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

Vehicle Engineering Master Programme
Curriculum

Valid from September 2018

Code:
6-ML_közös_2018_O
6-ML_közös_2018_T

Vehicle Engineering Master Programme start in February

	1./spring	2./autumn	3./spring	4./autumn
1	Advanced materials and technologies	Numerical methods	Projectmanagement in automotive industry KOKKM617	Computer aided manufacturing
2	KOGGM601	KOVRM121	2 0 0 m 2 MC KTKG	KOGGM618
3			Research and development process in th KOGGM614	
4		2 0 1 m 4 MC RHT	2 0 0 m 2 MC GJT	2 0 1 m 4 MC GJT
5	3 1 0 m 5 MC GJT	System technique and analysis	Elective economics course	Mechatronics, microcomputers
6	Control theory	KOVRM129	2 0 0 m 2 EC GTK	KOKAM604
7	KOKAM142		Elective economics course	
8	2 1 0 e 3 MC KJIT	2 1 0 m 4 MC VJJT	2 0 0 m 2 EC GTK	2 0 2 m 4 MC KJIT
9	Computer Aided design	Electronics – electronic measurement systems	Specialization 3	Optional courses
10	KOJSM605	KOKAM103		2 0 0 m 2 OC
11				Elective economics course
12	2 0 2 e 4 MC VJJT	2 1 0 m 4 MC KJIT		2 0 0 m 2 EC
13	Programming in C and Matlab	Structure analysis		Master thesis II.
14	KOKAM603	KOJSM609		KO**M554
15				
16	1 0 2 m 4 MC KJIT	1 0 2 e 4 MC VJJT		
17	Vehicle operation, reliability and diagnostics KOVRM602	Production process quality assurance in th KOGGM611		
18	2 0 0 m 2 MC VJJT	2 0 0 m 2 MC GJT	4 0 4 2m 10 SP	
19	Optional courses	Computational fluid- and thermodynamics	Optional courses	
20	2 0 0 m 2 OC	KOVRM606	2 0 0 m 2 OC	
21	Specialization 1		Diplomatervezés I	
22		2 0 2 e 4 MC RHT	KO**M553	
23		Specialization 2		
24				
25				
26				
27				
28	2 2 4 2e 8 SP			
29				
30		4 0 4 2e 8 SP	0 5 0 m 10 IP	
31			Internship	
32			4 weeks 0 0 s 0 MC	0 10 0 m 20 IP

Vehicle Engineering Master Programme start in September

	1./autumn	2./spring	3./autumn	4./spring
1	System technique and analysis	Control theory	Mechatronics, microcomputers	Research and development process in tl KOGGM614
2	KOVRM129	KOKAM142	KOKAM604	2 0 0 m 2 MC GJT
3		2 1 0 e 3 MC KJIT		Specialization 3
4	2 1 0 m 4 MC VJJT	Advanced materials and technologies	2 0 2 m 4 MC KJIT	
5	Numerical methods	KOGGM601	Elective economics course	
6	KOVRM121		2 0 0 m 2 EC GTK	
7			Elective economics course	
8	2 0 1 m 4 MC RHT	3 1 0 m 5 MC GJT	2 0 0 m 2 EC GTK	
9	Computational fluid- and thermodynamics	Computer aided design	Optional courses	
10	KOVRM606	KOJSM605	2 0 0 m 2 OC	
11			Computer aided manufacturing	
12	2 0 2 e 4 MC RHT	2 0 2 e 4 MC VJJT	KOGGM618	4 0 4 2m 10 SP
13	Electronics – electronic measurement systems	Programming in C and Matlab		Master thesis II.
14	KOKAM103	KOKAM603	2 0 1 m 4 MC GJT	KO**M554
15			Specialization 2	
16	2 1 0 m 4 MC KJIT	1 0 2 m 4 MC KJIT		
17	Structure analysis	Vehicle operation, reliability and diagnostics KOVRM602		
18	KOJSM609	2 0 0 m 2 MC VJJT		
19		Projectmanagement in automotive industry KOKKM617		
20	1 0 2 e 4 MC VJJT	2 0 0 m 2 MC KTKG		
21	Production process quality assurance in th KOGGM611	Specialization 1		
22	2 0 0 m 2 MC GJT		4 0 4 2e 8 SP	
23	Elective economics course		Master thesis I.	
24	2 0 0 m 2 EC GTK		KO**M553	
25	Optional courses			
26	2 0 0 m 2 OC			
27	Optional courses			
28	2 0 0 m 2 OC	2 2 4 2e 8 SP		
29				
30		Internship		
31		4 weeks 0 0 s 0 MC		
32			0 5 0 m 10 IP	0 10 0 m 20 IP

Specializations

Aerospace vehicle engineer specialization

		Aircraft analysis II. KOVRM632 3 0 2 m 7 SP RHT
Advanced Flight Theory KORHM620 2 1 0 e 4 SP RHT	Aircraft design and production II. KOVRM630 2 0 2 e 4 SP RHT	
Aircraft design and production I. KOVRM629 2 0 2 e 4 SP RHT	Aircraft analysis I. KOVRM631 2 0 2 e 4 SP RHT	Project KOVRM633 0 1 2 m 3 SP RHT

Aircraft maintenance and repair specialization

		Aircraft Maintenance and Documentation KOVRM643 3 0 2 f 6 SP RHT
Advanced Flight Theories and Aircraft Structures KOVRM639 1 0 2 v 3 SP RHT	Airworthiness Requirements KOVRM641 0 0 2 f 3 SP RHT	
Aircraft Systems and Avionics KOVRM640 1 2 2 v 5 SP RHT	Aircraft Design Steps and Manufacturing KOVRM642 4 0 2 v 5 SP RHT	Detailed Maintenance Process Procedure KOVRM644 1 0 2 f 4 SP RHT

