Weekly contact hours

4 lecture 0 practice 0 lab

8. Curriculum

D

9. Working hours for fulfilling the requirements of the subject

84 hours

- Contact hours 56 hours
- Preparation for seminars 0 hours
- Homework 8 hours
- Reading written materials 8 hours
- Midterm preparation 0 hours
- Exam preparation 12 hours

10. Department

Department of Automotive Technologies

11. Responsible lecturer

Dr. Markovits Tamás

12. Lecturers

Dr. Markovits Tamás

13. Prerequisites

- (-), -
- (-), -
- (-), -

14. Description of lectures

Sequence of manufacturing processes, its impact on quality, productivity and costs. Sequence planning (pre-products, allowance for machining); operation planning (bases); operation instruction (operation time). Tolerances for different manufacturing technologies. Measurement technology: measurement methods, regularities of measurement errors, typical measurement tasks and their instruments, coordinate measurements. Machines for vehicle manufacturing technologies.

15. Description of practices

-

16. Description of laboratory practices

-

17. Learning outcomes

a) Knowledge:
- Has a deeper understanding of how the succession of technological processes affects quality, productivity and costs.
- Knows the purpose and steps of the technological sequence design (pre-products, allowance for machining); operation planning (bases); operation instruction (operation time).
- Knows what tolerances have been expected for different manufacturing technologies.
- Familiar with measurement methods, regularities of measurement errors, typical measurement tasks and tools, coordinate measurements. Knows the most important machines of vehicle manufacturing technologies.

b) Ability:
- Able to overview the whole and the elements of a technological process and to plan it especially for technology design and quality control. Capable of a deeper, causal, scientific analysis of a technological process.
- Able to give suggestions for the development of a technological process.
- She/he is able to gather literature on a specific research topic and compile a summary based on it.
- Able to interpret the results found in the literature. Able to develop a suitable experimental method for a research topic and propose test methods. Able to interpret test results.

c) Attitude:
- She/he strives to develop his knowledge independently. Strives to explore the causal relationship with scientific depth.
- Strives to develop its own topic area. Strives to find connections between topics and disciplines.
- Strives to interpret the literature and their own research results independently and in teamwork, listening to others’ thoughts.
- Strives to share her/his knowledge.
- Independence and responsibility:

d) Autonomy and responsibility:
- Apply responsibly the knowledge acquired during the course with regard to their validity limits.
- Manages and communicates the results of others and their own results also in accordance with ethical standards.
- Endeavors to perform his assigned tasks independently in accordance with ethical standards. She/he knows how far his responsibilities are, informs his colleagues or his supervisor about her/his results, and when it is necessary.

18. Requirements, way to determine a grade (obtain a signature)

The course ends with an oral examination.

19. Retake and delayed completion

Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

20. Learning materials

Subject description

1. Subject name: Processes of Vehicle Production
2. Subject name in Hungarian: Járműgyártás folyamatai
3. Role: Basic course
4. Code: BMEKOGTD013
5. Evaluation type: e
6. Credits: 4
7. Weekly contact hours: 4 lecture 0 practice 0 lab
8. Curriculum: D
9. Working hours for fulfilling the requirements of the subject: 84 hours
   Contact hours: 56 hours
   Preparation for seminars: 0 hours
   Homework: 8 hours
   Reading written materials: 8 hours
   Midterm preparation: 0 hours
   Exam preparation: 12 hours
10. Department: Department of Automotive Technologies
11. Responsible lecturer: Dr. Vehovszky Balázs
12. Lecturers: Dr. Vehovszky Balázs
13. Prerequisites: - (-), - (-), - (-), - (-)
14. Description of lectures
   The student is able to critically evaluate the development trends in the production technology of typical vehicle parts, main units and some of their components. Developing plasticization technologies in the engine, chassis, bodywork; cold and heat shaping, to explore novel regularities that are inherent to the characteristics of each technological process. Vehicle parts pre-fabrication technologies: innovative development of casting, precision, die-casting, volume, sheet forming, hydroforming, sheet cutting (mechanical, thermal, water jet), bonding technologies (welding, soldering, riveting, gluing). Developing process design for machining technologies, developing specific tools (lathes, drills, milling, hollow, tapping, toothing, grinding)
15. Description of practices
   -
16. Description of laboratory practices
   -
17. Learning outcomes
   a) Knowledge:
      - Has a deeper knowledge of the characteristics of cold and hot forming technology. Familiar with the technologies of plastic forming used in motor, chassis and bodywork production. Has a deeper knowledge of casting technologies: sand molding, shell molding, die-casting, precision (lost-vax) casting, pressure casting. Has a deeper knowledge of sheet metal forming technologies: conventional and hydroforming, sheet cutting (mechanical, thermal, water jet). Knows the bonding technologies used in the automotive industry: welding, soldering, riveting, adhesive bonding. Has a deeper knowledge of process engineering, cutting-edge tools (turning, drill, milling, broaching, thread machining, gear cutting, grinding) of cutting technologies, about their selection, their renewal and the basics of their design. Knows the methods of tool management.
   b) Ability:
      - Able to overview the whole and the elements of a technological process and to plan it. Capable of a deeper, causal, scientific analysis of a technological process. Able to give suggestions for the development of a technological process. She/he is able to gather literature on a specific research topic and compile a summary based on it. Able to interpret the results found in the literature. Able to develop a suitable experimental method for a research topic and propose test methods. Able to interpret test results.
   c) Attitude:
      - She/he strives to develop his knowledge independently. Strives to explore the causal relationship with scientific depth. Strives to develop its own topic area. Strives to find connections between topics and disciplines. Strives to interpret the literature and their own research results independently and in teamwork, listening to others' thoughts. Strives to share her/his knowledge.
   d) Autonomy and responsibility:
      - Apply responsibly the knowledge acquired during the course with regard to their validity limits. Manages and communicates the results of others and their own results also in accordance with ethical standards. Endeavors to perform his assigned tasks independently in accordance with ethical standards. She/he knows how far his responsibilities are, informs his colleagues or his supervisor about her/his results, and when it is necessary.
18. Requirements, way to determine a grade (obtain a signature)
   The course ends with an oral examination.
19. Retake and delayed completion
   Possibilities for supplementation takes place in accordance with the applicable study and examination rules.
20. Learning materials
Subject description

1. Subject name: R&I process management in the industry

2. Subject name in Hungarian: Ipari K+F folyamatok menedzsmentje

3. Role: Specific course

4. Code: BMEKOGGD804

5. Evaluation type: e

6. Credits: 2

7. Weekly contact hours: 2 lecture 0 practice 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 60 hours

Contact hours: 14 hours Preparation for seminars: 18 hours Homework: 5 hours
Reading written materials: 5 hours Midterm preparation: 18 hours Exam preparation: 0 hours

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Zöldy Máté

12. Lecturers: Dr. Zöldy Máté

13. Prerequisites: - (-), -;
               - (-), -;
               - (-), -;

14. Description of lectures


15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
   - Is familiar with the images presented in the subject and the individual procedures of the internal relationships.

b) Ability:
   - Capable of all procedures and research.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and responsibility:
   - A vehicle for solving research tasks.

18. Requirements, way to determine a grade (obtain a signature)

Knowing the curriculum and application of it. The exam is oral.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials

The Innovation Tools Handbook, Volume 1: Organizational and Operational Tools, Methods, and Techniques that Every Innovator Must Know.
# Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Railway technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Vasúti üzemtan (PhD)</td>
</tr>
<tr>
<td>3. Role</td>
<td>Specific course</td>
</tr>
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<td>4. Code</td>
<td>BMEKOKKD010</td>
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<tr>
<td>5. Evaluation type</td>
<td>e</td>
</tr>
<tr>
<td>6. Credits</td>
<td>3</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>2 lecture 0 practice 0 lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
<tr>
<td>9. Working hours for fulfilling the requirements of the subject</td>
<td>90 hours</td>
</tr>
<tr>
<td>Contact hours</td>
<td>28 hours</td>
</tr>
<tr>
<td>Preparation for seminars</td>
<td>6 hours</td>
</tr>
<tr>
<td>Homework</td>
<td>24 hours</td>
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<tr>
<td>Reading written materials</td>
<td>6 hours</td>
</tr>
<tr>
<td>Midterm preparation</td>
<td>16 hours</td>
</tr>
<tr>
<td>Exam preparation</td>
<td>10 hours</td>
</tr>
<tr>
<td>10. Department</td>
<td>Department of Transport Technology and Economics</td>
</tr>
<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Mándoki Péter</td>
</tr>
<tr>
<td>12. Lecturers</td>
<td>Dr. Mándoki Péter</td>
</tr>
<tr>
<td>13. Prerequisites</td>
<td>-</td>
</tr>
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</tr>
<tr>
<td>15. Description of practices</td>
<td>-</td>
</tr>
<tr>
<td>16. Description of laboratory practices</td>
<td>-</td>
</tr>
<tr>
<td>17. Learning outcomes</td>
<td>a) Knowledge:</td>
</tr>
<tr>
<td>-</td>
<td>The student knows the characteristics and planning techniques of railway operation.</td>
</tr>
<tr>
<td>b) Ability:</td>
<td>Ability to dealing with creative problems in the field of transport and flexible solutions to complex tasks. Able to plan the railway operation (stations and lines). Able to working in a group, sharing tasks and managing them over time.</td>
</tr>
<tr>
<td>c) Attitude:</td>
<td>- engages in professional and ethical values related to the technical field, and works based on a system-oriented and process-oriented mindset, in a team-work.</td>
</tr>
<tr>
<td>d) Autonomy and responsibility:</td>
<td>- Make his decisions carefully, in consultation with representatives of other fields of expertise, with full responsibility.</td>
</tr>
<tr>
<td>18. Requirements, way to determine a grade (obtain a signature)</td>
<td>Defendse of semester task and oral examination.</td>
</tr>
<tr>
<td>19. Retake and delayed completion</td>
<td>Unsuccessful task can be replaced during the replacement period.</td>
</tr>
<tr>
<td>20. Learning materials</td>
<td>Uploaded materials to theMoodle System and the Department website.</td>
</tr>
</tbody>
</table>
1. Subject name: Rapid Prototyping

2. Subject name in Hungarian: Gyors prototípusgyártás

3. Role: Specific course

4. Code: BMEKOGTD004

5. Evaluation type: E

6. Credits: 3

7. Weekly contact hours: 2 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 44 hours

   Contact hours: 10 hours
   Preparation for seminars: 0 hours
   Homework: 20 hours
   Reading written materials: 10 hours
   Midterm preparation: 0 hours
   Exam preparation: 4 hours

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Takács János

12. Lecturers: Dr. Takács János, Dr. Markovits Tamás

13. Prerequisites:

   - (-), -;
   - (-), -;
   - (-), -;

14. Description of lectures


Rapid prototyping techniques: laminated Object Modeling (LOM), Fused Deposition Modelling (FDM), Stereolithography (SLA), Selective Laser Sintering and Melting (SLS, SLM), Laser Material Deposition (LMD). Accuracy, productivity, cost, technical characteristics of procedures.

15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
   - Familiar with additive technologies and the internal relations of a specific processes.

b) Ability:
   - Ability to research and develop specific processes.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)

It is necessary to prepare and submit an independent homework within the subject. The course ends with an oral exam.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials


### Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Reaction processes of internal combustion engines</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Belsőégésű motorok reakciófolyamatai.</td>
</tr>
<tr>
<td>3. Role</td>
<td>Basic course</td>
</tr>
<tr>
<td>4. Code</td>
<td>BMEKOGJD013</td>
</tr>
<tr>
<td>5. Evaluation type</td>
<td>e</td>
</tr>
<tr>
<td>6. Credits</td>
<td>4</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>2 lecture 0 practice 0 lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
</tbody>
</table>

#### 9. Working hours for fulfilling the requirements of the subject

| Contact hours | 28 hours |
| Preparation for seminars | 22 hours |
| Homework | 50 hours |
| Reading written materials | 0 hours |
| Midterm preparation | 0 hours |
| Exam preparation | 20 hours |

#### 10. Department

Department of Automotive Technologies

#### 11. Responsible lecturer

Dr. Zöldy Máté

#### 12. Lecturers

Dr. Zöldy Máté

#### 13. Prerequisites

- (-), -
- (-), -
- (-), -

#### 14. Description of lectures

Description of combustion and reaction kinetic processes taking place in internal combustion engines. For PhD students dealing with related research topics to combustion, effect of fuels and pollution formation in internal combustion engines.

#### 15. Description of practices

- 

#### 16. Description of laboratory practices

- 

#### 17. Learning outcomes

a) Knowledge:
- Is familiar with the images presented in the subject and the individual procedures of the internal relationships.

b) Ability:
- Capable of all procedures and research.

c) Attitude:
- Openness to new opportunities in the field.

d) Autonomy and responsibility:
- A vehicle for solving research tasks.

#### 18. Requirements, way to determine a grade (obtain a signature)

The course ends with an oral examination.

#### 19. Retake and delayed completion

There is one occasion to retake the exam.

#### 20. Learning materials

Warnatz, Maas, Dibble: Combustion, Springer, 2006
Subject description

1. Subject name
Reinforcement Learning for vehicle control

2. Subject name in Hungarian
Megerősítéses tanulás a járműirányításban

3. Role
Specific course

4. Code
BMEKOKAD017

5. Evaluation type
e

6. Credits
3

7. Weekly contact hours
2 lecture 0 practice 0 lab

8. Curriculum
D

9. Working hours for fulfilling the requirements of the subject
90 hours

Contact hours: 28 hours
Preparation for seminars: 14 hours
Homework: 30 hours

Reading written materials: 0 hours
Midterm preparation: 0 hours
Exam preparation: 18 hours

10. Department
Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer
Dr. Bécsi Tamás

12. Lecturers
Dr Bécsi Tamás, Dr. Aradi Szilárd

13. Prerequisites
- (-), -;
- (-), -;
- (-), -

14. Description of lectures

15. Description of practices
-

16. Description of laboratory practices
-

17. Learning outcomes
-

18. Requirements, way to determine a grade (obtain a signature)
Final exam and three homeworks.

19. Retake and delayed completion
-

20. Learning materials
-
### Subject description

1. **Subject name**
   - **Research techniques**

2. **Subject name in Hungarian**
   - Kutatási alapismeretek

3. **Role**
   - Specific course

4. **Code**
   - BMEKOKAD004

5. **Evaluation type**
   - e

6. **Credits**
   - 3

7. **Weekly contact hours**
   - 2 lecture
   - 0 practice
   - 0 lab

8. **Curriculum**
   - D

9. **Working hours for fulfilling the requirements of the subject**
   
<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 hours</td>
<td>0 hours</td>
<td>28 hours</td>
<td>0 hours</td>
</tr>
</tbody>
</table>

   **Reading written materials**
   - 0 hours

   **Midterm preparation**
   - 0 hours

   **Exam preparation**
   - 0 hours

10. **Department**
    - Department of Control for Transportation and Vehicle Systems

11. **Responsible lecturer**
    - Dr. Tettamanti Tamás, Dr. Török Ádám

12. **Lecturers**
    - Dr. Tettamanti Tamás, Dr. Török Ádám

13. **Prerequisites**
    - (-), -;
    - (-), -;
    - (-), -;

14. **Description of lectures**


15. **Description of practices**

16. **Description of laboratory practices**

17. **Learning outcomes**

   a) Knowledge and Ability:
   - The student interprets and manages the link organizing, editing and word processing software required for writing articles.
   - It is able to briefly summarize its novel scientific results in the form of an article.
   - He is committed and critical to the development of communication technologies in the technical and economic field.
   - Solve problems in a creative way.
   - By applying domestic and international databases, your thinking becomes more open and your knowledge is constantly updated.

18. **Requirements, way to determine a grade (obtain a signature)**

   Completed homeworks and semester projekt.

19. **Retake and delayed completion**

   Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

20. **Learning materials**

   -
1. **Subject name**: Risk and safety integrity in traffic

2. **Subject name in Hungarian**: Kockázat és biztonságintegritás a közlekedésben

3. **Role**: Specific course

4. **Code**: BMEKOKAD008

5. **Evaluation type**: e

6. **Credits**: 3

7. **Weekly contact hours**: 3 lecture 0 practice 0 lab

8. **Curriculum**: D

9. **Contact hours**: 42 hours

10. **Working hours for fulfilling the requirements of the subject**: 42 hours

11. **Department**: Department of Control for Transportation and Vehicle Systems

12. **Responsible lecturer**: Dr. Sághi Balázs

13. **Lecturers**: Dr. Sághi Balázs

14. **Prerequisites**: - (-), -;

15. **Description of lectures**: The aim of the subject is to provide students with special knowledge in risk analysis and assessment and safety integrity in different fields of transportation.

16. **Description of practices**

17. **Description of laboratory practices**

18. **Learning outcomes**

19. **Requirements, way to determine a grade (obtain a signature)**

   Final mark is given based on the result of the exam (50%) and on the prepared study (50%).

20. **Retake and delayed completion**

21. **Learning materials**
1. Subject name: **Road Telematic Systems**

2. Subject name in Hungarian: Közúti telematikai rendszerek PhD

3. Role: Specific course

4. Code: BMEKOKUD023

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 1 lecture, 1 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject:

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 hours</td>
<td>4 hours</td>
<td>30 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 hours</td>
<td>8 hours</td>
<td>10 hours</td>
</tr>
</tbody>
</table>

90 hours

10. Department: Department of Transport Technology and Economics

11. Responsible lecturer: Dr. Tóth János

12. Lecturers: Dr. Tóth János

13. Prerequisites:
- (-), (-)
- (-), (-)
- (-), (-)

14. Description of lectures:
Definition of telematics and traffic management. The goals and classification of information and traffic influencing systems. The elements of intelligent transport systems. The application of satellite based communication in transportation. ITS on highways and in city transport. Information systems in private and public transport. Parking management in cities. Electronic data interchange (EDI) in transport.

15. Description of practices:
Analysis and development of telematics systems in a choosen city.

16. Description of laboratory practices:
-

17. Learning outcomes:

a) Knowledge:
- Familiar with types and features of road telematic systems, the relevant terms and standards.

b) Ability:
- Ability to classify road telematic systems. Able to elaborate the developments concepts of existing road telematic systems.

c) Attitude:
- Strive to acquire the highest level of system approach.

d) Autonomy and responsibility:
- Responsible applies of acquired knowledge in individual or in team work.

18. Requirements, way to determine a grade (obtain a signature):
The criterion of the signature (and to take the exam) is to solve the chosen project till the deadline and to write the midterm exam at least an acceptable level. The exam is written.

19. Retake and delayed completion:
Second test possibility for those not present on the test, possibility of delayed deadline for home work.

20. Learning materials:
-
Subject description

1. Subject name: Road traffic modelling, simulation and control

2. Subject name in Hungarian: Közúti járműforgalom modellezése, szimulációja és irányítása

3. Role: Basic course

4. Code: BMEKOKAD016

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture, 0 practice, 2 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 76 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 hours</td>
<td>0 hours</td>
<td>4 hours</td>
<td>8 hours</td>
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</table>

10. Department: Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer: Dr. Tettamanti Tamás

12. Lecturers: Dr. Tettamanti Tamás

13. Prerequisites:
- ( ), -
- ( ), -
- ( ), -

14. Description of lectures


15. Description of practices

Road traffic modelling and traffic control algorithm realization in Matlab environment.

16. Description of laboratory practices

17. Learning outcomes

a) Knowledge:
- Organization and functioning of road traffic control systems; levels and methods of traffic modeling; urban traffic management strategies, tools and software; control systems of public transport and highway systems.

b) Ability:
- Modeling road traffic dynamics; design of traffic measurement and estimation systems.

c) Attitude:
- Open to research on traffic management and autonomous vehicles.

d) Autonomy and Responsibility:
- Independently design road traffic control.