Automotive vehicle engineer specialization

		Engine design II. KOGGM671 2 0 2 e 5 SP GJT
Suspension design KOGJM613 2 0 2 e 4 SP GJT	Engine design I. KOGGM670 2 0 2 e 4 SP GJT	
Instrumental tests for motor vehicles, measurement tec KOGGM668 0 0 4 m 4 SP GJT	Transmission system design KOGJM612 2 0 2 e 4 SP GJT	Mechatronic design of vehicle systems KOGGM622 2 0 2 e 5 SP GJT

Naval vehicle engineer specialization

		Ship hydrodynamics KOVRM626 1 1 1 m 4 SP RHT
Theory of Ships III. KOVRM616 2 1 0 e 3 SP RHT	Ship motions KOVRM624 2 1 1 e 4 SP RHT	Ship strength KOVRM621 1 1 1 m 4 SP RHT
Ship design KOVRM615 2 2 0 e 5 SP RHT	Design of pleasure craft KOVRM625 2 1 0 e 4 SP RHT	Project work KOVRM628 0 1 1 m 2 SP RHT

Railway vehicle engineer specialization

Design and testing of railway vehicle systems KOVRM607 4 0 2 m 10 SP VJJT		
	Diesel and electric traction KOVRM610 3 1 0 e 5 SP VJJT	Railway vehicle system dynamics KOVRM608 3 1 0 e 5 SP VJJT
	Traction mechanics KOVRM619 2 1 0 e 3 SP VJJT	Operation of railway vehicles KOVJM409 2 0 0 e 3 SP VJJT

Road and traffic safety engineer specialization

Road safety, legislative environment, human factors KOGGM653 2 0 2 e 4 SP GJT	Accident analysis I., forensic processes KOGGM654 2 0 2 e 4 SP GJT	Accident analysis II., simulation methods KOGGM655 2 0 2 e 5 SP GJT
Instrumental tests for motor vehicles, measurement tec KOGGM668 0 0 4 m 4 SP GJT	Dynamics of vehicle, active- and passive safety KOGJM641 2 0 2 e 4 SP GJT	Vehicle evaluation, traffic environment KOGJM640 2 0 2 e 5 SP GJT

Vehicle automation engineer specialization

Environment Sensing in the Vehicle Industry KOKAM656 2 0 2 e 4 SP KJIT	Discrete Control Design KOKAM658 2 0 2 e 4 SP KJIT	Reliability, Safety and Security in the Vehicle Industry KOKAM660 2 0 0 m 3 SP KJIT
Vehicle automation systems KOGGM659 2 0 2 e 4 SP GJT	Advanced Driver Assistance Systems KOGGM657 2 0 2 e 4 SP GJT	Design of Vehicle Automation Systems KOKAM661 2 0 4 m 7 SP KJIT

Vehicle manufacturing and repairing engineer specialization

Surface Engineering KOGGM647 2 0 2 e 4 SP GJT	Construction of vehicle manufacturing systems I. KOGGM649 2 0 2 e 4 SP GJT	Measurement systems in vehicle manufacturing KOGGM652 2 0 2 m 5 SP GJT
Practice in technology of manufacturing and materials KOGGM648 0 2 2 e 4 SP GJT	Fixing and sealing KOGGM650 2 0 2 e 4 SP GJT	Construction of vehicle manufacturing systems II. KOGGM651 2 0 2 m 5 SP GJT

Vehicle structure engineer specialization

Mechanics of superstructure materials KOJSM663 2 0 2 e 4 SP VJJT	Structural vibrations KOJSM665 2 0 2 e 4 SP VJJT	Superstructure control technics KOJSM666 2 0 2 m 5 SP VJJT
Requirements for superstructure designers KOJSM662 0 2 2 e 4 SP VJJT	Superstructure preliminary design KOJSM664 2 0 2 e 4 SP VJJT	Vehicle superstructure design KOJSM667 2 0 2 m 5 SP VJJT

Vehicle system engineer specialization

Measurement techniques and signal processing in veh KOKAM635 4 0 2 e 8 SP KJIT	Vehicle system dynamics and control KOVRM636 3 2 1 e 8 SP KJIT VJJT	Vehicle system informatics KOVJM437 2 0 2 m 5 SP VJJT
		Vehicle simulation and optimisation KOVRM638 2 2 0 m 5 SP VJJT

Course description explanation

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

Curriculum Supplement

All questions and conditions that regulate the study progress should be defined in this Supplement to the Curriculum. Thus, the Curriculum Supplement (curriculum appendix) contains **the system of subject prerequisites**, the rules for the selecting specializations, the description of the conditions for the **preparation of the Master thesis and the final examination**, as well as the order of the final exam.

1. The subject prerequisite system expresses the connections between the subjects. The specific subject prerequisites are included in the subject datasheets.

In the absence of a *strong* or a *weak* prerequisite, it is not possible to enroll in the subject, and no exceptions can be given, as it reflects the professional conditions of effective education. In the case of *co-requisite* subjects (simultaneous enrollment of two subjects in prerequisite connection), if the subject having a co-requisite subject is not fulfilled in the given semester, consequently the co-requisite subject also cannot be completed in that semester. In the absence of the *recommended* prerequisite, the course can be enrolled, but it should be noted that the course is preferably assumes knowledge from the recommended prerequisite subject.

2. There are no general rules for the selection of specialization and for specialization subjects.

3. Enrollment rules for the Master thesis subjects in all specializations:

The **prerequisite for enrollment in the Master thesis I. course** are the completion of compulsory courses covering all the basic natural scientific knowledge in the recommended curriculum (i.e. mandatory courses marked with pink background) and the collection of a minimum of 56 credits.

The **prerequisite for enrollment in the Master thesis II. course** are the completion of compulsory courses covering all the basic natural scientific knowledge included in the recommended curriculum (i.e. mandatory courses marked with pink background) and the collection of a minimum of 84 credits. The Master thesis I. course can be enrolled simultaneously as co-requisite, in which case the above cumulative acquired credits must be achieved by completing another subjects according to the recommended curriculum. A further condition is the completion of the 4-week internship in case of full time master study.

4. Criteria for taking the final examination:

Completion of all subjects included in the recommended curriculum, including optional subjects (all together at least 120 credits), submitting the Master thesis and, in the case of a full-time master study, fulfillment of all criterion requirements in the curriculum (4 weeks of internship).

5. Final examination order:

The final examination in front of the Final Examination Board consists of **defending the Master thesis** and **passing oral final exams from three subjects** (or subject groups). The final exam subjects (or subject groups) are assigned by the Department responsible for the specialization. The subjects must be selected partly from the professional core subjects, and from the specialization subjects, so that each subject has a minimum credit value of 3 and the knowledge of the three subjects (or subject groups) is **at least 15 credits in total.**

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

Subject description

1. Subject name	**Accident analysis I., forensic processes**				
2. Subject name in Hungarian	Balesetelemzés I, szakértői eljárások			**3. Role**	sp
4. Code	**KOGGM654**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	18 hours
Reading written materials	8 hours	**Midterm preparation**	10 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Török Árpád
12. Lecturers	Dr. Melegh Gábor, Dr. Török Árpád, Vida Gábor

13. Prerequisites	- (-), -

14. Description of lectures

Technical causes of accidents, vehicle and engine malfunctions: The most common high-risk vehicle and engine failures, fault finding process based on damage, determination of technical responsibility, conclusions, avoidance options. The role of the vehicles, the interpretation of the technical fault, the analysis of the technical accidents, the influence of the subjective causes.

Assessment of Accident Forms: Major Accident Forms and Conclusions from Post-Accident Status. Pedestrian Accidents, Basic Computational Opportunities, step outs like accidents , Accidents in Limited Visual circumstances, proving attempts.

Vehicle collisions: The basic contexts of the collision, vehicle deformations and damage patterns, energy grid, basics of collision calculation, edits, main procedures.

15. Description of practices

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16. Description of laboratory practices

Applying the relationships and procedures learned during the lectures during the analysis of specific tasks and accidents..

17. Learning outcomes

a) knowledge: - The student is familiar with the legal framework needed to understand the legal environment of road safety; - The student has to know the basic components of the process of legislation and law enforcement; - The student has to know the basic purpose and means of transport law; - The student has to know the online and printed aids and applications needed to apply traffic law;

b) skills: - The student is able to interpret the related legislation; - The student is able to apply and use relevant traffic laws; - The student is able to support the planning and research and development processes;

c) attitude: - The student aims to maximize their abilities by making their studies at the highest possible level, proficient and independent; - The student aims to cooperate with the instructor and the other students to improve knowledge; - The student aims to continue to imrpove the knowledge of the material parts of the lessons through continuous independent learning; - The student aims to use the information technology and computing tools (word processing computer software, mathematical software, image editing software, etc.), but also seeks to use classical devices (paper, ruler, pencil, hand-held calculator, editing, etc.); - The student aims to get to know and routinely use the tools needed to solve the tasks; - The student aims to provide accurate, error-free and precise work.

d) autonomy and responsibility: - The student is responsible for setting an example forthe other students rgarding the quality of its work and ethical standards; - The student applies the knowledge acquired during the course in a responsible manner with regard to their validity limits; - The student accepts openly the grounded critical remarks; - The student accepts the framework for cooperation, can do its job independently or as part of a team, depending on the situation.

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

During the semester 1 midterm test has to be completed with more the 50% of the maximal points.

The conditions for obtaining the signature are the completing the midterm test, attending all labs and submitting the homework on accepted level.

Final outcome of the subject is defined by the result of the mid-term exam in 30% proportion, the homework in 20% proportion, and the final exam in 50% proportion. All requirements have to be fulfilled to successfully finish the subject.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once. The homework can be delivered once additionally. One lab can be done once additionally.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Accident analysis II., simulation methods**				
2. Subject name in Hungarian	Balesetelemzés II, szimulációs módszerek			**3. Role**	sp
4. Code	**KOGGM655**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	24 hours
Reading written materials	42 hours	**Midterm preparation**	10 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Török Árpád
12. Lecturers	Dr. Melegh Gábor, Dr. Török Árpád, Vida Gábor

13. Prerequisites	Accident analysis I., forensic processes (KOGGM654), strong

14. Description of lectures

Description of Collision Models Used in Vehicle Dynamic Simulation Software Suitable for Accident Reconstruction.

Examination and analysis of complete, regular and irregular vehicle motion processes by simulation methods: determination of the range of required input parameters, delimitation of the questions to be answered based on the available parameters, interpretation of probability statements.

Parameter sensitivity analysis of simulation results.

Evaluation, analysis, interpretation, and plausibility of the results provided by simulation software.

15. Description of practices

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16. Description of laboratory practices

To deepen the knowledge acquired during the lectures by solving real tasks with simulation software.

17. Learning outcomes

a) knowledge: - The student is familiar with the legal framework needed to understand the legal environment of road safety; - The student has to know the basic components of the process of legislation and law enforcement; - The student has to know the basic purpose and means of transport law; - The student has to know the online and printed aids and applications needed to apply traffic law;

b) skills: - The student is able to interpret the related legislation; - The student is able to apply and use relevant traffic laws; - The student is able to support the planning and research and development processes;

c) attitude: - The student aims to maximize their abilities by making their studies at the highest possible level, proficient and independent; - The student aims to cooperate with the instructor and the other students to improve knowledge; - The student aims to continue to imrpove the knowledge of the material parts of the lessons through continuous independent learning; - The student aims to use the information technology and computing tools (word processing computer software, mathematical software, image editing software, etc.), but also seeks to use classical devices (paper, ruler, pencil, hand-held calculator, editing, etc.); - The student aims to get to know and routinely use the tools needed to solve the tasks - The student aims to provide accurate, error-free and precise work.

d) autonomy and responsibility: - The student is responsible for setting an example forthe other students rgarding the quality of its work and ethical standards; - The student applies the knowledge acquired during the course in a responsible manner with regard to their validity limits; - The student accepts openly the grounded critical remarks; - The student accepts the framework for cooperation, can do its job independently or as part of a team, depending on the situation.