18. Requirements, way to determine a grade (obtain a signature)

Completed homework and successful oral exam at the end of semester.

19. Retake and delayed completion

Possibilities for supplementation take place in accordance with the applicable study and examination rules.

20. Learning materials

Tettamanti T., Luspay T. and Varga I.: Road Traffic Modeling and Simulation, Akadémiai Kiadó, Budapest, 2019
1. Subject name | Security issues of Intelligent transportation systems PhD
---|---
2. Subject name in Hungarian | Intelligens közlekedési rendszerek védelmi kérdései PhD
3. Role | Specific course
4. Code | BMEKOGGD801
5. Evaluation type | e
6. Credits | 2
7. Weekly contact hours | 2 lecture, 0 practice, 0 lab
8. Curriculum | D

9. Working hours for fulfilling the requirements of the subject: 60 hours
- Contact hours: 28 hours
- Preparation for seminars: 14 hours
- Homework: 5 hours
- Reading written materials: 5 hours
- Midterm preparation: 8 hours
- Exam preparation: 0 hours

10. Department | Department of Automotive Technologies
11. Responsible lecturer | Dr. Török Árpád
12. Lecturers | Dr. Török Árpád

13. Prerequisites: - ( ), - ; - ( ), - ; - ( ), - ;

14. Description of lectures
Critical evaluation of the scientific and professional background of IT systems. Identifying the evolution of communication channels, data formats and processes. Identifying the main developmental relationships of infections and adverse effects and identifying novel patterns of possible prevention strategies. Analysis of threats related to IT systems and implementation of new technological solutions (autonomous transport) in macroscopic traffic model.

15. Description of practices
-

16. Description of laboratory practices
-

17. Learning outcomes
a) Knowledge:
   - Familiar with security questions of ITS frameworks.
b) Ability:
   - Ability to research and develop specific processes.
c) Attitude:
   - Openness to new opportunities in the field.
d) Autonomy and Responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)
The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

19. Retake and delayed completion
-

20. Learning materials
1. Subject name: Security of connected vehicles

2. Subject name in Hungarian: Hálózatba kapcsolt gépjárművek biztonsága

3. Role: Basic course

4. Code: BMEKOGGD802

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture 0 practice 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 120 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 hours</td>
<td>14 hours</td>
<td>22 hours</td>
<td>30 hours</td>
<td>0 hours</td>
</tr>
</tbody>
</table>

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Török Árpád

12. Lecturers: Dr. Török Árpád

13. Prerequisites: - (-), -;
                 - (-), -;
                 - (-), -

14. Description of lectures

Development of basic processes related to the operation of networked vehicles, V2x communication, information transfer / data packets, innovative technologies in networks. Developing novel and innovative malicious interventions and detection methods. Explore deeper connections in the process of approving vehicle safety systems and assessing the safety risks associated with networked vehicles.

15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
   - Familiar with connected vehicle systems.

b) Ability:
   - Ability to research and develop specific processes.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and Responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)

The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

19. Retake and delayed completion

- 

20. Learning materials

1. Subject name: Selected chapters from astrodynamics

2. Subject name in Hungarian: Válogatott fejezetek az asztrodinamikából (PHD)

3. Role: Specific course

4. Code: BMEKOMED019

5. Evaluation type: e

6. Credits: 2

7. Weekly contact hours: 2 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 60 hours

   Contact hours: 28 hours
   Preparation for seminars: 7 hours
   Homework: 7 hours
   Midterm preparation: 0 hours
   Exam preparation: 11 hours

10. Department: Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer: Dr. Béda Péter

12. Lecturers: Dr. Béda Péter

13. Prerequisites: - (-), -

14. Description of lectures


15. Description of practices

16. Description of laboratory practices

17. Learning outcomes

   a) Knowledge:
      - Methods of the space mechanics.
   b) Ability:
      - Description of motion of planets, satellites, rockets. Model building.
   c) Attitude:
      - Being open to understand and learn novelties on that given domain.
   d) Autonomy and responsibility:
      - Evaluation and choice of optimal model elements.

18. Requirements, way to determine a grade (obtain a signature)

   Semester note upon succesful realisation of the homework and an oral exam.

19. Retake and delayed completion

   Essay secondary deadlines precised in the lessons requirements.

20. Learning materials
**1. Subject name**  
Ship design PhD

**2. Subject name in Hungarian**  
Hajótervezés PhD

**3. Role**  
Specific course

**4. Code**  
BMEKORHD011

**5. Evaluation type**  
e

**6. Credits**  
2

**7. Weekly contact hours**  
2 lecture 0 practice 0 lab

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**  
60 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Midterm preparation</th>
<th>Homework</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>28 hours</td>
<td>10 hours</td>
<td>0 hours</td>
<td>12 hours</td>
<td>6 hours</td>
</tr>
</tbody>
</table>

**10. Department**  
Department of Aeronautics, Naval Architecture and Railway Vehicles

**11. Responsible lecturer**  
Dr. Simongáti Győző

**12. Lecturers**  
Dr. Simongáti Győző, Dr. Hargitai L. Csaba

**13. Prerequisites**  
Ship design (KOVRM615), recommended;

**14. Description of lectures**
The subject is able to evaluate independently the sub-tasks of ship design (definition of main dimensions, stability calculation, resistance calculation, drive design, maneuverability, structural design, etc.). They will be able to establish novel relationships in a deeper context of ship design and will be familiar with the scientific dilemmas, problems and current solutions to each subtask.

**15. Description of practices**

**16. Description of laboratory practices**

**17. Learning outcomes**
a) Knowledge:  
Know and understand the up to date problematics of stability calculations, problems of determination of thrust deduction factor and wake fraction, ship motion simulation methods, prediction methods for fuel consumption, new, modern application of CFD in ship design.

b) Ability:  
Able to understand and use the results of scientific publications, bale to use others knowledge for his/her own research project, able to write own publication.

c) Attitude:  
Interested, responsive, independent, take care for the deadlines.

**18. Requirements, way to determine a grade (obtain a signature)**
The pre-condition of the exam is the submission and acceptance of the own work. The exam is oral.

**19. Retake and delayed completion**
According to the TVSZ.

**20. Learning materials**

Hajók Kézikönyv  
Dr. Benedek Z. – Hajók 1-3.

D. J. Eyres – Ship construction

Young Bay – Marine structural design

Dr. Deseő Z. – Hajótestek szilárdsági kérdései


Schnee
### Subject description

1. **Subject name** | **Simulation systems and software in logistics**
2. **Subject name in Hungarian** | Szimulációs rendszerek és szoftverek logisztikai alkalmazása
3. **Role** | Basic course
4. **Code** | BMEKOEAD011
5. **Evaluation type** | e
6. **Credits** | 4
7. **Weekly contact hours** | 4 lecture 0 practice 0 lab
8. **Curriculum** | D
9. **Working hours for fulfilling the requirements of the subject** | 76 hours
   - Contact hours: 56 hours
   - Preparation for seminars: 4 hours
   - Reading written materials: 4 hours
   - Midterm preparation: 4 hours
   - Homework: 8 hours
10. **Contact hours** | 56 hours
11. **Preparation for seminars** | 4 hours
12. **Reading written materials** | 4 hours
13. **Midterm preparation** | 4 hours
14. **Exam preparation** | 0 hours
15. **Department** | Department of Material Handling and Logistics Systems
16. **Responsible lecturer** | Dr. Bohács Gábor
17. **Lecturers** | Dr. Bohács Gábor
18. **Prerequisites** | - (-), -;
   - (-), -;
   - (-), -;
19. **Description of lectures**
   SD simulations, DES simulations, agent-based simulations. Overview of features of modern simulation software. Typical applications for simulation systems in industry and for scientific tasks, in particular optimization of material flow systems. Presentation of the operation of modern simulation software. Trends in the development of simulation systems.
20. **Description of practices**
21. **Description of laboratory practices**
22. **Learning outcomes**
a) **Knowledge:**
   - Knowledge of Logistics Simulation Software.
   - Solving Logistics Problems with Simulation.
   - Knowledge of development trends of logistics simulations.
b) **Ability:**
   - It is able to combine logistics problems with the right model.
   - Ability to develop a logistics simulation model.
c) **Attitude:**
   - Strive to maximize their abilities to make their studies at the highest possible level, with a profound and independent knowledge, accurate and error-free, in compliance with the rules of the applicable tools, in collaboration with the instructors.
d) **Autonomy and responsibility:**
   - Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.
23. **Requirements, way to determine a grade (obtain a signature)**
The grade is calculated from the grade of the individual work and the tests as an average.
24. **Retake and delayed completion**
   - Announced at the beginning of the semester.
25. **Learning materials**
   - Law, Kelton: Simulation Modeling and Analysis.
1. **Subject name**
   **Smart City**

2. **Subject name in Hungarian**
   Intelligens városok - Smart city

3. **Role**
   Specific course

4. **Code**
   BMEKOKKD011

5. **Evaluation type**
   m

6. **Credits**
   2

7. **Weekly contact hours**
   2 lecture 0 practice 0 lab

8. **Curriculum**
   D

9. **Working hours for fulfilling the requirements of the subject**
   60 hours
   - Contact hours 28 hours
   - Preparation for seminars 4 hours
   - Homework 0 hours
   - Reading written materials 16 hours
   - Midterm preparation 12 hours
   - Exam preparation 0 hours

10. **Department**
    Department of Transport Technology and Economics

11. **Responsible lecturer**
    Dr. Tóth János

12. **Lecturers**
    Dr. Tóth János, Dr. Esztergár-Kiss Domokos

13. **Prerequisites**
    - ( ), -
    - ( ), -
    - ( ), -

14. **Description of lectures**

15. **Description of practices**
    -

16. **Description of laboratory practices**
    -

17. **Learning outcomes**
    a) **Knowledge:**
        - Familiar with Smart City concept, urban planning models, social media types, mobility patterns, Big Data data types, Internet of Things model and features.
    b) **Ability:**
        - Defines Smart City features, calculates with evaluation methods, applies land use models, uses road planning principles, uses Big Data approaches, distinguishes Smart Grid elements.
    c) **Attitude:**
        - Provides maximized abilities, extends knowledge independently, strives for precise task solving.
    d) **Autonomy and responsibility:**
        - Applies acquired knowledge during the course in a responsible way, accepts the framework of cooperation, is able to work independently or in a team.

18. **Requirements, way to determine a grade (obtain a signature)**
    There will be 2 written test during the semester, students need to pass both. The course mark will be calculated from the average of test marks.

19. **Retake and delayed completion**
    Midterm test correction possibility for those not present on one of the tests.

20. **Learning materials**
    Presentation slides and electronic lecture notes.
### Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Statistics in Transport (PhD)</th>
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</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Közlekedésstatisztika (PhD)</td>
</tr>
<tr>
<td>3. Role</td>
<td>Specific course</td>
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<td>4. Code</td>
<td>BMEKOKKD013</td>
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<td>5. Evaluation type</td>
<td>e</td>
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<tr>
<td>6. Credits</td>
<td>3</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>2 lecture, 0 practice, 0 lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
</tbody>
</table>

#### Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>70 hours</td>
<td>5 hours</td>
<td>6 hours</td>
<td>8 hours</td>
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<table>
<thead>
<tr>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>5 hours</th>
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</thead>
<tbody>
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<td>8 hours</td>
<td>Midterm preparation</td>
<td>5 hours</td>
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#### Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Working hours for fulfilling the requirements of the subject</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Contact hours</td>
<td>70 hours</td>
</tr>
<tr>
<td>Preparation for seminars</td>
<td>5 hours</td>
</tr>
<tr>
<td>Homework</td>
<td>6 hours</td>
</tr>
<tr>
<td>Midterm preparation</td>
<td>5 hours</td>
</tr>
<tr>
<td>Exam preparation</td>
<td>8 hours</td>
</tr>
</tbody>
</table>

#### Department

Department of Transport Technology and Economics

#### Responsible lecturer

Dr. Török Ádám

#### Lecturers

Dr. Sipos Tibor, Dr. Török Ádám

#### Prerequisites

- (-), -;
- (-), -;
- (-), -;

#### Description of lectures

Transport is an integral part of advanced societies. He is responsible for passenger transport, including access to services and goods and leisure mobility. He is also responsible for transporting consumer goods. Regional, national and global economies rely on efficient and safe transport. The aim of the course is the statistical analysis of data generated during transport processes. Descriptive statistics. Class interval estimation, hypothesis test, sample comparison. Linear regression. Time series analysis. Principal Component Analysis. Spatial Statistics.

#### Description of practices

- 

#### Description of laboratory practices

- 

#### Learning outcomes

a) Knowledge and Ability:
- The student repeats the material of the descriptive statistics and the hypothesis test.
- It learns the evolution of predictions, and thus opens up its thinking to accommodate novel solutions.
- The student will be able to specialize the general statistical problems in time and space.

#### Requirements, way to determine a grade (obtain a signature)

It is required to fulfill in time the individual student work.

#### Retake and delayed completion

The attendance requirements cannot be delayed completed. The individual case study report can be delayed submitted in the delayed completion period.

#### Learning materials

Simon P Washington; Methew G Karlaftis; Fred L. Mannering: Statistical and Econometric Methods for Transportation Data Analysis, Taylor a& Francis; 2011
Stochastic Processes in System Dynamics I.

Sztochasztikus folyamatok a rendszerdinamikában I.

1. Subject name

2. Subject name in Hungarian

3. Role

4. Code

BMEKOVDJ009

5. Evaluation type

e

6. Credits

4

7. Weekly contact hours

2 lecture 0 practice 0 lab

8. Curriculum

D

9. Working hours for fulfilling the requirements of the subject

120 hours

Contact hours

28 hours

Preparation for seminars

30 hours

Homework

0 hours

Reading written materials

30 hours

Midterm preparation

0 hours

Exam preparation

32 hours

10. Department

Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer

Dr. Zobory István

12. Lecturers

Dr. Zobory István

13. Prerequisites

Analitical Methods in System Technique I. (BMEKOVDJ001), recommended;

\( \cdot (\cdot), \cdot \);

\( \cdot (\cdot), \cdot \)

14. Description of lectures


15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge and Ability:

- Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: methods of the treatment of the stochastic systems and processes; probability theory and random variables, typical distribution and density functions of random variables; typical mapping procedures; the law of large numbers, central limit theorem.

b) Attitude, Autonomy and responsibility:

- Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new resource activities in new fields of knowledge in an innovative way.

18. Requirements, way to determine a grade (obtain a signature)

Regular participation at the lectures and written exam.

19. Retake and delayed completion

According to the TVSZ.

20. Learning materials


Subject name: Stochastic Processes in System Dynamics II.

2. Subject name in Hungarian: Sztochasztikus folyamatok a rendszerdynamikában II.

3. Role: Basic course

4. Code: BMEKOVJD010

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 120 hours

- Contact hours: 28 hours
- Preparation for seminars: 30 hours
- Midterm preparation: 0 hours
- Reading written materials: 15 hours
- Homework: 15 hours
- Exam preparation: 32 hours

10. Department: Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer: Dr. Zobory István

12. Lecturers: Dr. Zobory István

13. Prerequisites: Stochastic Processes in System Dynamics I. (BMEKOVJD009), recommended;
- (.), ()
- (.), ()

14. Description of lectures


15. Description of practices

16. Description of laboratory practices

17. Learning outcomes

a) Knowledge and Ability:
- Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: characteristic operations for stochastic processes; methods of application of point processes; procedures for applying Markov-chains; applicability of Markov-chains concerning the solution to mass-service tasks; the analytic properties of stochastic processes.

b) Attitude, Autonomy and responsibility:
- Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new resource activities in new fields of knowledge in an innovative way.

18. Requirements, way to determine a grade (obtain a signature)

Accepted homework sent before the deadline and written exam.

19. Retake and delayed completion

According to the TVSZ.

19. Learning materials

1. Subject name: Stochastic Processes in System Dynamics III.

2. Subject name in Hungarian: Sztochasztikus folyamatok a rendszerdinamikában III.

3. Role: Basic course

4. Code: BMEKOVJD011

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 120 hours

Contact hours: 28 hours

Preparation for seminars: 30 hours

Homework: 15 hours

Reading written materials: 15 hours

Midterm preparation: 0 hours

Exam preparation: 32 hours

10. Department: Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer: Dr. Zobory István

12. Lecturers: Dr. Zobory István

13. Prerequisites: Stochastic Processes in System Dynamics I. (BMEKOVJD009), recommended; Sztochasztikus folyamatok a rendszerdinamikában II. (BMEKOVJD010), recommended; - (-), -

14. Description of lectures


15. Description of practices

-  

16. Description of laboratory practices

-  

17. Learning outcomes

a) Knowledge and Ability:
   – Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: solution procedures applicable for stochastic differential equations; mapping of the real processes on Markovian model.

b) Attitude, Autonomy and responsibility:
   – Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasurce activities in new fields of knowledge in an innovative way.

18. Requirements, way to determine a grade (obtain a signature)

Accepted homework sent before the deadline and written exam.

19. Retake and delayed completion

According to the TVSZ.

19. Learning materials

1. Subject name | Surface Engineering

2. Subject name in Hungarian | Felületi technológiák

3. Role | Specific course

4. Code | BMEKOGTD016

5. Evaluation type | e

6. Credits | 3

7. Weekly contact hours | 3 lecture 0 practice 0 lab

8. Curriculum | D

9. Working hours for fulfilling the requirements of the subject

| Contact hours | 10 hours | Preparation for seminars | 0 hours | Homework | 20 hours |
| Reading written materials | 10 hours | Midterm preparation | 0 hours | Exam preparation | 4 hours |

10. Department | Department of Automotive Technologies

11. Responsible lecturer | Dr. Markovits Tamás

12. Lecturers | Dr. Markovits Tamás

13. Prerequisites | ( ), ( ), ( ), ( )

14. Description of lectures


15. Description of practices


16. Description of laboratory practices


17. Learning outcomes

a) Knowledge:
   – Familiar with advanced surface modification and measuring techniques and the internal relations of a specific processes.

b) Ability:
   – Ability to research and develop specific processes.

c) Attitude:
   – Openness to new opportunities in the field.

d) Autonomy and responsibility:
   – Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)

It is necessary to prepare and submit an independent homework within the subject. The course ends with an oral exam.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials


Subject description

1. Subject name
   **Technological Diagnostics**

2. Subject name in Hungarian
   Technológiai diagnosztika

3. Role
   Specific course

4. Code
   BMEKOGTD017

5. Evaluation type
   e

6. Credits
   3

7. Weekly contact hours
   3 lecture 0 practice 0 lab

8. Curriculum
   D

9. Working hours for fulfilling the requirements of the subject
   62 hours
   Contact hours 42 hours
   Preparation for seminars 0 hours
   Homework 0 hours
   Reading written materials 8 hours
   Midterm preparation 0 hours
   Exam preparation 12 hours

10. Department
    Department of Automotive Technologies

11. Responsible lecturer
    Dr. Takács János

12. Lecturers
    Dr. Takács János, Dr. Dömötör Ferenc

13. Prerequisites
    - (-), -;
    - (-), -;
    - (-), -;

14. Description of lectures

15. Description of practices
    -

16. Description of laboratory practices
    -

17. Learning outcomes
    a) Knowledge:
    - Has a deeper knowledge of fundamentals and fields of technical diagnostics.
    - Knows the objectives and methods of defect detection.
    - Familiar with the diagnostic methods of various principles and the operation and usage characteristics of the corresponding devices.
    - Has a deeper knowledge of controlling the operation of several operating equipment and technologies, and about the methods by which information can be obtained about several processes.
    - Familiar with the following test methods and their applicability in research tasks: high-speed photo and video recording, endoscopy, thermovision, force fluctuation analysis, vibration diagnostics, noise analysis.
    - Familiar with destructive and non-destructive tests: acoustic emission, penetration, ultrasonic, eddy current defect detection, analysis of fracture surface, structural analysis.
    - Has a deeper knowledge of the properties, devices and procedures for designing advanced diagnostic procedures (high speed video recording, endoscopy, thermovision, vibration diagnostics, acoustic emission, penetration, ultrasonic, eddy current detection).
    - Has deeper knowledge of vehicle diagnostic expert systems.
    - Knows the methods of evaluating and documenting test results.
    b) Ability:
    - Able to overview the whole and the elements of a technological process, to plan its supervision and diagnostic system.
    - Able to find and analyze the causes of a process or equipment failure.
    - Able to give suggestions for the development of a supervisory system.
    - Capable of properly documenting and analyzing scientific results.
    - Capable of a deeper, causal, scientific analysis of a technological process.
    - She/he is able to gather literature on a specific research topic and compile a summary based on it.
    - Able to interpret the results found in the literature.
    - Able to develop a suitable experimental method for a research topic and propose test methods.
    - Able to interpret test results.
    c) Attitude:
    - She/he strives to develop his knowledge independently.
– Strives to explore the causal relationship with scientific depth.
– Strives to develop its own topic area.
– Strives to find connections between topics and disciplines.
– Strives to interpret the literature and their own research results independently and in teamwork, listening to others’ thoughts.
– Strives to share her/his knowledge.

d) Autonomy and responsibility:
– Apply responsibly the knowledge acquired during the course with regard to their validity limits.
– Manages and communicates the results of others and their own results also in accordance with ethical standards.
– Endeavors to perform his assigned tasks independently in accordance with ethical standards.
– She/he knows how far his responsibilities are, informs his colleagues or his supervisor about her/his results, and when it is necessary.