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

During the semester 1 midterm test has to be completed with more the 50% of the maximal points.

The conditions for obtaining the midterm grade are the completing the midterm test, attending all labs and submitting the homework on accepted level.

Final outcome of the subject is defined by the result of the mid-term exam in 60% proportion, and the homework in 40% proportion. All requirements have to be fulfilled to successfully finish the subject.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once. The homework can be delivered once additionally. One lab can be done once additionally.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Advanced Driver Assistance Systems**				
2. Subject name in Hungarian	Vezetéstámogató rendszerek			**3. Role**	sp
4. Code	**KOGGM657**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	28 hours
Reading written materials	8 hours	**Midterm preparation**	0 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Rövid András
12. Lecturers	Fodor Károly

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

14. Description of lectures

The target is to present driver assistant systems and automated driving functions. The levels of automation according to SAE. Brief overview about vehicle dynamics. Driver assistance system overview on the stabilization level. Typical DAS systems, like AEBS, LDW, LKA available at present vehicles. Outlook on future advanced driver assistance systems at higher automation levels.

15. Description of practices

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16. Description of laboratory practices

The task is to work out an ADAS related topic including realization, testing and documentation

17. Learning outcomes

a) knowledge: Knowledge of ADAS systems

b) skills: Ability to develop ADAS systems

c) attitude: Openness to new opportunities in the field

d) autonomy and responsibility: Participate in solving independent tasks

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

An individual task fullfilment is required for the signiture. The final mark will be provided taking the exam result and the individual task result into account with weighted average of 60-40%.

19. Opportunity for repeat/retake and delayed completion

Individual taks replacement one

20. Learning materials

Slides

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

Subject description

1. Subject name	**Advanced Flight Theories and Aircraft Structures**				
2. Subject name in Hungarian	Fejlett repüléselmélet és repülőgép szerkezetek			**3. Role**	sp
4. Code	**KOVRM639**	**5. Evaluation type**	**e**	**6. Credits**	**3**
7. Weekly contact hours	**1 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	42 hours	**Preparation for seminars**	4 hours	**Homework**	0 hours
Reading written materials	14 hours	**Midterm preparation**	20 hours	**Exam preparation**	10 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Jankovics István
12. Lecturers	Jankovics István, Dr. Rohács József, Dr. Beneda Károly

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

14. Description of lectures

Basics of aerodynamics, main principles, aero coefficients.

Theory of operation of gas turbine engines, types of engines (turbofan, turboprop, etc.), systems of engines.

Basics of flight mechanics, aircraft controls (primary, secondary), stability of aircraft.

Structures: Airworthines requirements, construction methods. Fuselage, wings, stabilisers, controls, undercarriage systems, engine mount and nacelles.

15. Description of practices

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16. Description of laboratory practices

Solving lab based computational tasks connected with the themes of the lectures.

17. Learning outcomes

Knowledge: Understands and knows basic principles of modern aircraft, the relevant physical disciplines, the structures in general, airworthiness requirements and limitations of aircraft.

Ability: Able to estimates the effects of his/her work on operation of aircraft.

Attitude: Open minded, self-confident, focusing on aviation safety.

Autonomy and responsibility: Participate in solving independent tasks.

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

There will be a midterm exam during the semester about the material given by the lecturer till that time. The midterm exam can be repeated once during the semester in case of absence or having grade unsatisfactory. The semester work is accepted and the signature is given only in case of a successfull midterm exam. The subject is finished by exam about the full material given by the lecturer. The final grade is the grade given for the exam.

19. Opportunity for repeat/retake and delayed completion

The midterm exam can be repeated once in a semester in case of absence or unsatisfactory results. There is an extra option to complete the midterm exam in the supplementary week (the week followed by the semester directly) in case of absence or unsatisfactory results besides paying the administration fee.

20. Learning materials

The given materials by the lecturer.

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

Subject description

1. Subject name	**Advanced Flight Theory**				
2. Subject name in Hungarian	Fejlett repüléselmélet			**3. Role**	sp
4. Code	**KORHM620**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	8 hours	**Homework**	15 hours
Reading written materials	40 hours	**Midterm preparation**	0 hours	**Exam preparation**	15 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Rohács József
12. Lecturers	Dr. Rohács József, Jankovics István Róbert

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

14. Description of lectures

Aerodynamic summary: Lift, drag and components, profiles, aerodynamic characterization, finite wing theory, aerodynamics of cylindrical bodies, high-speed aerodynamics, supersonic flight, aerodynamic characterization of aircraft. Flight mechanics summary: characterization of propulsion, airplane performance, load and speed, elevation curves, stability, spatial displacement of aircraft, flight dynamics and control, aeroelastic phenomena. Aerodynamic factors: determination of aerodynamic factors, derivative factors, stationary aerodynamics, aerodynamic models, determination of aerodynamic characteristics by numerical methods. Nonlinear and statistical flight dynamics. Non-linearities. Parameter Uncertainty System Analyzes. Stochastic, controlled flight mechanics and dynamic models. Critical Flight Modes. Examination and control of airplane post-crash movement. Bifurcation analysis. Practical implementation of thrust control. Investigation of the thrust direction of a controlled airplane after a downhill motion. chaotic attractors. New ways to control aircraft. Passive and active control. Advanced control procedures, student, adaptive, integrated, robust, error tolerant, reconfigurable, stochastic, etc. control procedures. Development of biological-based control: principles of human perception, brain function and thinking, situation analysis - examination - decision process modeling, vision-based control, head and eye-driven systems, intelligent systems. Active, endogenous, subjective control of aircraft. Applying the subjective analysis method to investigate the activities of less experienced aircraft drivers. New control options for small aircraft. Safety philosophy of small aircraft driving. Application of MEMS (micro-electro-mechanical systems) for controlling the external and internal flow conditions of the aircraft, active control based on MEMS, special case control, landing for moving platform. Hyperonic flight: effect of dimensions, profile of flight mission, fundamentals of propulsion, propulsion, structural features, projects.