### 18. Requirements, way to determine a grade (obtain a signature)

The course ends with an oral examination.

### 19. Retake and delayed completion

Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

### 20. Learning materials


Auxiliary materials and ppt's downloadable from the department website.
### Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Theory of Additive Manufacturing Technologies PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Additív gyártástechnológiák elmélete PhD</td>
</tr>
<tr>
<td>3. Role</td>
<td>Specific course</td>
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<td>5. Evaluation type</td>
<td>e</td>
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<td>6. Credits</td>
<td>2</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>2 lecture 0 practice 0 lab</td>
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<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
</tbody>
</table>

### Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>14 hours</td>
<td>18 hours</td>
<td>5 hours</td>
<td>18 hours</td>
<td>0 hours</td>
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</tr>
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</table>

### Department

Department of Vehicle Elements and Vehicle-Structure Analysis

### Responsible lecturer

Dr. Ficzere Péter

### Lecturers

Dr. Ficzere Péter

### Prerequisites

- (-), -;
- (-), -;
- (-), -;

### Description of lectures


### Description of practices

- 

### Learning outcomes

**a) Knowledge:**
- Knowledge of recognition the applicability and cost effectiveness of additive manufacturing
- Knowledge of the recognition of the problems that may arise during additive manufacturing based on CAD models and how to eliminate them.
- Knowledge of the appropriate technology selection based on part / model requirements

**b) Ability:**
- Able to select and coordinate the appropriate manufacturing technology on the basis of any 3D model and individual part requirements
- Able to create the needed format to CAM software with an accurate enough based on any 3D model file
- Able to define the appropriate settings, manufacturing parameters and generating the code required for the machine
- Able to the manufacturing parts, including pre- and post-production

**c) Attitude:**
- Strive to maximize their abilities to make their studies at the highest possible level, with a profound and independent knowledge, accurate and error-free, in compliance with the rules of the applicable tools, in collaboration with the instructors.

**d) Autonomy and responsibility:**
- Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.

### Requirements, way to determine a grade (obtain a signature)

The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

### Retake and delayed completion

According to the TVSZ.

### Learning materials

Dr. Ficzere Péter, Az additív gyártástechnológiák elmélete diasor
1. **Subject name**: Traffic Technology (Modells) (PhD)

2. **Subject name in Hungarian**: Forgalomtechnika (modellezés) (PhD)

3. **Role**: Specific course

4. **Code**: BMEKOKUD009

5. **Evaluation type**: e

6. **Credits**: 2

7. **Weekly contact hours**: 0 lecture, 2 practice, 0 lab

8. **Curriculum**: D

9. **Working hours for fulfilling the requirements of the subject**: 60 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 hours</td>
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<td>20 hours</td>
<td>8 hours</td>
<td>0 hours</td>
<td>4 hours</td>
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10. **Department**: Department of Transport Technology and Economics

11. **Responsible lecturer**: Dr. Juhász János

12. **Lecturers**: Dr. Juhász János

13. **Prerequisites**: *(, , ;, , ;)*

14. **Description of lectures**


15. **Description of practices**

Exercising theoretical knowledge with examples and case studies.

16. **Description of laboratory practices**

- 

17. **Learning outcomes**

a) **Knowledge**:
   - Knows the microscopic characteristics of road traffic.
   - Knows the methods of simulation modelling.
   - Knows the models of the traffic process (traffic flow) and the behavior of transport operators.
   - Knows the methods of microscopic modelling of pedestrian traffic flow.

b) **Ability**:
   - Able to examine road traffic using a microscopic simulation model.
   - Able to apply the VISSIM program in practice to examine the flow of vehicle and pedestrian traffic, to compare different traffic control methods.
   - Able to make a comparative analysis of design multimodal node design variants with microscopic simulation.

c) **Attitude**:
   - The student attends the lectures, prepare independent study on time.
   - During the lectures, he is actively involved in processing the current topic.
   - During the independent study the student strives to develop new technical solutions.
   - Interested in international and domestic developments in the field.
   - Open to learn new knowledge and learn.

d) **Autonomy and responsibility**:
   - Apply responsibility the knowledge acquired in the course of the course.
   - Can independently develop new technical solutions.
   - Accepts the framework of collaboration, can perform its work independently or as part of a team, depending on the task.

18. **Requirements, way to determine a grade (obtain a signature)**

Exam. Evaluation of individual study.

19. **Retake and delayed completion**

Retake exam. Study repair.

20. **Learning materials**

Supported by downloadable documents from the Department website.
Subject description

1. Subject name  
Transport Economics I (PhD)

2. Subject name in Hungarian  
Közlekedésgazdaságtan I (PhD)

3. Role  
Basic course

4. Code  
BMEKOKGD006

5. Evaluation type  
e

6. Credits  
4

7. Weekly contact hours  
4 lecture  0 practice  0 lab

9. Working hours for fulfilling the requirements of the subject  
120 hours

Contact hours  
28 hours  Preparation for seminars  28 hours  Homework  12 hours

Reading written materials  
16 hours  Midterm preparation  20 hours  Exam preparation  16 hours

10. Department  
Department of Transport Technology and Economics

11. Responsible lecturer  
Dr. Török Ádám

12. Lecturers  
Dr. Táczos Lászlóné, Dr. Török Ádám

13. Prerequisites  
- ( ), - ;  
- ( ), - ;  
- ( ), -

14. Description of lectures

15. Description of practices
-

16. Description of laboratory practices
-

17. Learning outcomes
a) Knowledge and Ability:
- The student will be able to identify the relationship between economic policy and transport policy.
- The student gets acquainted with the main features of transport, the main directions of change and the main questions of their mathematical modeling.
- The student acquires and becomes able to interpret and develop the mathematical background of transport economics.

18. Requirements, way to determine a grade (obtain a signature)
It is required to fulfill in time the individual student work.

19. Retake and delayed completion
The attendance requirements cannot be delayed completed. The individual case study report can be delayed submitted in the delayed completion period.

20. Learning materials
### Subject Description

**1. Subject name**  
**Transport Economics II (PhD)**

**2. Subject name in Hungarian**  
Közlekedésgazdaságtan II. (PhD)

**3. Role**  
Basic course

**4. Code**  
BMEKOKGD007

**5. Evaluation type**  
e

**6. Credits**  
4

**7. Weekly contact hours**  
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<th>Lab</th>
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<tr>
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</table>

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**  
<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 hours</td>
<td>28 hours</td>
<td>12 hours</td>
<td>16 hours</td>
</tr>
</tbody>
</table>

**10. Department**  
Department of Transport Technology and Economics

**11. Responsible lecturer**  
Dr. Török Ádám

**12. Lecturers**  
Dr. Táczos Lászlóné, Dr. Török Ádám

**13. Prerequisites**  
- (-), -
- (-), -
- (-), -

**14. Description of lectures**


**15. Description of practices**

-  

**16. Description of laboratory practices**

-  

**17. Learning outcomes**

a) Knowledge and Ability:
- The student learns the mathematical background of transport economics.
- The student will be able to interpret the modeling of passenger and freight needs and supply.
- After acquiring the mathematical foundations of pricing and pricing, the student becomes more receptive to new solutions to transport problems.
- The student learns and is able to use the tools of social acceptance of awards.

**18. Requirements, way to determine a grade (obtain a signature)**

It is required to fulfill in time the individual student work.

**19. Retake and delayed completion**

The attendance requirements cannot be delayed completed. The individual case study report can be delayed submitted in the delayed completion period.

**20. Learning materials**

1. Subject name: Transport Informatics (PhD)

2. Subject name in Hungarian: Közlekedési informatika (PhD)

3. Role: Specific course

4. Code: BMEKOKUD002

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 2 lecture, 0 lab, 2 practice

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject:
   - Contact hours: 28 hours
   - Preparation for seminars: 14 hours
   - Midterm preparation: 14 hours
   - Reading written materials: 20 hours
   - Homework: 34 hours
   - Exam preparation: 10 hours
   - Total: 120 hours

10. Department: Department of Transport Technology and Economics

11. Responsible lecturer: Dr. Csiszár Csaba

12. Lecturers: Dr. Csiszár Csaba, Csonka Bálint, Földes Dávid

13. Prerequisites:
   - ({}), ;
   - ({}), ;
   - ({}), ;

14. Description of lectures
   Features of road electromobility system. Information system and services of electromobility, smart grid. Transportation system based on autonomous vehicles, mobility service types, impacts. Planning and operation of mobility services based on autonomous vehicles. Structure of transportation system, basic concepts in informatics. Structural model of transportation information systems. Characteristics and categorization of transportation organizations. Operational models of transportation organizations. Analysis and modelling methods of transportation information systems.

15. Description of practices
   Basic terms and main application fields of artificial intelligence, calculation examples. Rudiments of system planning. Case studies. The students elaborate a customized complex assignment for modelling and planning information system aiding transportation operation.

16. Description of laboratory practices

17. Learning outcomes
   a) Knowledge and Ability:
   - The students know structure and operation of complex transportation information systems.
   - They are able to analyse and design transportation information systems and operational processes.
   b) Attitude, Autonomy and responsibility:
   - The students strive for precise and errorless task accomplishment.
   - They apply the knowledge with responsibility.
   - They are able to work independently or in a team according to the situation.

18. Requirements, way to determine a grade (obtain a signature)
   The students write 4 midterms. 2 of them include theoretical questions; 2 of them include practical questions. The mid-semester signature is obtained if all the four midterms are passed (half of the max-imal scores) and the student assignment about data modelling is submitted and accepted (at least half of the maximal scores). The semester is finished by oral exam.

19. Retake and delayed completion
   The midterms can be retaken according to TVSZ (study code). The student assignment can be submitted after deadline (if extra fee is paid).

20. Learning materials
Subject description

1. Subject name
Transport Infrastructure and Regional Development

2. Subject name in Hungarian
Transport Infrastructure and Regional Development

3. Role
Specific course

4. Code
BMEKOKK006

5. Evaluation type
e

6. Credits
3

7. Weekly contact hours
1 lecture 1 practice 0 lab

8. Curriculum
D

9. Working hours for fulfilling the requirements of the subject
90 hours

Contact hours 28 hours Preparation for seminars 14 hours Homework 22 hours
Reading written materials 18 hours Midterm preparation 0 hours Exam preparation 8 hours

10. Department
Department of Transport Technology and Economics

11. Responsible lecturer
Dr. Mészáros Ferenc

12. Lecturers
Dr. Mészáros Ferenc

13. Prerequisites
- ( ), - ; - ( ), - ;

14. Description of lectures
Transport infrastructure and development are linked, although the link between them is not straightforward. This course explores and analyses this link. Regional development and its measurement is scrutinized as is the monetarisation of infrastructure charging and calculation of costs. The course engages the disciplines of economics, regional planning, environmental science, geography, and sociology in investigating the externalities of transportation. The course aims to provide a practical and contemporary, but yet critical introduction to this subject. It will involve the study real and contemporary examples.

15. Description of practices

16. Description of laboratory practices
-

17. Learning outcomes
a) Knowledge:
   - The student knows the definitions and interrelations of transport infrastructure and regional developments, gets know the sustainability goals and indicators.

b) Ability:
   - The student is able to identify and calculate/evaluate the wider impacts of transport infrastructure investments on the regional development.

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

d) Autonomy and responsibility:
   - In addition to the narrow professional aspects, the student also takes into account social and economic aspects in the utilization of its knowledge, asks for the professional opinions of others, makes responsible decisions in the selection of the most efficient transport investments, and takes care of the challenges responsibly.

18. Requirements, way to determine a grade (obtain a signature)
The students shall attend the at least 70% of lectures and at least 70% of seminars. The students shall individually work out a report about a selected and agreed case study analysis about wider impacts of a transport infrastructure investment and submit until the last day of study period. There are two assessments during the semester: (1) a formative assessment is conducted based on continuous performance and activity at the subject's contact lessons (active participation, contributing thoughts, participation in organised teamwork and discussions, etc.) (signature, weight of 70% in final grade), (2) a formative assessment during the verbal exam based on the student's case study analysis with brief presentation (weight of 30% in final grade).

19. Retake and delayed completion
The attendance requirements cannot be delayed completed. The individual case study report can be delayed submitted in the delayed completion period.

20. Learning materials
Caralampo Focas (2006) Transport Infrastructure and Regional Development. Course material, BME Department of Transport Economic, Budapest
Lecture slides
### Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th><strong>Transport Logistics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Szállítási logisztika</td>
</tr>
<tr>
<td>3. Role</td>
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<td>5. Evaluation type</td>
<td>e</td>
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<td>6. Credits</td>
<td>3</td>
</tr>
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<td>7. Weekly contact hours</td>
<td>3 lecture 0 practice 0 lab</td>
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<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
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<td>9. Working hours for fulfilling the requirements of the subject</td>
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<td>Midterm preparation</td>
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<td>Exam preparation</td>
<td>0 hours</td>
</tr>
<tr>
<td>10. Department</td>
<td>Department of Material Handling and Logistics Systems</td>
</tr>
<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Kovács Gábor</td>
</tr>
<tr>
<td>12. Lecturers</td>
<td>Dr. Kovács Gábor</td>
</tr>
<tr>
<td>13. Prerequisites</td>
<td>Packaging Technologies (BMEKOALD005), recommended;</td>
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<tr>
<td></td>
<td>- ( ), -</td>
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<td></td>
<td>- ( ), -</td>
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<tr>
<td>15. Description of practices</td>
<td></td>
</tr>
<tr>
<td>16. Description of laboratory practices</td>
<td></td>
</tr>
<tr>
<td>17. Learning outcomes</td>
<td>a) Knowledge:</td>
</tr>
<tr>
<td></td>
<td>- Knowledge of the modular structure and operation of the transport logistics systems.</td>
</tr>
<tr>
<td></td>
<td>- Knowledge of related optimum search tasks and solutions.</td>
</tr>
<tr>
<td>b) Ability:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Able to study the transport logistics systems, taking into account the scientific requirements.</td>
</tr>
<tr>
<td></td>
<td>- Able to carry out research and development tasks related to the transport logistics systems.</td>
</tr>
<tr>
<td>c) Attitude:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Strive to maximize their abilities to make their studies at the highest possible level, with a profound and independent knowledge, accurate and error-free, in compliance with the rules of the applicable tools, in collaboration with the instructors.</td>
</tr>
<tr>
<td>d) Autonomy and responsibility:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Take responsibility for the quality of the work and the ethical standards that set an example for the classmates, using the knowledge acquired during the course.</td>
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<tr>
<td>18. Requirements, way to determine a grade (obtain a signature)</td>
<td>The grade of the PhD student is based on the semester activity and the evaluation of the paper (publishing), in consultation with the supervisor.</td>
</tr>
<tr>
<td>19. Retake and delayed completion</td>
<td>Announced at the beginning of the semester.</td>
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<td>20. Learning materials</td>
<td>Slides and examples in electronic format.</td>
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</table>
1. **Subject name**

Transport Network Planning (models) (PhD)

2. **Subject name in Hungarian**

Közlekedési hálózattervezés (modellek) (PhD)

3. **Role**

Specific course

4. **Code**

BMEKOKUD008

5. **Evaluation type**

e

6. **Credits**

3

7. **Weekly contact hours**

1 lecture 0 practice 1 lab

8. **Curriculum**

D

9. **Working hours for fulfilling the requirements of the subject**

<table>
<thead>
<tr>
<th>Contact hours</th>
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<th>Homework</th>
<th>Exam preparation</th>
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<th>Midterm preparation</th>
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</tr>
</thead>
<tbody>
<tr>
<td>10 hours</td>
<td>12 hours</td>
<td>12 hours</td>
</tr>
</tbody>
</table>

90 hours

10. **Department**

Department of Transport Technology and Economics

11. **Responsible lecturer**

Dr. Tóth János

12. **Lecturers**

Dr. Tóth János, Aba Attila

13. **Prerequisites**

- ( ), -;
- ( ), -;
- ( ), -

14. **Description of lectures**

Transport network systems and their elements, the aim and process of transport network planning. The characteristics of transport demands. The elements of transport models, their application in network building. Transport network planning models: Trip generation, trip distribution, modal choice, traffic assignment. Detailed examination of traffic assignment models.

15. **Description of practices**

- 

16. **Description of laboratory practices**

The software of Transport network planning is introduced.

17. **Learning outcomes**

a) **Knowledge:**

- Familiar with goal and process of transport network planning.

b) **Ability:**

- Ability to use of VISUM szoftver.

c) **Attitude:**

- Strive to acquire the highest level of system approach.

d) **Autonomy and responsibility:**

- Responsible applies of acquired knowledge in individual or in team work.

18. **Requirements, way to determine a grade (obtain a signature)**

The criterion of the signature (and to take the exam) is to solve the chosen project till the deadline and to write the midterm exam at least an acceptable level. The exam is written.

19. **Retake and delayed completion**

Second test possibility for those not present on the test, possibility of delayed deadline for home work.

20. **Learning materials**

-
1. Subject name: Transport Technology (PhD)

2. Subject name in Hungarian: Közlekedési technológia (PhD)

3. Role: Specific course

4. Code: BMEKOKUD003

5. Evaluation type: e

6. Credits: 3

7. Weekly contact hours: 2 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 90 hours

   Contact hours: 28 hours
   Preparation for seminars: 8 hours
   Homework: 20 hours
   Midterm preparation: 20 hours
   Exam preparation: 10 hours

10. Department: Department of Transport Technology and Economics

11. Responsible lecturer: Dr. Mándoki Péter

12. Lecturers: Dr. Mándoki Péter

13. Prerequisites:

- (-), -;
- (-), -;
- (-), -;

14. Description of lectures

The subject of the course is to introduce and deepen the knowledge of road, rail, and urban transport technology. Describe the processes of passenger and freight transport, the linkages between sectors and the division of labour. Technical parameters of road traffic. Special tools for urban public transport and their operation. Features of rail transport. Main, secondary, and auxiliary processes of the railway operating system. Self-driving vehicles and automatic operation in public transport.

15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

   a) Knowledge:
      - The student knows and understands the characteristics, fields of application and planning techniques of each transport sub-sector.

   b) Ability:
      - Ability to dealing with creative problems in the field of transport and flexible solutions to complex tasks. Able to plan technological processes, taking into account their operational aspects. Able to working in a group, sharing tasks and managing them over time.

   c) Attitude:
      - Engages in professional and ethical values related to the technical field, and works based on a system-oriented and process-oriented mindset, in a team-work.

   d) Autonomy and responsibility:
      - Make his decisions carefully, in consultation with representatives of other fields of expertise, with full responsibility. In the case of team work, he also works with a well-defined responsibility.

18. Requirements, way to determine a grade (obtain a signature)

Exam, which included the results of individual tasks 50% weighting.

19. Retake and delayed completion

Unsuccessful task can be replaced during the replacement period.

20. Learning materials

Uploaded materials to the Moodle System and the Department website.
Subject description

1. Subject name
   Tribology

2. Subject name in Hungarian
   Tribológia

3. Role
   Specific course

4. Code
   BMEKOGTD005

5. Evaluation type
   e

6. Credits
   3

7. Weekly contact hours
   2 lecture 0 practice 0 lab

8. Curriculum
   D

9. Working hours for fulfilling the requirements of the subject
   48 hours

   Contact hours
   28 hours Preparation for seminars 0 hours Homework 0 hours

   Reading written materials
   8 hours Midterm preparation 0 hours Exam preparation 12 hours

10. Department
    Department of Automotive Technologies

11. Responsible lecturer
    Dr. Takács János

12. Lecturers
    Dr. Takács János

13. Prerequisites
    • (-), •

14. Description of lectures

15. Description of practices
    -

16. Description of laboratory practices
    -

17. Learning outcomes

   a) Knowledge:
      • Has a deeper knowledge of the surface and topography of solid bodies. Knows the concept of friction. Has a deeper knowledge of the factors that affect friction. Knows the relationship between friction and wear. Knows the role and characteristics of lubricants and the different lubrication systems. Has a deeper knowledge of wear-related phenomena and wear mechanisms: adhesion, abrasion, oxidation, fatigue wear; and their relationships. Has a deeper knowledge of modeling wear processes. Knows the wear testers and equipments. Has deeper knowledge of wear assessment and wear charts. Knows the possibilities of abrasion reduction and lifetime increase. Knows the principles of choosing material pairs of parts. Knows the methods of creating advanced surfaces that provide increased wear resistance. Knows the principles of choosing a lubricant and lubrication system related to stress and material matching. Has a deeper understanding of lifetime improvement methods.

   b) Ability:
      • Able to propose a material matching, lubrication system and surface modification procedure for a load condition system. Able to overview a technological or measurement process and capable of a deeper, causal, scientific analysis of it. Able to give suggestions for the development of a technological or measurement process. She/he is able to gather literature on a specific research topic and compile a summary based on it. Able to interpret the results found in the literature. Able to develop a suitable experimental method for a research topic and propose test methods. Able to interpret test results.

   c) Attitude:
      • She/he strives to develop his knowledge independently. Strives to explore the causal relationship with scientific depth. Strives to develop its own topic area. Strives to find connections between topics and disciplines. Strives to interpret the literature and their own research results independently and in teamwork, listening to others’ thoughts. Strives to share her/his knowledge.

   d) Autonomy and responsibility:
      • Apply responsibly the knowledge acquired during the course with regard to their validity limits. Manages and communicates the results of others and their own results also in accordance with ethical standards. Endeavors to perform his assigned tasks independently in accordance with ethical standards. She/he knows how far his responsibilities are, informs his colleagues or his supervisor about her/his results, and when it is necessary.

18. Requirements, way to determine a grade (obtain a signature)
    The course ends with an oral examination.

19. Retake and delayed completion
    Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

20. Learning materials
1. **Subject name**  
**Vehicle Manufacturing Systems**

2. **Subject name in Hungarian**  
Járműgyártó rendszerek

3. **Role**  
Basic course

4. **Code**  
BMEKOGTD014

5. **Evaluation type**  
e

6. **Credits**  
4

7. **Weekly contact hours**  
4 lecture 0 practice 0 lab

8. **Curriculum**  
D

9. **Working hours for fulfilling the requirements of the subject**  
84 hours

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</tr>
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<tbody>
<tr>
<td>4 hours</td>
<td>0 hours</td>
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10. **Department**  
Department of Automotive Technologies

11. **Responsible lecturer**  
Dr. Takács János

12. **Lecturers**  
Dr. Takács János

13. **Prerequisites**  
- (-), -;
- (-), -;
- (-), -;

14. **Description of lectures**  
The aim of this subject is to give research and development approach to design, build, and modernise manufacturing systems of vehicles and those parts. Construction of vehicle manufacturing systems; equipments of product production as system components. Designing components for build up and cut of technologies (cutting tools with definite and indefinite edge geometry, bulk forming tools). Design, manufacture, measurement and renewal of tools. Designing and dimensioning of measuring instruments. Installation and arrangement of vehicle manufacturing systems.

15. **Description of practices**  
-

16. **Description of laboratory practices**  
-

17. **Learning outcomes**  

a) Knowledge:  
- Knows the structure of vehicle manufacturing systems. Has a deeper knowledge of designing, manufacturing, measuring and renewal of tools.
- Has a deeper knowledge of the design, manufacture and renewal of workpiece clamping and tool guiding devices.
- Knows the process of machine tooling and equipping. Has a deeper knowledge of the design and dimensioning of measuring instruments.
- Has a deeper knowledge of the installation of vehicle manufacturing systems and the design of the plant layout.

b) Ability:  
- It is able to overview and plan the whole technological process (plant layout) and its elements (equipping, tooling, measurement).
- Capable of a deeper, causal, scientific analysis of a technological process. Able to give suggestions for the development of a technological process. She/he is able to gather literature on a specific research topic and compile a summary based on it.
- Able to interpret the results found in the literature. Able to develop a suitable experimental method for a research topic and propose test methods. Able to interpret test results.

18. **Requirements, way to determine a grade (obtain a signature)**  
The course ends with an oral examination.

19. **Retake and delayed completion**  
Possibilities for supplementation take place in accordance with the applicable study and examination rules.

20. **Learning materials**  
Vehicle Materials

1. Subject name

Járműszerkezeti anyagok

2. Subject name in Hungarian

Vehicle Materials

3. Role

Basic course

4. Code

BMEKOGGD002

5. Evaluation type

e

6. Credits

4

7. Weekly contact hours

4 lecture 0 practice 0 lab

8. Curriculum

D

9. Working hours for fulfilling the requirements of the subject

Contact hours 56 hours Preparation for seminars 0 hours Homework 8 hours

Reading written materials 8 hours Midterm preparation 0 hours Exam preparation 12 hours

10. Department

Department of Automotive Technologies

11. Responsible lecturer

Dr. Bán Krisztián

12. Lecturers

Dr. Bán Krisztián

13. Prerequisites

Advanced materials and technologies (BMEKOGGM601), recommended;
• (·), ·;
• (·), ·

14. Description of lectures


15. Description of practices


16. Description of laboratory practices


17. Learning outcomes

a) Knowledge:
- Knows the pre-production technologies of Fe-based, non-ferrous and lightweight metals.
- Has a deeper knowledge of impact of impurities and alloys on mechanical properties of steels.
- Knows the classification of steels by composition and use.
- Has a deeper knowledge of heat treatment technologies for steels.
- Has a deeper knowledge of types, structure and properties of advanced high strength steels.
- Has a deeper knowledge of types and properties of cast iron, heat treatment technologies for property modifications.
- Has a deeper knowledge of impact of impurities and alloys on the mechanical properties of non-ferrous and lightweight metals.
- Knows the classification of non-ferrous and lightweight metals according to their composition and use.
- Has a deeper knowledge of heat treatment technologies for property modifications of non-ferrous and lightweight metals.
- Has a deeper knowledge of bulk plastic deformation technologies and sheet metal forming.
- Has a deeper knowledge of main properties of plastics (structure, mechanical properties, transformation temperatures).
- Knows test methods for plastics.
- Knows plastics processing technologies.
- Has a deeper knowledge of properties of composite materials, production technologies (metal foams, in situ composites, fibre-reinforced composites).
- Has a deeper knowledge of properties of ceramics, manufacturing techniques of ceramic components.
- Has a deeper knowledge of surface modification procedures.

b) Ability:
- Able to overview a technological or measurement process and capable of a deeper, causal, scientific analysis of it.
- Able to give suggestions for the development of a technological or measurement process.
- She/he is able to gather literature on a specific research topic and compile a summary based on it.
- Able to interpret the results found in the literature.
- Able to develop a suitable experimental method for a research topic and propose test methods.
- Able to interpret test results.

   →

   c) Attitude:
- She/he strives to develop his knowledge independently.
- Strives to explore the causal relationship with scientific depth.
Strives to develop its own topic area.
Strives to find connections between topics and disciplines.
Strives to interpret the literature and their own research results independently and in teamwork, listening to others’ thoughts.
Strives to share her/his knowledge.

d) Autonomy and responsibility:
- Apply responsibly the knowledge acquired during the course with regard to their validity limits.
- Manages and communicates the results of others and their own results also in accordance with ethical standards.
- Endeavors to perform his assigned tasks independently in accordance with ethical standards.
- She/he knows how far his responsibilities are, informs his colleagues or his supervisor about her/his results, and when it is necessary.

18. Requirements, way to determine a grade (obtain a signature)
The course ends with an oral examination.

19. Retake and delayed completion
Possibilities for supplementation takes place in accordance with the applicable study and examination rules.

20. Learning materials
Flinn, Trojan: Engineering Materials and Their Applications,
Auxiliary materials and ppt's downloadable from the department website.
Subject description

1. Subject name: Vehicle system dynamics I.

2. Subject name in Hungarian: Járműrendszerdinamika I.

3. Role: Basic course

4. Code: BMEKOVJD007

5. Evaluation type: e

6. Credits: 4

7. Weekly contact hours: 2 lecture, 0 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject:
   - Contact hours: 28 hours
   - Preparation for seminars: 30 hours
   - Homework: 0 hours
   - Reading written materials: 30 hours
   - Midterm preparation: 0 hours
   - Exam preparation: 32 hours

10. Department: Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer: Dr. Zobory István

12. Lecturers: Dr. Zobory István

13. Prerequisites:
   - (-), (-)
   - (-), (-)
   - (-), (-)

14. Description of lectures

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes
   a) Knowledge and Ability:
      - Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: application of flow-charts, structure graphs and signal-flow-graphs for analysing vehicle dynamical systems; analytic and sintetic methods for generation motion equations; methods of characterisation of dynamic systems in the time- and frequency-domains.
   b) Attitude, Autonomy and responsibility:
      - Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new resarce activities in new fields of knowledge in an innovative way.

18. Requirements, way to determine a grade (obtain a signature)
   Regular participation at the lectures and written exam.

19. Retake and delayed completion
   According to the TVSZ.

20. Learning materials
Subject description

1. Subject name
   Vehicle system dynamics II.

2. Subject name in Hungarian
   Járműrendszerdinamika II.

3. Role
   Basic course

4. Code
   BMEKOVD008

5. Evaluation type
   e

6. Credits
   4

7. Weekly contact hours
   2 lecture 0 practice 0 lab

8. Curriculum
   D

9. Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
</tr>
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<tbody>
<tr>
<td>28 hours</td>
<td>30 hours</td>
<td>0 hours</td>
<td>30 hours</td>
<td>0 hours</td>
<td>32 hours</td>
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10. Department
    Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer
    Dr. Zobory István

12. Lecturers
    Dr. Zobory István

13. Prerequisites
    Vehicle system dynamics I. (BMEKOVD007), recommended;
    - (-), -;
    - (-), -

14. Description of lectures

15. Description of practices

16. Description of laboratory practices

17. Learning outcomes
    a) Knowledge and Ability:
       - Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: the linear and non linear force connections of vehicle dynamical systems; description methods of the rolling connection; procedures describing the wear mechanism of the rolling connection.
    b) Attitude, Autonomy and responsibility:
       - Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasurce activities in new fields of knowledge in an innovative way.

18. Requirements, way to determine a grade (obtain a signature)
    Regular participation at the lectures and written exam.

19. Retake and delayed completion
    According to the TVSZ.

20. Learning materials
### Subject Description

1. **Subject name**  
   **Vehicle system dynamics III.**

2. **Subject name in Hungarian**  
   Járőrendszerdinamika III.

3. **Role**  
   Basic course

4. **Code**  
   BMEKOVJD014

5. **Evaluation type**  
   e

6. **Credits**  
   4

7. **Weekly contact hours**  
   2 lecture, 0 practice, 0 lab

8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   120 hours
   - Contact hours: 28 hours
   - Preparation for seminars: 30 hours
   - Reading written materials: 30 hours
   - Midterm preparation: 0 hours
   - Homework: 0 hours
   - Exam preparation: 32 hours

10. **Department**  
    Department of Aeronautics, Naval Architecture and Railway Vehicles

11. **Responsible lecturer**  
    Dr. Szabó András

12. **Lecturers**  
    Dr. Szabó András

13. **Prerequisites**  
    Vehicle system dynamics II. (BMEKOVJD008), recommended;
    · (·), ·;
    · (·), ·;

14. **Description of lectures**

15. **Description of practices**

16. **Description of laboratory practices**

17. **Learning outcomes**
   a) Knowledge and Ability:
      - Students must know comprehensively, interpret in a constructive way and apply in his research activities in an innovative way the following elements of analysis methods: possibilities for modelling the railway-track/vehicle dynamical system; methods of generating the system-equations; transformation procedures connected to the system modelling; solution methods for the geometrical contact of wheel and rail; possibilities of taking into consideration the parametric excitation caused by the track stiffness inhomogeneity.
   b) Attitude, Autonomy and responsibility:
      - Students must persue to get knowledge of the new scientific results, the latter are applied with responsibility and initiates new reasurce activities in new fields of knowledge in an innovative way.

18. **Requirements, way to determine a grade (obtain a signature)**
    Regular participation at the lectures and written exam.

19. **Retake and delayed completion**
    According to the TVSZ.

20. **Learning materials**
1. Subject name **Vehicle system dynamics PhD**

2. Subject name in Hungarian **Gépjárműrendszerek dinamikája PhD**

3. Role Specific course

4. Code **BMEKOGJD004**

5. Evaluation type e

6. Credits 3

7. Weekly contact hours

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<th>Homework</th>
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8. Curriculum D

9. Working hours for fulfilling the requirements of the subject 120 hours

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<th>Homework</th>
<th>Exam preparation</th>
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<tr>
<td>28 hours</td>
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10. Department Department of Automotive Technologies

11. Responsible lecturer Dr. Szalay Zsolt

12. Lecturers Dr. Szalay Zsolt

13. Prerequisites

- (-), -;
- (-), -;
- (-), -;

14. Description of lectures

The subject discusses in detail driving dynamics, stability and vibrations of road vehicles using toolkits of linear and nonlinear dynamics. Architectures of systems acting the dynamics of the vehicle independent of the driver.

15. Description of practices

- 

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge:
   - Familiar with vehicle dynamics fundamentals.

b) Ability:
   - Ability to research and develop specific processes.

c) Attitude:
   - Openness to new opportunities in the field.

d) Autonomy and responsibility:
   - Participate in independent research tasks.

18. Requirements, way to determine a grade (obtain a signature)

The acquisition of the signature of the subject, and, in addition, the condition of taking exam is giving in the complete individual student homework for deadline. The exam is oral.

19. Retake and delayed completion

There is one occasion to retake the exam.

20. Learning materials


Subject description

1. Subject name
   Work Organisation and Management (PhD)

2. Subject name in Hungarian
   Üzemszervezés (PhD)

3. Role
   Specific course

4. Code
   BMEKOKUD011

5. Evaluation type
   e

6. Credits
   2

7. Weekly contact hours
   1 lecture  1 practice  0 lab

8. Curriculum
   D

9. Working hours for fulfilling the requirements of the subject
   60 hours
   
   Contact hours  28 hours
   Preparation for seminars  0 hours
   Homework  20 hours
   Reading written materials  8 hours
   Midterm preparation  0 hours
   Exam preparation  4 hours

10. Department
    Department of Transport Technology and Economics

11. Responsible lecturer
    Dr. Juhász János

12. Lecturers
    Dr. Juhász János

13. Prerequisites
    - (-), -;
    - (-), -;
    - (-), -;

14. Description of lectures

15. Description of practices
    Exercising theoretical knowledge with examples and case studies.

16. Description of laboratory practices
    -

17. Learning outcomes
    a) Knowledge:
       - Know the operational indexes of operational processes in the practice.
       - Know the methods and tools of organizing production systems.
       - Know the characteristics of different production systems.
       - Know the methods of time planning of production and transport processes.
       - Know the basic concepts of Lean and application possibilities.
       - Know the application of artificial intelligence in production systems.
       - Know the relationship between Industry 4.0 and operating methods.
    b) Ability:
       - Able to evaluate the development of indicators for the classification of operational and transport processes.
       - Able to time planning of production and transport processes. Able to apply of Industry 4.0 elements.
    c) Attitude:
       - The student attends the lectures, prepare independent study on time.
       - During the independent study the student strives to develop new technical solutions.
       - Interested in international and domestic developments in the field.
       - Open to learn new knowledge and learn.
    d) Autonomy and responsibility:
       - Apply responsibility the knowledge acquired in the course of the course.
       - Can independently develop new technical solutions.
       - Accepts the framework of collaboration, can perform its work independently or as part of a team, depending on the task.

18. Requirements, way to determine a grade (obtain a signature)
    Exam. Evaluation of individual study.

19. Retake and delayed completion
    Retake exam. Study repair.

20. Learning materials
    Supported by downloadable documents from the Department website
1. Subject name | Dissertation writing (1)
2. Subject name in Hungarian | Disszertáció készítése (1)
3. Role | Mandatory
4. Code | BMEKOALD171
5. Evaluation type | m
6. Credits | 10
7. Weekly contact hours | 0 lecture 10 practice 0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 300 hours
   Contact hours | 140 hours
   Preparation for seminars | 160 hours
   Homework | 0 hours
   Reading written materials | 0 hours
   Midterm preparation | 0 hours
   Exam preparation | 0 hours
10. Department | Department of Material Handling and Logistics Systems
11. Responsible lecturer | Dr. Bóna Krisztián
12. Lecturers | Dr. Bóna Krisztián
13. Prerequisites | - (-), -;
   - (-), -;
   - (-), -
14. Description of lectures
   -
15. Description of practices
   Formulation of the main theses of the doctoral research, preparation of the draft of the dissertation.
16. Description of laboratory practices
   -
17. Learning outcomes
   a) Knowledge and Ability:
      - The student is able to document, organize and present research results with scientific excellence.
18. Requirements, way to determine a grade (obtain a signature)
   The student's supervisor evaluates his / her half-year performance with a midterm grade. Excellent: Theses and publications are organized together, the table of content is ready; good: the theses have been formulated, publications based on theses are appropriate, the table of contents is ready; satisfactory: publications based on theses are appropriate, theses are formulated; pass: publications based on theses are appropriate.
19. Retake and delayed completion
   The semester requirements cannot be delayed completed or improved.
20. Learning materials
   -
### Subject description

**1. Subject name**  
**Dissertation writing (1)**

**2. Subject name in Hungarian**  
Disszertáció készítése (1)

**3. Role**  
Mandatory

**4. Code**  
BMEKOGGD171

**5. Evaluation type**  
m

**6. Credits**  
10

**7. Weekly contact hours**  
0 lecture 10 practice 0 lab

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**  
300 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>140 hours</td>
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<td>0 hours</td>
<td>0 hours</td>
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**10. Department**  
Department of Automotive Technologies

**11. Responsible lecturer**  
Dr. Szalay Zsolt

**12. Lecturers**  
Dr. Szalay Zsolt

**13. Prerequisites**

- (-), -
- (-), -
- (-), -

**14. Description of lectures**

- 

**15. Description of practices**

Formulation of the main theses of the doctoral research, preparation of the draft of the dissertation.

**16. Description of laboratory practices**

- 

**17. Learning outcomes**

a) Knowledge and Ability:

- The student is able to document, organize and present research results with scientific excellence.