15. Description of practices

The exercise includes three types of tasks: (i) performing short calculations to assist in the theoretical lectures, (ii) analysis of the results of international and domestic research and development projects, (iii) performing an independent research task.

16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: Knows and understand the aerodynamics and propulsion of aircraft. He/She knows aerodynamic derivatives and factors. He/She knows the basics of nonlinear statistical flight dynamics. Knows the airplane controls methods. The basics of using MEMS-based systems in flight.

b) skills: Can define aerodynamic derivatives and factors and build nonlinear flight dynamics model. Based on his/her knowledge, he/she can learn deeper the more specific knowledge of airplane control techniques and MEMS-based systems. He/she is able to support the research and development processes.

c) attitude: Interested, responsive.

d) autonomy and responsibility: Pro-activity in the solution of professional tasks, the self-standing selection of the solution methods.

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

1 exam measuring the theoretical knowledge, 1 semestrial home work, the final result is the average of the parts. Prerequisite of the exam is handing in a successful home-work for deadline.

19. Opportunity for repeat/retake and delayed completion

second exam and delayed submission of the homework

20. Learning materials

The presentation about the lectures
Literature

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

Subject description

1. Subject name	**Advanced materials and technologies**				
2. Subject name in Hungarian	Korszerű anyagok és technológiák			**3. Role**	k
4. Code	**KOGGM601**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**3 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	14 hours	**Homework**	15 hours
Reading written materials	50 hours	**Midterm preparation**	15 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Bán Krisztián
12. Lecturers	Dr. Bán Krisztián, Dr. Markovits Tamás, Dr. Lovas Antal, Dr. Dömötör Ferenc

13. Prerequisites	- (-), -

14. Description of lectures

The course provides a deeper knowledge of non iron-based structural materials applied in vehicle industry. Modern light metal alloys, elastomers, plastics, composites and ceramics are described. The physical properties, production technologies and peculiarities of manufacturing are described in details of the mentioned structural materials of vehicles. During the course the students are introduced into the basic knowledge necessary for each topic, mentioned above, such as thermodynamic stability, metastability, non-equilibrium systems, the effect of phase relations on material properties, strength enhancement, and material interactions. The characteristics of composites and hybrid materials and their production technologies are presented. Students are introduced to the technological bases of surface modification phenomena and technologies as well as additive manufacturing. Within the scope of the course we discuss the aspects of material selection in the consideration of operating conditions of the vehicles and environmental protection.

15. Description of practices

The aim of the practices to translate the theoretical knowledge of the lecture into practice by examples and solving practical tasks in the topics such as equilibrium transformations, quality certificates, selection of semi-finished products based on specified criteria from metallic and non-metallic raw materials as well as to provide a material model for a real material based on material testing.

16. Description of laboratory practices

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17. Learning outcomes

a) knowledge:
- Knows the characteristics of metallic bonding and what is the role of it in the properties of metallic systems.
- Knows how the phase relationships which can be read from the phase diagram affect the properties.
- Knows the concept and types of metastability.
- Knows the mechanisms of strength enhancement.
- Knows the classification of light metals based on microstructure characteristics.
- Knows the purpose of the manufacturer's quality certificate and the most important contents of it.
- Knows the most important properties of sheet products in the point of view of technology.
- Knows the phase conditions are formed in metal-gas systems.
- Knows the concept of surface modification, its main goals, and the most important procedures.
- Knows the advantages and disadvantages of using ceramic materials, the major physical properties of ceramics, and the most important aspects of ceramic design.
- Knows the most important steps in the manufacturing of modern technical ceramics.
- Knows the types of composite materials, their structural features and their effect on physical properties.
- Knows the types of plastics and elastomers, their structural features and their impact on physical properties.
- Knows the types of material models.

b) skills:
- Able to see and explain the relationship between the phase diagram and the physical properties of binary systems.
- Able to see and explain how the types of metastability are related to the possibilities of strength enhancement.
- Able to see and explain the relationship between the strength-enhancing mechanisms and the equilibrium phase conditions (shape of the diagrams).
- Capable of interpreting any manufacturer's quality certificate.
- Able to select a sheet material based on the deformations given by a sheet forming technology.
- Able to propose a surface modification method to achieve a surface property, analyze its feasibility, advantages and limitations.
- Able to determine a flexible-plastic model by using the results of a tensile test.

- Able to collect literature on a specific topic and compile a summary based on it.

c) attitude:

- Strives to find relationships between the different topics.
- Strives to interpret independently what has been said in lectures and practices (relationships, statements, diagrams), to be open to thinking together with the instructor and his / her students.
- Strives for active participation in lectures and practices.

d) autonomy and responsibility

- Accepts the frameworks for completing the subject, and performs its tasks independently and responsibly, in accordance with ethical norms.
- Apply responsibly the knowledge acquired during the course with regard to their validity limits.
- The task is performed independently, according to the designated conditions and ethical norms.

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

Students prepare a literature research about a topic agreed with the lecturer, from which they have to prepare a written summaries and hand in to the end of the semester, or perform a subtask of the research project of the department. During the semester, we have two midterm exams for which the students will be awarded. The result of the submitted manuscript and two midterm exams are the basis for calculating the grade in 50-25-25%.

19. Opportunity for repeat/retake and delayed completion

Both midterm exams can be substitute twice, the supplementation of the written work is possible during the supplementation week.