**18. Requirements, way to determine a grade (obtain a signature)**

The student’s supervisor evaluates his / her half-year performance with a midterm grade. Excellent: Theses and publications are organized together, the table of content is ready; good: the theses have been formulated, publications based on theses are appropriate, the table of contents is ready; satisfactory: publications based on theses are appropriate, theses are formulated; pass: publications based on theses are appropriate.

**19. Retake and delayed completion**

The semester requirements cannot be delayed completed or improved.

**20. Learning materials**

-
Subject description

1. Subject name  **Dissertation writing (1)**

2. Subject name in Hungarian  **Disszertáció készítése (1)**

3. Role  Mandatory

4. Code  **BMEKOJSD171**

5. Evaluation type  m

6. Credits  10

7. Weekly contact hours  0 lecture  10 practice  0 lab

8. Curriculum  D

9. Working hours for fulfilling the requirements of the subject  300 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
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<td>140 hours</td>
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10. Department  Department of Vehicle Elements and Vehicle-Structure Analysis

11. Responsible lecturer  Dr. Lovas László

12. Lecturers  Dr. Lovas László

13. Prerequisites  -

14. Description of lectures  -

15. Description of practices  Formulation of the main theses of the doctoral research, preparation of the draft of the dissertation.

16. Description of laboratory practices  -

17. Learning outcomes  a) Knowledge and Ability:

   - The student is able to document, organize and present research results with scientific excellence.

18. Requirements, way to determine a grade (obtain a signature)  The student's supervisor evaluates his / her half-year performance with a midterm grade. Excellent: Theses and publications are organized together, the table of content is ready; good: the theses have been formulated, publications based on theses are appropriate, the table of contents is ready; satisfactory: publications based on theses are appropriate, theses are formulated; pass: publications based on theses are appropriate.

19. Retake and delayed completion  The semester requirements cannot be delayed completed or improved.

20. Learning materials  -
Subject description

1. Subject name: **Dissertation writing (1)**

2. Subject name in Hungarian: Disszertáció készítése (1)

3. Role: Mandatory

4. Code: BMEKOKAD171

5. Evaluation type: m

6. Credits: 10

7. Weekly contact hours: 0 lecture, 10 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 300 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
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<th>Midterm preparation</th>
<th>Homework</th>
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<tr>
<td>140 hours</td>
<td>160 hours</td>
<td>0 hours</td>
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</table>

10. Department: Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer: Dr. Gáspár Péter

12. Lecturers: Dr. Gáspár Péter

13. Prerequisites: - (-), -
                  - (-), -
                  - (-), -

14. Description of lectures: -

15. Description of practices: Formulation of the main theses of the doctoral research, preparation of the draft of the dissertation.

16. Description of laboratory practices: -

17. Learning outcomes:

   a) Knowledge and Ability:
      - The student is able to document, organize and present research results with scientific excellence.

18. Requirements, way to determine a grade (obtain a signature):

   The student's supervisor evaluates his / her half-year performance with a midterm grade. Excellent: Theses and publications are organized together, the table of content is ready; good: the theses have been formulated, publications based on theses are appropriate, the table of contents is ready; satisfactory: publications based on theses are appropriate, theses are formulated; pass: publications based on theses are appropriate.

19. Retake and delayed completion:

   The semester requirements cannot be delayed completed or improved.

20. Learning materials: -
1. Subject name  **Dissertation writing (1)**

2. Subject name in Hungarian  Disszertáció készítése (1)

3. Role  Mandatory

4. Code  BMEKOKKD171

5. Evaluation type  m

6. Credits  10

7. Weekly contact hours  0 lecture  10 practice  0 lab

8. Curriculum  D

9. Working hours for fulfilling the requirements of the subject  300 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
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<td>160 hours</td>
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10. Department  Department of Transport Technology and Economics

11. Responsible lecturer  Dr. Tóth János

12. Lecturers  Dr. Tóth János

13. Prerequisites  -

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- () , 
- () , 
- () , 
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14. Description of lectures  -

15. Description of practices  Formulation of the main theses of the doctoral research, preparation of the draft of the dissertation.

16. Description of laboratory practices  -

17. Learning outcomes  a) Knowledge and Ability:

- The student is able to document, organize and present research results with scientific excellence.

18. Requirements, way to determine a grade (obtain a signature)  The student's supervisor evaluates his / her half-year performance with a midterm grade. Excellent: Theses and publications are organized together, the table of content is ready; good: the theses have been formulated, publications based on theses are appropriate, the table of contents is ready; satisfactory: publications based on theses are appropriate, theses are formulated; pass: publications based on theses are appropriate.

19. Retake and delayed completion  The semester requirements cannot be delayed completed or improved.

20. Learning materials  -
<table>
<thead>
<tr>
<th>1. Subject name</th>
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<tr>
<td>2. Subject name in Hungarian</td>
<td>Disszertáció készítése (1)</td>
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<td>7. Weekly contact hours</td>
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<td>10. Department</td>
<td>Department of Aeronautics, Naval Architecture and Railway Vehicles</td>
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<td>11. Responsible lecturer</td>
<td>Dr. Rohács Dániel</td>
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<td>12. Lecturers</td>
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<td>15. Description of practices</td>
<td>Formulation of the main theses of the doctoral research, preparation of the draft of the dissertation.</td>
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<td>16. Description of laboratory practices</td>
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<td>17. Learning outcomes</td>
<td>a) Knowledge and Ability:</td>
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<tr>
<td></td>
<td>- The student is able to document, organize and present research results with scientific excellence.</td>
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<tr>
<td>18. Requirements, way to determine a grade (obtain a signature)</td>
<td>The student's supervisor evaluates his / her half-year performance with a midterm grade. Excellent: Theses and publications are organized together, the table of content is ready; good: the theses have been formulated, publications based on theses are appropriate, the table of contents is ready; satisfactory: publications based on theses are appropriate, theses are formulated; pass: publications based on theses are appropriate.</td>
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<td>19. Retake and delayed completion</td>
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<td>20. Learning materials</td>
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1. Subject name: **Dissertation writing (2)**

2. Subject name in Hungarian: **Disszertáció készítése (2)**

3. Role: Mandatory

4. Code: BMEKOALD172

5. Evaluation type: m

6. Credits: 10

7. Weekly contact hours: 0 lecture, 10 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 300 hours

<table>
<thead>
<tr>
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<th>Preparation for seminars</th>
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<th>Midterm preparation</th>
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10. Department: Department of Material Handling and Logistics Systems

11. Responsible lecturer: Dr. Bóna Krisztián

12. Lecturers: Dr. Bóna Krisztián

13. Prerequisites: Dissertation writing (1) (BMEKOALD171), strong; - (-), -; - (-), -

14. Description of lectures

15. Description of practices

Preparing a doctoral thesis for the internal defense.

16. Description of laboratory practices

17. Learning outcomes

a) Knowledge and Ability:
   - The student is able to document, organize and present research results with scientific excellence.

18. Requirements, way to determine a grade (obtain a signature)


19. Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

20. Learning materials
### Subject description

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<tbody>
<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Szalay Zsolt</td>
</tr>
<tr>
<td>12. Lecturers</td>
<td>Dr. Szalay Zsolt</td>
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| 13. Prerequisites | Dissertation writing (1) (BMEKOGGD171), strong; \( \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot 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Subject description

1. Subject name | Dissertation writing (2)
2. Subject name in Hungarian | Disszertáció készítése (2)
3. Role | Mandatory
4. Code | BMEKOJSD172
5. Evaluation type | m
6. Credits | 10
7. Weekly contact hours | 0 lecture | 10 practice | 0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 300 hours
   | Contact hours | 140 hours | Preparation for seminars | 160 hours | Homework | 0 hours
   | Reading written materials | 0 hours | Midterm preparation | 0 hours | Exam preparation | 0 hours
10. Department | Department of Vehicle Elements and Vehicle-Structure Analysis
11. Responsible lecturer | Dr. Lovas László
12. Lecturers | Dr. Lovas László
13. Prerequisites | Dissertation writing (1) (BMEKOJSD171), strong; z (.), z
14. Description of lectures
15. Description of practices
   Preparing a doctoral thesis for the internal defense.
16. Description of laboratory practices
17. Learning outcomes
   a) Knowledge and Ability:
      – The student is able to document, organize and present research results with scientific excellence.
18. Requirements, way to determine a grade (obtain a signature)
19. Retake and delayed completion
   The semester requirements cannot be delayed completed or improved.
20. Learning materials
## Subject description

1. **Subject name**  
   **Dissertation writing (2)**

2. **Subject name in Hungarian**  
   Disszertáció készítése (2)

3. **Role**  
   Mandatory

4. **Code**  
   BMEKOKAD172

5. **Evaluation type**  
   m

6. **Credits**  
   10

7. **Weekly contact hours**  
   0 lecture, 10 practice, 0 lab

8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   **300 hours**

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<th>140 hours</th>
<th>Preparation for seminars</th>
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<td>Exam preparation</td>
<td>0 hours</td>
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10. **Department**  
   Department of Control for Transportation and Vehicle Systems

11. **Responsible lecturer**  
   Dr. Gáspár Péter

12. **Lecturers**  
   Dr. Gáspár Péter

13. **Prerequisites**  
   Dissertation writing (1) (BMEKOKAD171), strong:
   - (~), ~

14. **Description of lectures**  
   -

15. **Description of practices**  
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16. **Description of laboratory practices**  
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17. **Learning outcomes**  
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18. **Requirements, way to determine a grade (obtain a signature)**  

19. **Retake and delayed completion**  
   The semester requirements cannot be delayed completed or improved.

20. **Learning materials**  
   -
1. Subject name: Dissertation writing (2)

3. Role: Mandatory

5. Evaluation type: m

6. Credits: 10

7. Weekly contact hours: 0 lecture, 10 practice, 0 lab

9. Working hours for fulfilling the requirements of the subject: 300 hours

Contact hours: 140 hours
Preparation for seminars: 160 hours
Reading written materials: 0 hours
Midterm preparation: 0 hours
Homework: 0 hours
Exam preparation: 0 hours

10. Department: Department of Transport Technology and Economics

11. Responsible lecturer: Dr. Tóth János

12. Lecturers: Dr. Tóth János

13. Prerequisites: Dissertation writing (1) (BMEKOKKD171), strong; - (-), -;
- (-), -

14. Description of lectures:

15. Description of practices:
Preparing a doctoral thesis for the internal defense.

16. Description of laboratory practices:

17. Learning outcomes:
a) Knowledge and Ability:
   - The student is able to document, organize and present research results with scientific excellence.

18. Requirements, way to determine a grade (obtain a signature):

19. Retake and delayed completion:
The semester requirements cannot be delayed completed or improved.

20. Learning materials:
-
### Subject description

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#### Working hours for fulfilling the requirements of the subject

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#### Working hours

- Contact hours: 140 hours
- Preparation for seminars: 160 hours
- Homework: 0 hours
- Research written materials: 0 hours
- Midterm preparation: 0 hours
- Exam preparation: 0 hours

### Department

Department of Aeronautics, Naval Architecture and Railway Vehicles

### Responsible lecturer

Dr. Rohács Dániel

### Lecturers

Dr. Rohács Dániel

### Prerequisites

Dissertation writing (1) (BMEKOVRD171), strong;

### Description of lectures

- 

### Description of practices

Preparing a doctoral thesis for the internal defense.

### Description of laboratory practices

- 

### Learning outcomes

a) Knowledge and Ability:

- The student is able to document, organize and present research results with scientific excellence.

### Requirements, way to determine a grade (obtain a signature)


### Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

### Learning materials

- 

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Subject description

1. Subject name  
**Dissertation writing (3)**

2. Subject name in Hungarian  
Disszertáció készítése (3)

3. Role  
Mandatory

4. Code  
BMEKOGGD173

5. Evaluation type  
m

6. Credits  
10

7. Weekly contact hours  
0 lecture  10 practice  0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
300 hours

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10. Department  
Department of Automotive Technologies

11. Responsible lecturer  
Dr. Szalay Zsolt

12. Lecturers  
Dr. Szalay Zsolt

13. Prerequisites  
Dissertation writing (2) (BMEKOGGD172), strong; 

14. Description of lectures  
-

15. Description of practices  
Preparing a doctoral thesis for public defense.

16. Description of laboratory practices  
-

17. Learning outcomes  
a) Knowledge and Ability:  
   - The student is able to document, organize and present research results with scientific excellence.

18. Requirements, way to determine a grade (obtain a signature)  

19. Retake and delayed completion  
The semester requirements cannot be delayed completed or improved.

20. Learning materials  
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### Subject description

**1. Subject name**  
Dissertation writing (3)

**2. Subject name in Hungarian**  
Disszertáció készítése (3)

**3. Role**  
Mandatory

**4. Code**  
BMEKOKAD173

**5. Evaluation type**  
m

**6. Credits**  
10

**7. Weekly contact hours**  
0 lecture  |  10 practice  |  0 lab

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**  
300 hours

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<td>140 hours</td>
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**10. Department**  
Department of Control for Transportation and Vehicle Systems

**11. Responsible lecturer**  
Dr. Gáspár Péter

**12. Lecturers**  
Dr. Gáspár Péter

**13. Prerequisites**  
Dissertation writing (2) (BMEKOKAD172), strong: - (•), -

**14. Description of lectures**

- 

**15. Description of practices**

Preparing a doctoral thesis for public defense.

**16. Description of laboratory practices**

- 

**17. Learning outcomes**

a) Knowledge and Ability:
   - The student is able to document, organize and present research results with scientific excellence.

**18. Requirements, way to determine a grade (obtain a signature)**


**19. Retake and delayed completion**

The semester requirements cannot be delayed completed or improved.

**20. Learning materials**

- 


### Subject description

1. **Subject name**  
   **Dissertation writing (3)**

2. **Subject name in Hungarian**  
   Disszertáció készítése (3)

3. **Role**  
   Mandatory

4. **Code**  
   BMEKOKKD173

5. **Evaluation type**  
   m

6. **Credits**  
   10

7. **Weekly contact hours**  
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8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   **300 hours**

<table>
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<th>Reading written materials</th>
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<td>160 hours</td>
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10. **Department**  
    Department of Transport Technology and Economics

11. **Responsible lecturer**  
    Dr. Tóth János

12. **Lecturers**  
    Dr. Tóth János

13. **Prerequisites**  
    Dissertation writing (2) (BMEKOKKD172), strong;
    “(1), “;
    “(2), “.

14. **Description of lectures**

15. **Description of practices**

   Preparing a doctoral thesis for public defense.

16. **Description of laboratory practices**

17. **Learning outcomes**
   a) Knowledge and Ability:
   - The student is able to document, organize and present research results with scientific excellence.

18. **Requirements, way to determine a grade (obtain a signature)**


19. **Retake and delayed completion**

   The semester requirements cannot be delayed completed or improved.

20. **Learning materials**

-
Subject description

1. Subject name  
**Dissertation writing (3)**

2. Subject name in Hungarian  
Disszertáció készítése (3)

3. Role  
Mandatory

4. Code  
BMEKOVRD173

5. Evaluation type  
m

6. Credits  
10

7. Weekly contact hours  
0 lecture 10 practice 0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
300 hours

- Contact hours  
140 hours

- Preparation for seminars  
160 hours

- Reading written materials  
0 hours

- Midterm preparation  
0 hours

- Homework  
0 hours

- Exam preparation  
0 hours

10. Department  
Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer  
Dr. Rohács Dániel

12. Lecturers  
Dr. Rohács Dániel

13. Prerequisites  
Dissertation writing (2) (BMEKOVRD172), strong;

- (-), -;

- (-), -

14. Description of lectures  

- 

15. Description of practices  
Preparing a doctoral thesis for public defense.

16. Description of laboratory practices  

- 

17. Learning outcomes  
a) Knowledge and Ability:

- The student is able to document, organize and present research results with scientific excellence.

18. Requirements, way to determine a grade (obtain a signature)  

19. Retake and delayed completion  
The semester requirements cannot be delayed completed or improved.

20. Learning materials  

-
1. Subject name: Publication activity (1)

2. Subject name in Hungarian: Publikációs tevékenység (1)

3. Role: Mandatory

4. Code: BMEKODHD161

5. Evaluation type: m

6. Credits: 5

7. Weekly contact hours: 0 lecture, 5 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 150 hours

   Contact hours: 70 hours
   Preparation for seminars: 80 hours
   Midterm preparation: 0 hours
   Homework: 0 hours
   Reading written materials: 0 hours
   Exam preparation: 0 hours

10. Department: Dean's Office

11. Responsible lecturer: Dr. Török Ádám

12. Lecturers: Dr. Török Ádám

13. Prerequisites: - (-), -; - (-), -; - (-), -

14. Description of lectures

15. Description of practices

   Fulfillment of the expected publication performance level of the entire scientific life-work related to the doctoral research.

16. Description of laboratory practices

17. Learning outcomes

   a) Knowledge and Ability:
   - The student is able to judge the publication capability of the research results and search for a suitable publication platform, and can compile the publication according to the publication requirements.

18. Requirements, way to determine a grade (obtain a signature)

   Half of the submitted but pending publications can be counted, except for the WoS IF articles, they are only counted on the accepted article!
   Based on the MTA MTO publication point system, at least 0.3 (0.6 for the modified system) score: 5 (excellent)
   Based on the MTA MTO publication point system, at least 0.2 (0.4 - in the case of a modified system) score: 4 (good)
   Based on the MTA MTO publication point system, at least 0.1 (0.2 - for a modified system) score: 3 (satisfactory)
   Based on the MTA MTO publication point system, at least 0.05 (0.1 for a modified system) score: 2 (good)

19. Retake and delayed completion

   The semester requirements cannot be delayed completed or improved.

20. Learning materials

   -
### Subject description

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<td>Dr. Török Ádám</td>
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<table>
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<th>15. Description of practices</th>
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Fulfillment of the expected publication performance level of the entire scientific life-work related to the doctoral research.

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<th>17. Learning outcomes</th>
<th>a) Knowledge and Ability:</th>
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<tbody>
<tr>
<td></td>
<td>The student is able to judge the publication capability of the research results and search for a suitable publication platform, and can compile the publication according to the publication requirements.</td>
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<thead>
<tr>
<th>18. Requirements, way to determine a grade (obtain a signature)</th>
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</table>

Half of the submitted but pending publications can be counted, except for the WoS IF articles, they are only counted on the accepted article!

Based on the MTA MTO publication point system, at least 0.3 (0.6 for the modified system) score: 5 (excellent)
Based on the MTA MTO publication point system, at least 0.2 (0.4 - in the case of a modified system) score: 4 (goog)
Based on the MTA MTO publication point system, at least 0.1 (0.2 - for a modified system) score: 3 (satisfactory)
Based on the MTA MTO publication point system, at least 0.05 (0.1 for a modified system) score: 2 (good)

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<th>19. Retake and delayed completion</th>
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The semester requirements cannot be delayed completed or improved.

<table>
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<th>20. Learning materials</th>
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### Subject description

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|---------|-------------|-------------------|---|----------|----|

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<th>10. Department</th>
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<thead>
<tr>
<th>15. Description of practices</th>
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<tr>
<th>16. Description of laboratory practices</th>
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<table>
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<tr>
<th>17. Learning outcomes</th>
<th>a) Knowledge and Ability:</th>
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<tbody>
<tr>
<td>The student is able to judge the publication capability of the research results and search for a suitable publication platform, and can compile the publication according to the publication requirements.</td>
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</table>

<table>
<thead>
<tr>
<th>18. Requirements, way to determine a grade (obtain a signature)</th>
<th>Half of the submitted but pending publications can be counted, except for the WoS IF articles, they are only counted on the accepted article!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on the MTA MTO publication point system, at least 0.3 (0.6 for the modified system) score: 5 (excellent)</td>
<td>Based on the MTA MTO publication point system, at least 0.2 (0.4 in the case of a modified system) score: 4 (good)</td>
</tr>
<tr>
<td>Based on the MTA MTO publication point system, at least 0.1 (0.2 for a modified system) score: 3 (satisfactory)</td>
<td>Based on the MTA MTO publication point system, at least 0.05 (0.1 for a modified system) score: 2 (good)</td>
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<table>
<thead>
<tr>
<th>19. Retake and delayed completion</th>
<th>The semester requirements cannot be delayed completed or improved.</th>
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<table>
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<tr>
<th>20. Learning materials</th>
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</table>
Subject description

1. Subject name: Publication activity (4)

2. Subject name in Hungarian: Publikációs tevékenység (4)

3. Role: Mandatory

4. Code: BMEKODHD164

5. Evaluation type: m

6. Credits: 20

7. Weekly contact hours: 0 lecture, 20 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 600 hours

   Contact hours: 280 hours
   Preparation for seminars: 320 hours
   Homework: 0 hours
   Reading written materials: 0 hours
   Midterm preparation: 0 hours
   Exam preparation: 0 hours

10. Department: Dean's Office

11. Responsible lecturer: Dr. Török Ádám

12. Lecturers: Dr. Török Ádám

13. Prerequisites: Publication activity (3) (BMEKODHD163), strong;

14. Description of lectures:

15. Description of practices:

Fulfillment of the expected publication performance level of the entire scientific life-work related to the doctoral research.

16. Description of laboratory practices:

17. Learning outcomes:

a) Knowledge and Ability:
   - The student is able to judge the publication capability of the research results and search for a suitable publication platform, and can compile the publication according to the publication requirements.

18. Requirements, way to determine a grade (obtain a signature):

Half of the submitted but pending publications can be counted, except for the WoS IF articles, they are only counted on the accepted article!

Based on the MTA MTO publication point system, at least 0.3 (0.6 for the modified system) score: 5 (excellent)
Based on the MTA MTO publication point system, at least 0.2 (0.4 - in the case of a modified system) score: 4 (good)
Based on the MTA MTO publication point system, at least 0.1 (0.2 - for a modified system) score: 3 (satisfactory)
Based on the MTA MTO publication point system, at least 0.05 (0.1 for a modified system) score: 2 (good)

19. Retake and delayed completion:

The semester requirements cannot be delayed completed or improved.

20. Learning materials:

-
### 1. Subject name  
**Publication activity (5)**

### 2. Subject name in Hungarian  
Publikációs tevékenység (5)

### 3. Role  
Mandatory

### 4. Code  
BMEKODHD165

### 5. Evaluation type  
m

### 6. Credits  
20

### 7. Weekly contact hours  
0 lecture 20 practice 0 lab

### 8. Curriculum  
D

### 9. Working hours for fulfilling the requirements of the subject  
600 hours

<table>
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<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Midterm preparation</th>
<th>Homework</th>
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<tbody>
<tr>
<td>280 hours</td>
<td>320 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
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### 10. Department  
Dean's Office

### 11. Responsible lecturer  
Dr. Török Ádám

### 12. Lecturers  
Dr. Török Ádám

### 13. Prerequisites  
Publication activity (4) (BMEKODHD164), strong:
- 
- 
- 

### 14. Description of lectures  
-

### 15. Description of practices  
Fulfillment of the expected publication performance level of the entire scientific life-work related to the doctoral research.

### 16. Description of laboratory practices  
-

### 17. Learning outcomes  
a) Knowledge and Ability:
   - The student is able to judge the publication capability of the research results and search for a suitable publication platform, and can compile the publication according to the publication requirements.

### 18. Requirements, way to determine a grade (obtain a signature)  
Half of the submitted but pending publications can be counted, except for the WoS IF articles, they are only counted on the accepted article!

Based on the MTA MTO publication point system, at least 0.3 (0.6 for the modified system) score: 5 (excellent)

Based on the MTA MTO publication point system, at least 0.2 (0.4 in the case of a modified system) score: 4 (good)

Based on the MTA MTO publication point system, at least 0.1 (0.2 for a modified system) score: 3 (satisfactory)

Based on the MTA MTO publication point system, at least 0.05 (0.1 for a modified system) score: 2 (good)

### 19. Retake and delayed completion  
The semester requirements cannot be delayed completed or improved.

### 20. Learning materials  
-
# Subject Description

## 1. Subject name
**Teaching activity (1)**

## 2. Subject name in Hungarian
Oktatási tevékenység (1)

## 3. Role
Mandatory

## 4. Code
BMEKOALD131

## 5. Evaluation type
m

## 6. Credits
6

## 7. Weekly contact hours
- 0 lecture
- 6 practice
- 0 lab

## 8. Curriculum
D

## 9. Working hours for fulfilling the requirements of the subject
- **Contact hours** 84 hours
- **Preparation for seminars** 96 hours
- **Homework** 0 hours

## 10. Department
Department of Material Handling and Logistics Systems

## 11. Responsible lecturer
Dr. Bóna Krisztián

## 12. Lecturers
Dr. Bóna Krisztián

## 13. Prerequisites
- (-), -;
- (-), -;
- (-), -;

## 14. Description of lectures

## 15. Description of practices
Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

## 16. Description of laboratory practices

## 17. Learning outcomes

### a) Knowledge and Ability:
- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

## 18. Requirements, way to determine a grade (obtain a signature)
The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

## 19. Retake and delayed completion
The semester requirements cannot be delayed completed or improved.

## 20. Learning materials
1. Subject name: Teaching activity (1)

2. Subject name in Hungarian: Oktatási tevékenység (1)

3. Role: Mandatory

4. Code: BMEKOGGD131

5. Evaluation type: m

6. Credits: 6

7. Weekly contact hours: 0 lecture, 6 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 180 hours

   Contact hours: 84 hours
   Preparation for seminars: 96 hours
   Homework: 0 hours
   Reading written materials: 0 hours
   Midterm preparation: 0 hours
   Exam preparation: 0 hours

10. Department: Department of Automotive Technologies

11. Responsible lecturer: Dr. Szalay Zsolt

12. Lecturers: Dr. Szalay Zsolt

13. Prerequisites: -

14. Description of lectures

15. Description of practices

   Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. Description of laboratory practices

17. Learning outcomes
a) Knowledge and Ability:
   – Through participating in the teaching activity of the department, both the student’s lecturer skills and educational methodological experiences will develop.

18. Requirements, way to determine a grade (obtain a signature)

   The supervisor evaluates the student’s semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion

   The semester requirements cannot be delayed completed or improved.

20. Learning materials
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| 13. Prerequisites | - |

| 14. Description of lectures | - |

| 15. Description of practices | Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures. |

| 16. Description of laboratory practices | - |

| 17. Learning outcomes | a) Knowledge and Ability: 
  Through participating in the teaching activity of the department, both the student's lecture skills and educational methodological experiences will develop. |

| 18. Requirements, way to determine a grade (obtain a signature) | The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans. |

| 19. Retake and delayed completion | The semester requirements cannot be delayed completed or improved. |

| 20. Learning materials | - |
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<th>15. Description of practices</th>
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<tr>
<th>20. Learning materials</th>
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1. **Subject name**  
Teaching activity (1)

2. **Subject name in Hungarian**  
Oktatási tevékenység (1)

3. **Role**  
Mandatory

4. **Code**  
BMEKOKKD131

5. **Evaluation type**  
m

6. **Credits**  
6

7. **Weekly contact hours**  
0 lecture  
6 practice  
0 lab

8. **Curriculum**  
D

9. **Working hours for fulfilling the requirements of the subject**  
180 hours

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<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>84 hours</td>
<td>96 hours</td>
<td>0 hours</td>
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10. **Department**  
Department of Transport Technology and Economics

11. **Responsible lecturer**  
Dr. Tóth János

12. **Lecturers**  
Dr. Tóth János

13. **Prerequisites**  
- 

14. **Description of lectures**

- 

15. **Description of practices**

Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. **Description of laboratory practices**

- 

17. **Learning outcomes**

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- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. **Requirements, way to determine a grade (obtain a signature)**

The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. **Retake and delayed completion**

The semester requirements cannot be delayed completed or improved.

20. **Learning materials**

-
Subject description

1. Subject name | Teaching activity (1)
2. Subject name in Hungarian | Oktatási tevékenység (1)
3. Role | Mandatory
4. Code | BMEKOVRD131
5. Evaluation type | m
6. Credits | 6
7. Weekly contact hours | 0 lecture 6 practice 0 lab
8. Curriculum | D

9. Working hours for fulfilling the requirements of the subject | 180 hours
| Contact hours | 84 hours | Preparation for seminars | 96 hours | Homework | 0 hours
| Reading written materials | 0 hours | Midterm preparation | 0 hours | Exam preparation | 0 hours

10. Department | Department of Aeronautics, Naval Architecture and Railway Vehicles
11. Responsible lecturer | Dr. Rohács Dániel
12. Lecturers | Dr. Rohács Dániel

13. Prerequisites | -
- (-), -;
- (-), -;
- (-), -;

14. Description of lectures |

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| 13. Prerequisites | Teaching activity (1) (BMEKOJSD131), strong; |
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| 14. Description of lectures | |

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| 20. Learning materials | |


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| 12. Lecturers | Dr. Tóth János |

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<table>
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<th>18. Requirements, way to determine a grade (obtain a signature)</th>
<th>The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.</th>
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<tbody>
<tr>
<td>19. Retake and delayed completion</td>
<td>The semester requirements cannot be delayed completed or improved.</td>
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<td>20. Learning materials</td>
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</table>
### Subject description

1. Subject name | **Teaching activity (2)**

2. Subject name in Hungarian | Oktatási tevékenység (2)

3. Role | Mandatory

4. Code | BMEKOVRD132

5. Evaluation type | m

6. Credits | 6

7. Weekly contact hours | 0 lecture 6 practice 0 lab

8. Curriculum | D

9. Working hours for fulfilling the requirements of the subject | 180 hours

<table>
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<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
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<td>96 hours</td>
<td>0 hours</td>
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<td>0 hours</td>
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</table>

10. Department | Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer | Dr. Rohács Dániel

12. Lecturers | Dr. Rohács Dániel

13. Prerequisites | Teaching activity (1) (BMEKOVRD131), strong;

- (-), -;
- (-), -;

14. Description of lectures

- 

15. Description of practices

Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. Description of laboratory practices

- 

17. Learning outcomes

a) Knowledge and Ability:

- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. Requirements, way to determine a grade (obtain a signature)

The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

20. Learning materials

- 
### Subject Description

<table>
<thead>
<tr>
<th>1. Subject name</th>
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<tbody>
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<td>2. Subject name in Hungarian</td>
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<td>9. Working hours for fulfilling the requirements of the subject</td>
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<td>10. Department</td>
<td>Department of Material Handling and Logistics Systems</td>
</tr>
<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Bóna Krisztián</td>
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<td>12. Lecturers</td>
<td>Dr. Bóna Krisztián</td>
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**Teaching activity (3)**

**2. Subject name in Hungarian**  
Oktatási tevékenység (3)

**3. Role**  
Mandatory

**4. Code**  
BMEKOGGD133

**5. Evaluation type**  
m

**6. Credits**  
6

**7. Weekly contact hours**  
0 lecture 6 practice 0 lab

**8. Curriculum**  
D

**9. Working hours for fulfilling the requirements of the subject**  
180 hours

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<th>Contact hours</th>
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**10. Department**  
Department of Automotive Technologies

**11. Responsible lecturer**  
Dr. Szalay Zsolt

**12. Lecturers**  
Dr. Szalay Zsolt

**13. Prerequisites**  
Teaching activity (2) (BMEKOGGD132), strong;

**14. Description of lectures**  
-

**15. Description of practices**  
Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

**16. Description of laboratory practices**  
-

**17. Learning outcomes**  
a) Knowledge and Ability:
   – Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

**18. Requirements, way to determine a grade (obtain a signature)**  
The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

**19. Retake and delayed completion**  
The semester requirements cannot be delayed completed or improved.

**20. Learning materials**  
-
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<td><strong>11. Responsible lecturer</strong></td>
<td>Dr. Lovas László</td>
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<td>Dr. Lovas László</td>
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<td><strong>18. Requirements, way to determine a grade (obtain a signature), opportunity for repeat/retake and delayed completion</strong></td>
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# Subject description

1. **Subject name**: Teaching activity (3)

2. **Subject name in Hungarian**: Oktatási tevékenység (3)

3. **Role**: Mandatory

4. **Code**: BMEKOKAD133

5. **Evaluation type**: m

6. **Credits**: 6

7. **Weekly contact hours**: 0 lecture 6 practice 0 lab

8. **Curriculum**: D

9. **Working hours for fulfilling the requirements of the subject**: 180 hours

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<tr>
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10. **Department**: Department of Control for Transportation and Vehicle Systems

11. **Responsible lecturer**: Dr. Gáspár Péter

12. **Lecturers**: Dr. Gáspár Péter

13. **Prerequisites**: Teaching activity (2) (BMEKOKAD132), strong; (-), (-);

14. **Description of lectures**

15. **Description of practices**

Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. **Description of laboratory practices**

17. **Learning outcomes**

a) Knowledge and Ability:

- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. **Requirements, way to determine a grade (obtain a signature), opportunity for repeat/retake and delayed completion**

The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans. The semester requirements cannot be delayed completed or improved.

19. **Learning materials**

- 

20. **Learning outcomes**

- 

21. **Requirements, way to determine a grade (obtain a signature)**

The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

22. **Retake and delayed completion**

The semester requirements cannot be delayed completed or improved.

23. **Learning materials**

-
### Subject description

1. **Subject name**  
   Teaching activity (3)

2. **Subject name in Hungarian**  
   Oktatási tevékenység (3)

3. **Role**  
   Mandatory

4. **Code**  
   BMEKOKKD133

5. **Evaluation type**  
   m

6. **Credits**  
   6

7. **Weekly contact hours**  
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8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
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10. **Department**  
    Department of Transport Technology and Economics

11. **Responsible lecturer**  
    Dr. Tóth János

12. **Lecturers**  
    Dr. Tóth János

13. **Prerequisites**  
    Teaching activity (2) (BMEKOKKD132), strong;
    - ( ), -;
    - ( ), -

14. **Description of lectures**  

15. **Description of practices**  
    Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. **Description of laboratory practices**  

17. **Learning outcomes**  
   a) Knowledge and Ability:
      - Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. **Requirements, way to determine a grade (obtain a signature)**  
    The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. **Retake and delayed completion**  
    The semester requirements cannot be delayed completed or improved.

20. **Learning materials**  

1. Subject name: Teaching activity (3)

2. Subject name in Hungarian: Oktatási tevékenység (3)

3. Role: Mandatory

4. Code: BMEKOVRD133

5. Evaluation type: m

6. Credits: 6

7. Weekly contact hours: 0 lecture, 6 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 180 hours

Contact hours: 84 hours
Preparation for seminars: 96 hours
Homework: 0 hours
Reading written materials: 0 hours
Midterm preparation: 0 hours
Exam preparation: 0 hours

10. Department: Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer: Dr. Rohács Dániel

12. Lecturers: Dr. Rohács Dániel

13. Prerequisites: Teaching activity (2) (BMEKOVRD132), strong; (-), -

14. Description of lectures:

15. Description of practices:
Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. Description of laboratory practices:

17. Learning outcomes:
a) Knowledge and Ability:
   - Through participating in the teaching activity of the department, both the student’s lecturer skills and educational methodological experiences will develop.

18. Requirements, way to determine a grade (obtain a signature):
The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion:
The semester requirements cannot be delayed completed or improved.

20. Learning materials:
# Subject description

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### Working hours for fulfilling the requirements of the subject

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<th>Exam preparation</th>
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<tr>
<td>12. Lecturers</td>
<td>Dr. Bóna Krisztián</td>
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</table>

13. Prerequisites

Teaching activity (3) (BMEKOALD133), strong;

- \(1\), \(2\);

14. Description of lectures

-  

15. Description of practices

Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. Description of laboratory practices

-  

17. Learning outcomes

a) Knowledge and Ability:

- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. Requirements, way to determine a grade (obtain a signature)

The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

20. Learning materials

-  
### Subject description

1. **Subject name**: Teaching activity (4)
2. **Subject name in Hungarian**: Oktatási tevékenység (4)
3. **Role**: Mandatory
4. **Code**: BMEKOGGD134
5. **Evaluation type**: m
6. **Credits**: 6
7. **Weekly contact hours**: 0 lecture, 6 practice, 0 lab
8. **Curriculum**: D
9. **Working hours for fulfilling the requirements of the subject**
   - **Contact hours**: 84 hours
   - **Preparation for seminars**: 96 hours
   - **Reading written materials**: 0 hours
   - **Midterm preparation**: 0 hours
   - **Homework**: 0 hours
   - **Exam preparation**: 0 hours
   - **Total**: 180 hours
10. **Department**: Department of Automotive Technologies
11. **Responsible lecturer**: Dr. Szalay Zsolt
12. **Lecturers**: Dr. Szalay Zsolt
13. **Prerequisites**: Teaching activity (3) (BMEKOGGD133), strong;
    - (-), -;
    - (-), -;
14. **Description of lectures**
    - 
15. **Description of practices**
    - Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.
16. **Description of laboratory practices**
    - 
17. **Learning outcomes**
   a) **Knowledge and Ability**;
      - Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.
18. **Requirements, way to determine a grade (obtain a signature)**
   - The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.
19. **Retake and delayed completion**
   - The semester requirements cannot be delayed completed or improved.
20. **Learning materials**
    -
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#### 9. Working hours for fulfilling the requirements of the subject

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#### 10. Department

Department of Vehicle Elements and Vehicle-Structure Analysis

#### 11. Responsible lecturer

Dr. Lovas László

#### 12. Lecturers

Dr. Lovas László

#### 13. Prerequisites

- Teaching activity (3) (BMEKOJSD133), strong;
- (-), -;
- (-), -;

#### 14. Description of lectures

- 

#### 15. Description of practices

Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

#### 16. Description of laboratory practices

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#### 17. Learning outcomes

a) Knowledge and Ability:

- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

#### 18. Requirements, way to determine a grade (obtain a signature)

The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

#### 19. Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

#### 20. Learning materials

-
Subject description

1. Subject name | Teaching activity (4)

2. Subject name in Hungarian | Oktatási tevékenység (4)

3. Role | Mandatory

4. Code | BMEKOKAD134

5. Evaluation type | m

6. Credits | 6

7. Weekly contact hours | 0 lecture, 6 practice, 0 lab

8. Curriculum | D

9. Working hours for fulfilling the requirements of the subject | 180 hours

| Contact hours | 84 hours |
| Preparation for seminars | 96 hours |
| Reading written materials | 0 hours |
| Midterm preparation | 0 hours |
| Homework | 0 hours |
| Exam preparation | 0 hours |

10. Department | Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer | Dr. Gáspár Péter

12. Lecturers | Dr. Gáspár Péter

13. Prerequisites | Teaching activity (3) (BMEKOKAD133), strong;
                   - (-), -;
                   - (-), -

14. Description of lectures

15. Description of practices

| Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

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17. Learning outcomes

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The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion

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20. Learning materials
Subject description

1. Subject name  
Teaching activity (4)

2. Subject name in Hungarian  
Oktatási tevékenység (4)

3. Role  
Mandatory

4. Code  
BMEKOKKD134

5. Evaluation type  
m

6. Credits  
6

7. Weekly contact hours  
0 lecture  6 practice  0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
180 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Midterm preparation</th>
<th>Homework</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>84 hours</td>
<td>96 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
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</tbody>
</table>

10. Department  
Department of Transport Technology and Economics

11. Responsible lecturer  
Dr. Tóth János

12. Lecture  
Dr. Tóth János

13. Prerequisites  
Teaching activity (3) (BMEKOKKD133), strong; · ·; · ·.· ··

14. Description of lectures  
-

15. Description of practices  
Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. Description of laboratory practices  
-

17. Learning outcomes  
a) Knowledge and Ability:
   – Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. Requirements, way to determine a grade (obtain a signature)  
The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion  
The semester requirements cannot be delayed completed or improved.