20. Learning materials

- Charles Kittel: Introduction to solid state physics,
- Thornton, Calangelo: Fundamentals of engineering materials,

Prentice-Hall, Inc. New Jersey, 1985,

- Flinn, Trojan: Engineering Materials and Their Applications,
- Auxiliary materials and ppt's downloadable from the department website.

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

Subject description

1. Subject name	**Aircraft analysis I.**				
2. Subject name in Hungarian	Repülőgépek vizsgálata I.			**3. Role**	sp
4. Code	**KOVRM631**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	18 hours
Reading written materials	18 hours	**Midterm preparation**	0 hours	**Exam preparation**	10 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Beneda Károly
12. Lecturers	Dr. Beneda Károly, Dr. Sziroczák Dávid, Dr. Veress Árpád

13. Prerequisites	Advanced Flight Theory (KORHM620), strong; - (-), -; - (-), -

14. Description of lectures

Measurement technics. Powerplant or aircraft practical measurements.
Control of aircraft engines based on different control laws. Analysis methods of aircraft engines; application of mathematical models.

15. Description of practices

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16. Description of laboratory practices

Design of aircraft engine control system on computer; measurement carried out on engine or on aircraft, establishment of mathematical model and simulation.

17. Learning outcomes

a) knowledge: The student knows the mathematical-physical background of aircraft engine control and the methods of aircraft engine analysis, knows the possible mathematical models of different components of an aircraft engine. The student knows the technical terms of measurements, the planning of measurements, the process of data acquisition and interpretation of results. b) skills: The student is able to plan measurement processes, perform data acqusition and process the acquired data. able to design an aircraft engine control system based on computer simulation, able to carry out measurements on an aircraft engine, able to develop different depth mathematical models evaluating the acquired data. c) attitude: the student looks self-supporting for creative solutions considering the available resources; cooperates with the teacher and the colleagues; aims the precise documentation of his/her work; able to obey the safety regulations during the work nearby an aircraft engine. d) autonomity and responsibility: the student can choose one from the existing methods with different precision considering the goals and available resources; accepts the frame of cooperation

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

Design of measurement task, data acquisition (power plant or aircraft, one task chosen by the student), processing and evaluation of measurement data. The outcome of the task is a project report (in MS Word or PowerPoint format). The deadline of completing this document and delivering to the lecturer is the last week of the semester. The students will get grade to the analysis task. The requirement for the signature is the delivered and accepted analysis task. The final grade of the subject is the mathematical average of the grade given for the exam and for the analysis tasks.

19. Opportunity for repeat/retake and delayed completion

If measurement task is not delivered in time, it is also possible to deliver the documentation in the supplementary week besides paying administration fee.

20. Learning materials

K. Beneda: Measurement techniques of gas turbines slides
A. Giampaolo: Gas Turbine Handbook - Principles and Practices. Taylor & Francis, 2006, ISBN 0-88173-516-7
M. P. Boyce: Gas Turbine Engineering Handbook. Elsevier, 2017, ISBN 978-0-7506-7846-9

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

Subject description

1. Subject name	**Aircraft design and production I.**				
2. Subject name in Hungarian	Repülőgépek tervezése, gyártása I.			**3. Role**	sp
4. Code	**KOVRM629**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	26 hours
Reading written materials	10 hours	**Midterm preparation**	0 hours	**Exam preparation**	10 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Rohács Dániel
12. Lecturers	Dr. Beneda Károly, Prof. Rohács József, Dr. Sziroczák Dávid, Dr. Veress Árpád

13. Prerequisites	- (-), -

14. Description of lectures

Aircraft development philosophy. Role of aviation in economy. Problems to be solved in the fields of aviation and aircraft. Fundamental equations of aircraft development. Goodness and economic factors. Change of factors as a function of development philosophies. General description of development. Technology protection and the role of technology transfer. Aircraft development and design methods. Control of the development process. Role of aircraft structures and systems. Determination of loads and power requirements. Preliminary design based on estimated loads, sizing of main elements. Preliminary design of aircraft as group project. Aerospace materials, manufacturing technology and good design practice. Basic composite calculations. Basics of CAD design. CATIA specifics. Solid parts, assemblies, surfaces modelling. Theoretical and practical aspects of gas turbine engine design: thermodynamic cycle analysis, determination of the main geometrical sizes, mean line design, blade twisting, 3D component design and creating 3D CAD models.

15. Description of practices

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16. Description of laboratory practices

Preliminary design of aircraft, sizing of main components. Gas turbine engine design. Learning CATIA, and application of knowledge for design tasks

17. Learning outcomes

a) knowledge: - The student knows the steps of preliminary aircraft design and the aerodynamic design of gas turbine engines (determination of loads, sizing of main components, thermodynamic cycle analysis, determination of the main geometrical sizes, mean line design, blade twisting, 3D component design and creating 3D CAD models) and the theoretical and practical aspects of each design step;

b) skills: - The student is able to complete a gas-turbine design task with supervision, the student is able to generate preliminary level design of an aircraft component as a group task ;

c) attitude: - The student aims to complete his/her specified tasks 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 cooperates with professors and mates during the studies; - The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

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 can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation;

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

Design task: Design of gas turbine engine based on the steps defined in the subject description via weekly consultations. The outcome of the design process is the calculation table (in Excel, Matlab, Mathcad, Mathematica, etc. environment) and project report (in MS Word format). There is also a group project involving the preliminary design of an aircraft component as a group project.

Mid-term requirement: Delivery of design task until one week before examination period of semester. The final grade of the subject is the mathematical average of the grade given for the exam and for the design task.

19. Opportunity for repeat/retake and delayed completion

The delivery date of the design task and the documentations is the last week of the semester. If it is not delivered in time, it is also possible to deliver the design task and documentations in the supplementary week besides paying the administration fee.