20. Learning materials  
-
# Subject description

1. **Subject name**  
   **Teaching activity (4)**

2. **Subject name in Hungarian**  
   Oktatási tevékenység (4)

3. **Role**  
   Mandatory

4. **Code**  
   BMEKOVRD134

5. **Evaluation type**  
   m

6. **Credits**  
   6

7. **Weekly contact hours**  
<table>
<thead>
<tr>
<th>Lecture</th>
<th>Practice</th>
<th>Lab</th>
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<tbody>
<tr>
<td>0 hours</td>
<td>6 hours</td>
<td>0 hours</td>
</tr>
</tbody>
</table>

8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   **180 hours**

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Exam preparation</th>
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</thead>
<tbody>
<tr>
<td>84 hours</td>
<td>96 hours</td>
<td>0 hours</td>
<td>0 hours</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Preparation for seminars</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 hours</td>
<td>0 hours</td>
<td>96 hours</td>
</tr>
</tbody>
</table>

10. **Department**  
   Department of Aeronautics, Naval Architecture and Railway Vehicles

11. **Responsible lecturer**  
   Dr. Rohács Dániel

12. **Lecturers**  
   Dr. Rohács Dániel

13. **Prerequisites**  
   Teaching activity (3) (BMEKOVRD133), strong;
   `- 0.0.5.0, 0.1.0, 0.1.0;

14. **Description of lectures**  
   -

15. **Description of practices**  
   Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. **Description of laboratory practices**  
   -

17. **Learning outcomes**  
   a) Knowledge and Ability:  
   – Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. **Requirements, way to determine a grade (obtain a signature)**  
   The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. **Retake and delayed completion**  
   The semester requirements cannot be delayed completed or improved.

20. **Learning materials**  
   -
<table>
<thead>
<tr>
<th>Subject name</th>
<th>Teaching activity (5)</th>
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</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Oktatási tevékenység (5)</td>
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<tr>
<td>3. Role</td>
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<tr>
<td>4. Code</td>
<td>BMEKOALD135</td>
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<tr>
<td>5. Evaluation type</td>
<td>m</td>
</tr>
<tr>
<td>6. Credits</td>
<td>4</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>0 lecture 4 practice 0 lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
</tbody>
</table>

9. Working hours for fulfilling the requirements of the subject | 120 hours |
| Contact hours | 56 hours |
| Preparation for seminars | 64 hours |
| Homework | 0 hours |
| Reading written materials | 0 hours |
| Midterm preparation | 0 hours |
| Exam preparation | 0 hours |

10. Department | Department of Material Handling and Logistics Systems |
11. Responsible lecturer | Dr. Bóna Krisztán |
12. Lecturers | Dr. Bóna Krisztán |

13. Prerequisites | Teaching activity (4) (BMEKOALD134), strong; - (1), -; - (2), - |

14. Description of lectures | - |
15. Description of practices | Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures. |
16. Description of laboratory practices | - |
17. Learning outcomes | - |

a) Knowledge and Ability:  
 Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop. |

18. Requirements, way to determine a grade (obtain a signature) | The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans. |

19. Retake and delayed completion | The semester requirements cannot be delayed completed or improved. |

20. Learning materials | - |
### Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Teaching activity (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Oktatási tevékenység (5)</td>
</tr>
<tr>
<td>3. Role</td>
<td>Mandatory</td>
</tr>
<tr>
<td>4. Code</td>
<td>BMEKOGGD135</td>
</tr>
<tr>
<td>5. Evaluation type</td>
<td>m</td>
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<tr>
<td>6. Credits</td>
<td>4</td>
</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>0 lecture 4 practice 0 lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>D</td>
</tr>
</tbody>
</table>

#### 9. Working hours for fulfilling the requirements of the subject

| Contact hours | 56 hours |
| Preparation for seminar | 64 hours |
| Reading written materials | 0 hours |
| Midterm preparation | 0 hours |
| Homework | 0 hours |

| 10. Department | Department of Automotive Technologies |
| 11. Responsible lecturer | Dr. Szalay Zsolt |
| 12. Lecturers | Dr. Szalay Zsolt |

| 13. Prerequisites | Teaching activity (4) (BMEKOGGD134), strong; |
| | ( ), ( ), ( ) |

#### 14. Description of lectures

- 

#### 15. Description of practices

Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignements, contributing to lectures.

#### 16. Description of laboratory practices

- 

#### 17. Learning outcomes

a) Knowledge and Ability:
- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

#### 18. Requirements, way to determine a grade (obtain a signature)

The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

#### 19. Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

#### 20. Learning materials

-
1. Subject name | **Teaching activity (5)**
---|---
2. Subject name in Hungarian | Oktatási tevékenység (5)
3. Role | Mandatory
4. Code | BMEKOJSD135
5. Evaluation type | m
6. Credits | 4
7. Weekly contact hours | 0 lecture 4 practice 0 lab
8. Curriculum | D

9. Working hours for fulfilling the requirements of the subject
---|---
Contact hours | 56 hours
Preparation for seminars | 64 hours
Homework | 0 hours
Reading written materials | 0 hours
Midterm preparation | 0 hours
Exam preparation | 0 hours

10. Department | Department of Vehicle Elements and Vehicle-Structure Analysis
11. Responsible lecturer | Dr. Lovas László
12. Lecturers | Dr. Lovas László

13. Prerequisites | Teaching activity (4) (BMEKOJSD134), strong;
- (-), -;
- (-), -

14. Description of lectures

15. Description of practices
Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. Description of laboratory practices

17. Learning outcomes
a) Knowledge and Ability:
- Through participating in the teaching activity of the department, both the student’s lecturer skills and educational methodological experiences will develop.

18. Requirements, way to determine a grade (obtain a signature)
The supervisor evaluates the student’s semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion
The semester requirements cannot be delayed completed or improved.

20. Learning materials

### Subject description

1. **Subject name**

   **Teaching activity (5)**

2. **Subject name in Hungarian**

   Oktatási tevékenység (5)

3. **Role**

   Mandatory

4. **Code**

   BMEKOKAD135

5. **Evaluation type**

   m

6. **Credits**

   4

7. **Weekly contact hours**

   - Lecture: 0
   - Practice: 4
   - Lab: 0

8. **Curriculum**

   D

9. **Working hours for fulfilling the requirements of the subject**

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Midterm preparation</th>
<th>Homework</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>56 hours</td>
<td>64 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
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</tbody>
</table>

10. **Department**

    Department of Control for Transportation and Vehicle Systems

11. **Responsible lecturer**

    Dr. Gáspár Péter

12. **Lecturers**

    Dr. Gáspár Péter

13. **Prerequisites**

    Teaching activity (4) (BMEKOKAD134), strong;
    - ( ), -;
    -( ), -

14. **Description of lectures**

    -

15. **Description of practices**

    Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. **Description of laboratory practices**

    -

17. **Learning outcomes**

    a) Knowledge and Ability:
    - Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. **Requirements, way to determine a grade (obtain a signature)**

    The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. **Retake and delayed completion**

    The semester requirements cannot be delayed completed or improved.

20. **Learning materials**

    -
### Subject description

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
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<td>Teaching activity (5)</td>
<td></td>
</tr>
<tr>
<td><strong>2. Subject name in Hungarian</strong></td>
<td>Oktatási tevékenység (5)</td>
<td></td>
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<tr>
<td><strong>3. Role</strong></td>
<td>Mandatory</td>
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<tr>
<td><strong>4. Code</strong></td>
<td>BMEKOKKD135</td>
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<td><strong>5. Evaluation type</strong></td>
<td>m</td>
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</tr>
<tr>
<td><strong>6. Credits</strong></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>7. Weekly contact hours</strong></td>
<td>0 lecture 4 practice 0 lab</td>
<td></td>
</tr>
<tr>
<td><strong>8. Curriculum</strong></td>
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</tbody>
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<th></th>
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<tbody>
<tr>
<td><strong>9. Working hours for fulfilling the requirements of the subject</strong></td>
<td>120 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Contact hours</strong></td>
<td>56 hours</td>
<td></td>
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<tr>
<td><strong>Preparation for seminars</strong></td>
<td>64 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Homework</strong></td>
<td>0 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Reading written materials</strong></td>
<td>0 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Midterm preparation</strong></td>
<td>0 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Exam preparation</strong></td>
<td>0 hours</td>
<td></td>
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<p>| | | |</p>
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<tr>
<th></th>
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<tbody>
<tr>
<td><strong>10. Department</strong></td>
<td>Department of Transport Technology and Economics</td>
<td></td>
</tr>
<tr>
<td><strong>11. Responsible lecturer</strong></td>
<td>Dr. Tóth János</td>
<td></td>
</tr>
<tr>
<td><strong>12. Lecturers</strong></td>
<td>Dr. Tóth János</td>
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<thead>
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<th></th>
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<tbody>
<tr>
<td><strong>13. Prerequisites</strong></td>
<td>Teaching activity (4) (BMEKOKKD134), strong; · (·), ·; · (·), ·</td>
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<thead>
<tr>
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<tbody>
<tr>
<td><strong>14. Description of lectures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15. Description of practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignements, contributing to lectures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>16. Description of laboratory practices</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
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<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>17. Learning outcomes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>a) Knowledge and Ability:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.</td>
<td></td>
<td></td>
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<tbody>
<tr>
<td><strong>18. Requirements, way to determine a grade (obtain a signature)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19. Retake and delayed completion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The semester requirements cannot be delayed completed or improved.</td>
<td></td>
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<tr>
<td><strong>20. Learning materials</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
Subject description

1. Subject name  
Teaching activity (5)

2. Subject name in Hungarian  
Oktatási tevékenység (5)

3. Role  
Mandatory

4. Code  
BMEKOVRD135

5. Evaluation type  
m

6. Credits  
4

7. Weekly contact hours  
0 lecture  
4 practice  
0 lab

8. Curriculum  
D

9. Working hours for fulfilling the requirements of the subject  
120 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Midterm preparation</th>
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<tbody>
<tr>
<td>56 hours</td>
<td>64 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
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</tbody>
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10. Department  
Department of Aeronautics, Naval Architecture and Railway Vehicles

11. Responsible lecturer  
Dr. Rohács Dániel

12. Lecturers  
Dr. Rohács Dániel

13. Prerequisites  
Teaching activity (4) (BMEKOVRD134), strong;
- ( ), -;
- ( ), -

14. Description of lectures

15. Description of practices
Holding practical classes and laboratory practices, supervising and evaluating midterm exams and written exams, consulting and evaluating lab tasks and other home assignments, contributing to lectures.

16. Description of laboratory practices

17. Learning outcomes
a) Knowledge and Ability:
- Through participating in the teaching activity of the department, both the student's lecturer skills and educational methodological experiences will develop.

18. Requirements, way to determine a grade (obtain a signature)
The supervisor evaluates the student's semester education activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion
The semester requirements cannot be delayed completed or improved.

20. Learning materials
### Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Research progress report (1)</th>
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<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Kutatási előrehaladási jelentés (1)</td>
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<tr>
<td>3. Role</td>
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<td>4. Code</td>
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<td>5. Evaluation type</td>
<td>m</td>
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<td>6. Credits</td>
<td>5</td>
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<tr>
<td>7. Weekly contact hours</td>
<td>0 lecture 5 practice 0 lab</td>
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<th>9. Working hours for fulfilling the requirements of the subject</th>
<th>150 hours</th>
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<tbody>
<tr>
<td>Contact hours</td>
<td>70 hours</td>
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<tr>
<td>Preparation for seminars</td>
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<tr>
<td>Homework</td>
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<td>Reading written materials</td>
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<td>Midterm preparation</td>
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<tr>
<td>Exam preparation</td>
<td>0 hours</td>
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<table>
<thead>
<tr>
<th>10. Department</th>
<th>Dean's Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Török Ádám</td>
</tr>
<tr>
<td>12. Lecturers</td>
<td>Dr. Török Ádám</td>
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<table>
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<th>13. Prerequisites</th>
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<table>
<thead>
<tr>
<th>14. Description of lectures</th>
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<tbody>
<tr>
<td>15. Description of practices</td>
<td>Demonstration of the scientific results of the given period of the doctoral research and of all previous results.</td>
</tr>
<tr>
<td>16. Description of laboratory practices</td>
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<table>
<thead>
<tr>
<th>17. Learning outcomes</th>
<th>a) Knowledge and Ability:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>The student will be able to assess the progress of its research according to the general research plan, document the progress and adjust the previously defined research plan.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>18. Requirements, way to determine a grade (obtain a signature)</th>
<th>The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Retake and delayed completion</td>
<td>The semester requirements cannot be delayed completed or improved.</td>
</tr>
<tr>
<td>20. Learning materials</td>
<td>-</td>
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</tbody>
</table>
Subject description

1. **Subject name**  
**Research progress report (2)**

2. **Subject name in Hungarian**  
Kutatási előrehaladási jelentés (2)

3. **Role**  
Mandatory

4. **Code**  
BMEKODHD142

5. **Evaluation type**  
m

6. **Credits**  
5

7. **Weekly contact hours**  
0 lecture  
5 practice  
0 lab

8. **Curriculum**  
D

9. **Working hours for fulfilling the requirements of the subject**  
150 hours

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
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<tbody>
<tr>
<td>70 hours</td>
<td>80 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
</tr>
</tbody>
</table>

10. **Department**  
Dean's Office

11. **Responsible lecturer**  
Dr. Török Ádám

12. **Lecturers**  
Dr. Török Ádám

13. **Prerequisites**  
Research progress report (1) (BMEKODHD141), strong;
- (-), -;
- (-), -

14. **Description of lectures**

- 

15. **Description of practices**

Demonstration of the scientific results of the given period of the doctoral research and of all previous results.

16. **Description of laboratory practices**

- 

17. **Learning outcomes**

a) Knowledge and Ability:
   - The student will be able to assess the progress of its research according to the general research plan, document the progress and adjust the previously defined research plan.

18. **Requirements, way to determine a grade (obtain a signature)**

The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.

19. **Retake and delayed completion**

The semester requirements cannot be delayed completed or improved.

19. **Learning materials**

-
1. Subject name: **Research progress report (3)**

2. Subject name in Hungarian: **Kutatási előrehaladási jelentés (3)**

3. Role: Mandatory

4. Code: BMEKODHD143

5. Evaluation type: m

6. Credits: 5

7. Weekly contact hours: 0 lecture, 5 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 150 hours

   - Contact hours: 70 hours
   - Preparation for seminars: 80 hours
   - Midterm preparation: 0 hours
   - Homework: 0 hours

10. Department: Dean's Office

11. Responsible lecturer: Dr. Török Ádám

12. Lecturers: Dr. Török Ádám

13. Prerequisites: Research progress report (2) (BMEKODHD142), strong; - (-), -;

14. Description of lectures

15. Description of practices

Demonstration of the scientific results of the given period of the doctoral research and of all previous results.

16. Description of laboratory practices

17. Learning outcomes

   a) Knowledge and Ability:

   - The student will be able to assess the progress of its research according to the general research plan, document the progress and adjust the previously defined research plan.

18. Requirements, way to determine a grade (obtain a signature)

The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.

19. Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

20. Learning materials
1. **Subject name**  
   **Research progress report (4)**

2. **Subject name in Hungarian**  
   Kutatási előrehaladási jelentés (4)

3. **Role**  
   Mandatory

4. **Code**  
   BMEKODHD144

5. **Evaluation type**  
   m

6. **Credits**  
   5

7. **Weekly contact hours**  
   - Lecture: 0
   - Practice: 5
   - Lab: 0

9. **Working hours for fulfilling the requirements of the subject**  
   **150 hours**
   - Contact hours: 70 hours
   - Preparation for seminar: 80 hours
   - Midterm preparation: 0 hours
   - Homework: 0 hours

10. **Department**  
    Dean's Office

11. **Responsible lecturer**  
    Dr. Török Ádám

12. **Lecturers**  
    Dr. Török Ádám

13. **Prerequisites**  
    Research progress report (3) (BMEKODHD143), strong;
    - (-), -;
    - (-), -;

14. **Description of lectures**  
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15. **Description of practices**  
    Demonstration of the scientific results of the given period of the doctoral research and of all previous results.

16. **Description of laboratory practices**  
    -

17. **Learning outcomes**  
   a) Knowledge and Ability:
      - The student will be able to assess the progress of its research according to the general research plan, document the progress and adjust the previously defined research plan.

18. **Requirements, way to determine a grade (obtain a signature)**  
    The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.

19. **Retake and delayed completion**  
    The semester requirements cannot be delayed completed or improved.

20. **Learning materials**  
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## Subject description

**1. Subject name**
Research progress report (5)

**2. Subject name in Hungarian**
Kutatási előrehaladási jelentés (5)

**3. Role**
Mandatory

**4. Code**
BMEKODHD145

**5. Evaluation type**
m

**6. Credits**
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**7. Weekly contact hours**

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**8. Curriculum**
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**9. Working hours for fulfilling the requirements of the subject**

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<td>Preparation for seminars</td>
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**10. Department**
Dean's Office

**11. Responsible lecturer**
Dr. Török Ádám

**12. Lecturers**
Dr. Török Ádám

**13. Prerequisites**
Research progress report (4) (BMEKODHD144), strong;

- ( ), -;
- ( ), -

**14. Description of lectures**

- 

**15. Description of practices**
Demonstration of the scientific results of the given period of the doctoral research and of all previous results.

**16. Description of laboratory practices**

- 

**17. Learning outcomes**

a) Knowledge and Ability:
   
   - The student will be able to assess the progress of its research according to the general research plan, document the progress and adjust the previously defined research plan.

**18. Requirements, way to determine a grade (obtain a signature)**

The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.

**19. Retake and delayed completion**

The semester requirements cannot be delayed completed or improved.

**20. Learning materials**

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<td>17. Learning outcomes</td>
<td>a) Knowledge and Ability:</td>
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<tr>
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<td>The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.</td>
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<td>20. Learning materials</td>
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# Subject description

1. **Subject name**
   - **Research progress report (7)**

2. **Subject name in Hungarian**
   - Kutatási előrehaladási jelentés (7)

3. **Role**
   - Mandatory

4. **Code**
   - BMEKODHD147

5. **Evaluation type**
   - m

6. **Credits**
   - 5

7. **Weekly contact hours**
   - 0 lecture
   - 5 practice
   - 0 lab

8. **Curriculum**
   - D

9. **Working hours for fulfilling the requirements of the subject**
   - **Total:** 150 hours
     - **Contact hours:** 70 hours
     - **Preparation for seminars:** 80 hours
     - **Midterm preparation:** 0 hours
     - **Lab:** 0 hours

10. **Department**
    - Dean's Office

11. **Responsible lecturer**
    - Dr. Török Ádám

12. **Lecturers**
    - Dr. Török Ádám

13. **Prerequisites**
    - Research progress report (6) (BMEKODHD146), strong;
    - (-), -;
    - (-), -;

14. **Description of lectures**
    - 

15. **Description of practices**
    - Demonstration of the scientific results of the given period of the doctoral research and of all previous results.

16. **Description of laboratory practices**
    - 

17. **Learning outcomes**
    - a) Knowledge and Ability:
      - The student will be able to assess the progress of its research according to the general research plan, document the progress and adjust the previously defined research plan.

18. **Requirements, way to determine a grade (obtain a signature)**
    - The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.

19. **Retake and delayed completion**
    - The semester requirements cannot be delayed completed or improved.

20. **Learning materials**
    - 

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**BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS**

**Faculty of Transportation Engineering and Vehicle Engineering**

**PhD Programme**

**transportation.bme.hu**

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### Subject description

1. **Subject name**: Research progress report (8)

2. **Subject name in Hungarian**: Kutatási előrehaladási jelentés (8)

3. **Role**: Mandatory

4. **Code**: BMEKODHD148

5. **Evaluation type**: m

6. **Credits**: 5

7. **Weekly contact hours**: 0 lecture, 5 practice, 0 lab

8. **Curriculum**: D

9. **Working hours for fulfilling the requirements of the subject**: 150 hours

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<th>Contact hours</th>
<th>Preparation for seminars</th>
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10. **Department**: Dean's Office

11. **Responsible lecturer**: Dr. Török Ádám

12. **Lecturers**: Dr. Török Ádám

13. **Prerequisites**: Research progress report (7) (BMEKODHD147), strong;

14. **Description of lectures**

15. **Description of practices**

   Demonstration of the scientific results of the given period of the doctoral research and of all previous results.

16. **Description of laboratory practices**

17. **Learning outcomes**

   a) Knowledge and Ability:

   - The student will be able to assess the progress of its research according to the general research plan, document the progress and adjust the previously defined research plan.

18. **Requirements, way to determine a grade (obtain a signature)**

   The vice dean for scientific affairs evaluates the fulfillment of the reporting obligation set out in the Regulations of the Doctoral School by giving midterm grade.

19. **Retake and delayed completion**

   The semester requirements cannot be delayed completed or improved.

20. **Learning materials**
### Subject description

1. **Subject name**  
   **Individual research activity (1)**

2. **Subject name in Hungarian**  
   Önálló kutatási tevékenység (1)

3. **Role**  
   Mandatory

4. **Code**  
   BMEKOALD151

5. **Evaluation type**  
   m

6. **Credits**  
   10

7. **Weekly contact hours**  
   - lecture: 0
   - practice: 10
   - lab: 0

8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   **300 hours**

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10. **Department**  
   Department of Material Handling and Logistics Systems

11. **Responsible lecturer**  
   Dr. Bóna Krisztián

12. **Lecturers**  
   Dr. Bóna Krisztián

13. **Prerequisites**  
   - ( ), -
   - ( ), -
   - ( ), -

14. **Description of lectures**  
   -

15. **Description of practices**  
   Semester research activity agreed with the supervisor.

16. **Description of laboratory practices**  
   -

17. **Learning outcomes**  
   a) Knowledge and Ability:
   - The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.

18. **Requirements, way to determine a grade (obtain a signature)**  
   The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.

19. **Retake and delayed completion**  
   The semester requirements cannot be delayed completed or improved.

20. **Learning materials**  
   -
## Subject description

1. **Subject name**: Individual research activity (1)

2. **Subject name in Hungarian**: Önálló kutatási tevékenység (1)

3. **Role**: Mandatory

4. **Code**: BMEKOGGD151

5. **Evaluation type**: m

6. **Credits**: 10

7. **Weekly contact hours**: 0 lecture, 10 practice, 0 lab

8. **Curriculum**: D

9. **Working hours for fulfilling the requirements of the subject**: 300 hours

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10. **Department**: Department of Automotive Technologies

11. **Responsible lecturer**: Dr. Szalay Zsolt

12. **Lecturers**: Dr. Szalay Zsolt

13. **Prerequisites**: 
- 
- 
- 

14. **Description of lectures**:

15. **Description of practices**

Semester research activity agreed with the supervisor.

16. **Description of laboratory practices**:

17. **Learning outcomes**

a) Knowledge and Ability:

- The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.

18. **Requirements, way to determine a grade (obtain a signature)**

The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.

19. **Retake and delayed completion**

The semester requirements cannot be delayed completed or improved.

20. **Learning materials**
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<td><strong>10. Department</strong></td>
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### Subject description

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 Subject description

1. Subject name  **Individual research activity (1)**

2. Subject name in Hungarian  Önálló kutatási tevékenység (1)

3. Role  Mandatory

4. Code  BMEKOKKD151

5. Evaluation type  m

6. Credits  10

7. Weekly contact hours  
- lecture: 0 hours
- practice: 10 hours
- lab: 0 hours

8. Curriculum  D

9. Working hours for fulfilling the requirements of the subject

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>140 hours</td>
<td>160 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
<td>0 hours</td>
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</table>

10. Department  Department of Transport Technology and Economics

11. Responsible lecturer  Dr. Tóth János

12. Lecturers  Dr. Tóth János

13. Prerequisites  
- ( ), ( ];
- ( ), ( ];
- ( ), ( ];

14. Description of lectures

15. Description of practices

 Semester research activity agreed with the supervisor.

16. Description of laboratory practices

17. Learning outcomes

a) Knowledge and Ability:

- The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.

18. Requirements, way to determine a grade (obtain a signature)

 The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion

 The semester requirements cannot be delayed completed or improved.

20. Learning materials

-
1. **Subject name** | Individual research activity (1)  
2. **Subject name in Hungarian** | Önálló kutatási tevékenység (1)  
3. **Role** | Mandatory  
4. **Code** | BMEKOVRD151  
5. **Evaluation type** | m  
6. **Credits** | 10  
7. **Weekly contact hours** | 0 lecture, 10 practice, 0 lab  
8. **Curriculum** | D  
9. **Working hours for fulfilling the requirements of the subject** | 300 hours  
   | Contact hours | 140 hours  
   | Preparation for seminars | 160 hours  
   | Homework | 0 hours  
   | Reading written materials | 0 hours  
   | Midterm preparation | 0 hours  
   | Exam preparation | 0 hours  
10. **Department** | Department of Aeronautics, Naval Architecture and Railway Vehicles  
11. **Responsible lecturer** | Dr. Rohács Dániel  
12. **Lecturers** | Dr. Rohács Dániel  
13. **Prerequisites** | -  
14. **Description of lectures** | -  
15. **Description of practices** | Semester research activity agreed with the supervisor.  
16. **Description of laboratory practices** | -  
17. **Learning outcomes** | a) Knowledge and Ability:  
   – The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.  
18. **Requirements, way to determine a grade (obtain a signature)** | The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.  
19. **Retake and delayed completion** | The semester requirements cannot be delayed completed or improved.  
20. **Learning materials** | -
### Subject description

<table>
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<tr>
<th>1. Subject name</th>
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<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
<td>Önálló kutatási tevékenység (2)</td>
</tr>
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<td>3. Role</td>
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<td>4. Code</td>
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<td>5. Evaluation type</td>
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<td>6. Credits</td>
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</tr>
<tr>
<td>7. Weekly contact hours</td>
<td>0 lecture 10 practice 0 lab</td>
</tr>
<tr>
<td>8. Curriculum</td>
<td>D</td>
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</table>

| 9. Working hours for fulfilling the requirements of the subject | 300 hours |
| Contact hours | 140 hours |
| Preparation for seminars | 160 hours |
| Reading written materials | 0 hours |
| Midterm preparation | 0 hours |
| Homework | 0 hours |
| Exam preparation | 0 hours |

| 10. Department | Department of Material Handling and Logistics Systems |
| 11. Responsible lecturer | Dr. Bóna Krisztián |
| 12. Lecturers | Dr. Bóna Krisztián |

<table>
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<tr>
<th>13. Prerequisites</th>
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| 14. Description of lectures | - |

| 15. Description of practices | Semester research activity agreed with the supervisor. |

| 16. Description of laboratory practices | - |

| 17. Learning outcomes | a) Knowledge and Ability: |
| - | The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results. |

| 18. Requirements, way to determine a grade (obtain a signature) | The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans. |

| 19. Retake and delayed completion | The semester requirements cannot be delayed completed or improved. |

| 20. Learning materials | - |
### Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th>Individual research activity (2)</th>
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<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
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<td>6. Credits</td>
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### Working hours for fulfilling the requirements of the subject

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<th>Contact hours</th>
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<th>Exam preparation</th>
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<td>140 hours</td>
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</table>

### Department

Department of Automotive Technologies

### Responsible lecturer

Dr. Szalay Zsolt

### Lecturers

Dr. Szalay Zsolt

### Prerequisites

Individual research activity (1) (BMEKOGGD151), strong; ...

### Description of lectures

- Semester research activity agreed with the supervisor.

### Description of practices

- Semester research activity agreed with the supervisor.

### Description of laboratory practices

- Semester research activity agreed with the supervisor.

### Learning outcomes

a) Knowledge and Ability:
   - The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.

### Requirements, way to determine a grade (obtain a signature)

The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.

### Retake and delayed completion

The semester requirements cannot be delayed completed or improved.

### Learning materials
# Subject description

<table>
<thead>
<tr>
<th>1. Subject name</th>
<th><strong>Individual research activity (2)</strong></th>
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<tbody>
<tr>
<td>2. Subject name in Hungarian</td>
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<td>3. Role</td>
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<td>6. Credits</td>
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</tr>
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<td>7. Weekly contact hours</td>
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<td>8. Curriculum</td>
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<tr>
<th>9. Working hours for fulfilling the requirements of the subject</th>
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<tbody>
<tr>
<td>Contact hours</td>
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<td>Reading written materials</td>
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<tr>
<th>10. Department</th>
<th>Department of Vehicle Elements and Vehicle-Structure Analysis</th>
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</thead>
<tbody>
<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Lovas László</td>
</tr>
<tr>
<td>12. Lecturers</td>
<td>Dr. Lovas László</td>
</tr>
</tbody>
</table>

| 13. Prerequisites | Individual research activity (1) (BMEKOJSD151), strong; * (*), *; |

| 14. Description of lectures | - |
| 15. Description of practices | - |
| Semester research activity agreed with the supervisor. |
| 16. Description of laboratory practices | - |

<table>
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<tr>
<th>17. Learning outcomes</th>
<th>a) Knowledge and Ability:</th>
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<tr>
<td>- The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.</td>
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| 18. Requirements, way to determine a grade (obtain a signature) | The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans. |
| 19. Retake and delayed completion | The semester requirements cannot be delayed completed or improved. |
| 20. Learning materials | - |
Subject description

1. Subject name  
**Individual research activity (2)**

2. Subject name in Hungarian  
 Önálló kutatási tevékenység (2)

3. Role  
 Mandatory

4. Code  
 BMEKOKAD152

5. Evaluation type  
 m

6. Credits  
 10

7. Weekly contact hours  
 0 lecture  10 practice  0 lab

8. Curriculum  
 D

9. Working hours for fulfilling the requirements of the subject  
 300 hours

<table>
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<tr>
<th>Contact hours</th>
<th>Preparation for seminars</th>
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</table>

10. Department  
 Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer  
 Dr. Gáspár Péter

12. Lecturers  
 Dr. Gáspár Péter

13. Prerequisites  
 Individual research activity (1) (BMEKOKAD151), strong;

14. Description of lectures  
 -

15. Description of practices  
 Semester research activity agreed with the supervisor.

16. Description of laboratory practices  
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17. Learning outcomes  
 a) Knowledge and Ability:

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18. Requirements, way to determine a grade (obtain a signature)  
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19. Retake and delayed completion  
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20. Learning materials  
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<td>17. Learning outcomes</td>
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<td>19. Retake and delayed completion</td>
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<tr>
<td>12. Lecturers</td>
<td>Dr. Rohács Dániel</td>
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| 13. Prerequisites | Individual research activity (1) (BMEKOVRD151), strong; |
|                  | · (·), ·; |
|                  | · (·), · |

<table>
<thead>
<tr>
<th>14. Description of lectures</th>
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<tr>
<td>15. Description of practices</td>
<td>Semester research activity agreed with the supervisor.</td>
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<td>16. Description of laboratory practices</td>
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<th>a) Knowledge and Ability:</th>
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<td>19. Retake and delayed completion</td>
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<td>20. Learning materials</td>
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</table>
1. Subject name: Individual research activity (3)

2. Subject name in Hungarian: Önálló kutatási tevékenység (3)

3. Role: Mandatory

4. Code: BMEKOALD153

5. Evaluation type: m

6. Credits: 10

7. Weekly contact hours:
   - Lecture: 0 hours
   - Practice: 10 hours
   - Lab: 0 hours

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 300 hours
   - Contact hours: 140 hours
   - Preparation for seminars: 160 hours
   - Homework: 0 hours
   - Reading written materials: 0 hours
   - Midterm preparation: 0 hours
   - Exam preparation: 0 hours

10. Department: Department of Material Handling and Logistics Systems

11. Responsible lecturer: Dr. Bóna Krisztián

12. Lecturers: Dr. Bóna Krisztián

13. Prerequisites: Individual research activity (2) (BMEKOALD152), strong;
                       Individual research activity (2), 
                       Individual research activity (2), 

14. Description of lectures:

15. Description of practices:
   Semester research activity agreed with the supervisor.

16. Description of laboratory practices:

17. Learning outcomes:
   a) Knowledge and Ability:
      - The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.

18. Requirements, way to determine a grade (obtain a signature):
   The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion:
   The semester requirements cannot be delayed completed or improved.

20. Learning materials:


Subject description

1. Subject name  Individual research activity (3)

2. Subject name in Hungarian  Önálló kutatási tevékenység (3)

3. Role  Mandatory

4. Code  BMEKOGGD153

5. Evaluation type  m

6. Credits  10

7. Weekly contact hours  0 lecture  10 practice  0 lab

8. Curriculum  D

9. Working hours for fulfilling the requirements of the subject  300 hours

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<tr>
<th>Contact hours</th>
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<tr>
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10. Department  Department of Automotive Technologies

11. Responsible lecturer  Dr. Szalay Zsolt

12. Lecturers  Dr. Szalay Zsolt

13. Prerequisites  Individual research activity (2) (BMEKOGGD152), strong; - (-), -;

14. Description of lectures  -

15. Description of practices  Semester research activity agreed with the supervisor.

16. Description of laboratory practices  -

17. Learning outcomes  a) Knowledge and Ability:

- The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.

18. Requirements, way to determine a grade (obtain a signature)

The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.

19. Retake and delayed completion  The semester requirements cannot be delayed completed or improved.

20. Learning materials  -
1. Subject name | Individual research activity (3)
2. Subject name in Hungarian | Önálló kutatási tevékenység (3)
3. Role | Mandatory
4. Code | BMEKOJS0153
5. Evaluation type | m
6. Credits | 10
7. Weekly contact hours | 0 lecture, 10 practice, 0 lab
8. Curriculum | D
9. Working hours for fulfilling the requirements of the subject | 300 hours
   | Contact hours | 140 hours
   | Preparation for seminars | 160 hours
   | Reading written materials | 0 hours
   | Midterm preparation | 0 hours
   | Homework | 0 hours
   | Exam preparation | 0 hours
10. Department | Department of Vehicle Elements and Vehicle-Structure Analysis
11. Responsible lecturer | Dr. Lovas László
12. Lecturers | Dr. Lovas László
13. Prerequisites | Individual research activity (2) (BMEKOJS0152), strong:
   | \(-\cdot\•
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Subject description

1. Subject name: Individual research activity (3)

2. Subject name in Hungarian: Önálló kutatási tevékenység (3)

3. Role: Mandatory

4. Code: BMEKOKKD153

5. Evaluation type: m

6. Credits: 10

7. Weekly contact hours: 0 lecture, 10 practice, 0 lab

8. Curriculum: D

9. Working hours for fulfilling the requirements of the subject: 300 hours

- Contact hours: 140 hours
- Preparation for seminars: 160 hours
- Reading written materials: 0 hours
- Midterm preparation: 0 hours
- Homework: 0 hours
- Exam preparation: 0 hours

10. Department: Department of Transport Technology and Economics

11. Responsible lecturer: Dr. Tóth János

12. Lecturers: Dr. Tóth János

13. Prerequisites: Individual research activity (2) (BMEKOKKD152), strong;
                  \(- (-), \sim\)

14. Description of lectures

15. Description of practices

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17. Learning outcomes

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18. Requirements, way to determine a grade (obtain a signature)

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Subject description

1. Subject name: Individual research activity (4)
2. Subject name in Hungarian: Önálló kutatási tevékenység (4)
3. Role: Mandatory
4. Code: BMEKOALD154
5. Evaluation type: m
6. Credits: 10
7. Weekly contact hours: 0 lecture, 10 practice, 0 lab
8. Curriculum: D
9. Working hours for fulfilling the requirements of the subject: 300 hours
   - Contact hours: 140 hours
   - Preparation for seminars: 160 hours
   - Midterm preparation: 0 hours
   - Homework: 0 hours
   - Reading written materials: 0 hours
   - Midterm preparation: 0 hours
   - Exam preparation: 0 hours
10. Department: Department of Material Handling and Logistics Systems
11. Responsible lecturer: Dr. Bóna Kriszián
12. Lecturers: Dr. Bóna Kriszián
13. Prerequisites: Individual research activity (3) (BMEKOALD153), strong;
14. Description of lectures: -
15. Description of practices: Semester research activity agreed with the supervisor.
16. Description of laboratory practices: -
17. Learning outcomes: a) Knowledge and Ability:
   - The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.
18. Requirements, way to determine a grade (obtain a signature): The supervisor evaluates the student's semester research activity with midyear grade in the light of preliminary plans.
19. Retake and delayed completion: The semester requirements cannot be delayed completed or improved.
20. Learning materials: -
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<tr>
<td>11. Responsible lecturer</td>
<td>Dr. Szalay Zsolt</td>
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### Subject description

1. **Subject name**  
   **Individual research activity (4)**

2. **Subject name in Hungarian**  
   Önálló kutatási tevékenység (4)

3. **Role**  
   Mandatory

4. **Code**  
   BMEKOJSD154

5. **Evaluation type**  
   m

6. **Credits**  
   10

7. **Weekly contact hours**  
   - lecture: 0 hours  
   - practice: 10 hours  
   - lab: 0 hours

8. **Curriculum**  
   D

9. **Working hours for fulfilling the requirements of the subject**  
   **300 hours**
   - Contact hours: 140 hours
   - Preparation for seminars: 160 hours
   - Homework: 0 hours
   - Reading written materials: 0 hours
   - Midterm preparation: 0 hours
   - Exam preparation: 0 hours

10. **Department**  
    Department of Vehicle Elements and Vehicle-Structure Analysis

11. **Responsible lecturer**  
    Dr. Lovas László

12. **Lecturers**  
    Dr. Lovas László

13. **Prerequisites**  
    Individual research activity (3) (BMEKOJSD153), strong;
    - (-), -;
    - (-), -

14. **Description of lectures**  
    -

15. **Description of practices**  
    Semester research activity agreed with the supervisor.

16. **Description of laboratory practices**  
    -

17. **Learning outcomes**
   a) Knowledge and Ability:
      - The student is able to implement the ideas formulated in the semester research plan, evaluate and document the results.

18. **Requirements, way to determine a grade (obtain a signature)**
    The supervisor evaluates the student's semester research activity with midterm grade in the light of preliminary plans.

19. **Retake and delayed completion**
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9. Working hours for fulfilling the requirements of the subject

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<th>Homework</th>
<th>Reading written materials</th>
<th>Midterm preparation</th>
<th>Exam preparation</th>
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<tbody>
<tr>
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10. Department
Department of Control for Transportation and Vehicle Systems

11. Responsible lecturer
Dr. Gáspár Péter

12. Lecturers
Dr. Gáspár Péter

13. Prerequisites
Individual research activity (3) (BMEKOKAD153), strong;

14. Description of lectures
- Semester research activity agreed with the supervisor.

15. Description of practices
- Semester research activity agreed with the supervisor.

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17. Learning outcomes
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9. Working hours for fulfilling the requirements of the subject

| Contact hours | 140 hours | Preparation for seminars | 160 hours | Homework | 0 hours |
| Reading written materials | 0 hours | Midterm preparation | 0 hours | Exam preparation | 0 hours |

10. Department
Department of Transport Technology and Economics

11. Responsible lecturer
Dr. Tóth János

12. Lecturers
Dr. Tóth János

13. Prerequisites
Individual research activity (3) (BMEKOKKD153), strong;

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