20. Learning materials

The presentation about the lectures
Literature

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

Subject description

1. Subject name	**Aircraft design and production II.**				
2. Subject name in Hungarian	Repülőgépek tervezése, gyártása II.			**3. Role**	sp
4. Code	**KOVRM630**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	19 hours
Reading written materials	17 hours	**Midterm preparation**	0 hours	**Exam preparation**	10 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Sziroczák Dávid
12. Lecturers	Dr. Sziroczák Dávid

13. Prerequisites	Aircraft design and production I. (KOVRM629), strong; - (-), -; - (-), -

14. Description of lectures

Aircraft development process. Conceptual level design. Requirements definition. Geometry specification. Powerplant selection. Mission specification. Mass breakdown methods (e.g. statistical). Fuel fraction method. Iterative mass determination. Aerodynamics estimation. IVHM, crashworthiness, rotor burst, lightning protection. Optimisation and applied methods. Design of special air vehicles.

15. Description of practices

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16. Description of laboratory practices

Presentation and use of required tools.

17. Learning outcomes

a) knowledge: - The student knows the aircraft design process. The student understands the procedure of conceptual level aircraft design, the relevant fields of knowledge and tools. The student knows the practical application of optimisation methods.

b) skills: - The student is able to independently complete a conceptual level aircraft design taking into account the relevant requirements and constraints. The student is able to link multidisciplinary processes and use optimization tools.

c) attitude: - The student aims to complete his/her specified simulation tasks 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 cooperates with professors and mates during the studies; - The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

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 can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation;

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

Design task: Conceptual level design of an aircraft performed independently with weekly regular consulting support. The deadline of completing this document and delivering to the lecturer is the last week of the semester. The students will get grade to the analysis task. The requirement for the signature is the delivered and accepted analysis task. The final grade of the subject is the mathematical average of the grade given for the exam and for the analysis tasks.

19. Opportunity for repeat/retake and delayed completion

If design task is not delivered in time, it is also possible to deliver the documentation in the supplementary week besides paying administration fee.

20. Learning materials

Related national and international scientific literature

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

Subject description

1. Subject name	**Aircraft Design Steps and Manufacturing**				
2. Subject name in Hungarian	Repülőgépek tervezési lépései és gyártása			**3. Role**	sp
4. Code	**KOVRM642**	**5. Evaluation type**	**e**	**6. Credits**	**5**
7. Weekly contact hours	**4 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	84 hours	**Preparation for seminars**	4 hours	**Homework**	20 hours
Reading written materials	12 hours	**Midterm preparation**	0 hours	**Exam preparation**	30 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Sziroczák Dávid
12. Lecturers	Dr. Sziroczák Dávid, Dr. Rohács József

13. Prerequisites	Aircraft Systems and Avionics (KOVRM640), strong; Airworthiness Requirements (KOVRM641), co-requisite; - (-), -

14. Description of lectures

Aircraft design process, design philosophy. Revision of the design process; steps of the aircraft design process; requirements, conceptual design, preliminary design, detailed design, manufacturing and testing. Theoretical and computational methods of aircraft design and manufacturing. Fundamentals of aircraft manufacturing; primary structural materials, manufacturing principles and processes, metallic materials, composite materials and manufacturing processes. Details of manufacturing processes; cold forming, sheet and plate forming, extrusions, high energy forming and joining processes, tube and duct forming, welding technology for aerospace applications, metal cutting and machining technology, abrasive machining, chemical machining and chemical processing of metallic parts. Metallic fasteners, repair of composite structures, composite joining processes, emerging additive manufacturing technologies (e.g. 3D printing). Basic measurement and inspection methods in aerospace manufacturing.

15. Description of practices

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16. Description of laboratory practices

Solve aircraft design and analysis problems in the departmental computer lab. Observation of manufacturing processes in an industrial environment, hands on experience during lab excersises.

17. Learning outcomes

Knowledge: A1: The student is familiar with the process of aircraft design A2: The student is familiar with manufacturing processes used in the aerospace industry and their developments

Ability: B1: The student is able to independently and skillfully use computational tools in aircraft design and manufacturing and is able to critically appraise results from such tools B2: The student knows the metallic and composite manufacturing technologies used in the aerospace industry and is able to select the appropriate methods to solve engineering tasks

Attitude: C1: The student is self motivated to learn and undestrand new methods and technologies with appropriate guidance C2: The student delivers the highest quality work whether working individually or as a group C3: The student connects the taught material and self-learnt knowldege to the requirements of industrial application and uses the acquired knowledge C4: The student delivers the assigned tasks at the higest possible quality within the allocated time and other constraints

Autonomy and responsibility: D1: The student understands and applies the relevant fire, health and safety regulations and the regulations of industrial environments D2: The student is responsible for the quality of work and for the compliance with keeping ethical regulations whether working individually or as part of a group D3: The student openly accepts constructive criticism and observations, and to the highest extent possible uses them for personal improvement D4: The student is able to critically appraise other persons' work, define constructive criticism and be able to, within the extent of their knowledge, determine the validity of acquired information

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

To pass the subject, the students must succesfully complete the examination at the end of the semester. The requirements for taking the examination are the submitting of assignments provided during the semester and the attendance of all the lab excersises.

19. Opportunity for repeat/retake and delayed completion

The in-term assignments can be re-submitted by the end of the re-submission period. Laboratory excersises due to their nature might not be repeated. Retake of failed examinations as per the university regulations.

20. Learning materials

The lecture notes, supplementary materials and example problems will be provided during the lectures.

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

Subject description

1. Subject name	**Aircraft Maintenance and Documentation**				
2. Subject name in Hungarian	Repülőgépek karbantartása és dokumentációi			**3. Role**	sp
4. Code	**KOVRM643**	**5. Evaluation type**	**m**	**6. Credits**	**6**
7. Weekly contact hours	**3 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**180 hours**
Contact hours	70 hours	**Preparation for seminars**	14 hours	**Homework**	30 hours
Reading written materials	66 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Veress Árpád
12. Lecturers	Galvácsy Károly

13. Prerequisites	Aircraft Design Steps and Manufacturing (KOVRM642), strong

14. Description of lectures

Getting basic knowledge about aircraft maintenance types, specifications and processes via following topics: Analyses: Destructive and non destructive (NDT), Enhanced Zonal Analyses procedure (EZAP), L/HIRF, CPCP; Standard maintenance tasks: Check for over all conditions, leaks (CHK), Lubrication (LU) Cleaning (CLN), Sealing, Conservation and deconservation, Drain, Servicing, Replenishment, Rigging, Restoration (RS), Discard (DS), Painting and paint removal, surface preparation, Data read out, Data Base /S/W upload; Inspection methods: Zonal, Visual check (VC), General Visual (GVI), Detailed (DET), Special Detailed (SDI), Boroscope Inspection (BSI, HSI); Checks: Circuit continuity, isolation, short to GND, bonding, Fluid reserve, fluid level, Pressure, Compression, decompression; Tests: Operational (OPC), Functional (FNC), System test, Maintenance message read out, Data readout (Fault history, Vibration data, …); Ad-Hoc maintenance tasks: Parking, Mooring, Deicing, antiicing, Volcanic ash treatment, Bird strike, Lighting strike, ……, Trouble shooting (T/S), Fault isolation, fixing; Repair methods: Temporary protection, Final …, (SRM, SWPM); Good practices, Clean-as-you-go, Protection, Periodical cleaning; Authority originated: Fuel Tank Safety (FTS), Critical Design Configuration Control Limitation (CDCCL), Airworthiness Limitations (AWL, ALI, FAL, …); Basic Operational knowledges: Low Visibility Operation (LVO), Performance Based Navigation (PBN), RVSM and ETOPS. Built up basic knowledge about aircraft maintenance documentation via next topics: Manufacturer provided basic documentation: AMM (CMM), WDM, IPC, TC, SB, SL/SIL, OAT, …, MMEL; MRO/Operator originated documentation: WP, Summary, Tally, WO, TC, JC, JO, EO, …, NRC-s, DR, JS, …, NDT report, Boroscope report, MEL, HIL, …

15. Description of practices

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16. Description of laboratory practices

Access, opening, reading/revising, understanding and analysing of manufacturer, MRO/Operator originated documentations in printed and electronic formats.

17. Learning outcomes

Knowledge: A1. The student knows and understands the methods of inspection and different types of maintenances, their processes and procedures together with the documentations given by the aircraft manufacturers and MROs/operators;

Ability: B1. The student can understand, complete / develop tasks / methodologies in conjunction with maintenance processes and procedures by using available and relevant specifications/norms.

Attitude: C1. 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; C2. The student cooperates with professors and mates during the studies; C3. The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

Autonomy and responsibility: D1. The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms; D2. The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints; D3. The student can friendly accept the well-established constructive criticism and can utilize that in future; D4. The student can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation;

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

The condition for fulfilling the subject is to get a mark at the end of the semester. The mark is given by the lecturer for the quality of the completed task(s) during the semester and the performance of all the lab exercises. The requirement for getting mark is the attendance of all the lab exercises.

19. Opportunity for repeat/retake and delayed completion

The in-term assignments can be re-submitted by the end of the re-submission period. Laboratory excersises due to their nature might not be repeated. Retake of failed examinations as per the university regulations.

20. Learning materials

The lecture notes, supplementary materials and documentations will be provided during the semester.

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

Subject description

1. Subject name	**Aircraft Systems and Avionics**				
2. Subject name in Hungarian	Repülőgép rendszerek és avionika			**3. Role**	sp
4. Code	**KOVRM640**	**5. Evaluation type**	**e**	**6. Credits**	**5**
7. Weekly contact hours	**1 lecture**	**2 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	70 hours	**Preparation for seminars**	8 hours	**Homework**	10 hours
Reading written materials	12 hours	**Midterm preparation**	0 hours	**Exam preparation**	50 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Bicsák György
12. Lecturers	Dr. Bicsák György, Rácz János, Hámori György

13. Prerequisites	Advanced Flight Theories and Aircraft Structures (KOVRM639), co-requisite; - (-), -; - (-), -

14. Description of lectures

Introduction of mechanic and avionic systems of an aircraft according to the ATA chapter ranking. During the demonstration of the systems, the recently used applications, most widespread solution technics and architecture are presented. The disappearing technical solutions are only mentioned as curiosums. Durint the lecture, each system goal, function, general structure, most important system components and their operation, most commonly emerging maintenance processes, and most frequent problems. The following mechanical systems are introduced: air conditioning, equipment and furnishing, fire protection, flight control, fuel system, hydraulic system, ice and rain protection, landing gear, oxygen system and emergency equipment, pneumatic system, water and waste system, inert gas system, auxiliary power unit, structures, powerplant systems. The demonstrated avionic systems are the following: autopilot, communication, electrical power, indication and instrumentation, lights, navigation, on-board maintenance system and air traffic management system.

15. Description of practices

During the semester aircraft visit is organized in order to demonstrate the aircraft systems in practice. In a hangar, the students can observe the known systems, their components and if possible, their operation.

16. Description of laboratory practices

During the semester aircraft-systems visit is organized in order to show them in practice. In a demonstration lab, the students can observe the known systems, their components and if possible, their operation.

17. Learning outcomes

Knowledge: A1. The student knows the recently most widespread systems applied on aircraft, their goals, functions, structure and operation principles;

Ability: B1. The student can realize and understand an unknown aircraft system, based on aircraft documentation, the function of different components, their effect on each other and their dependence; B2. The student can point out on the system weaknesses;

Attitude: C1. 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; C2. The student cooperates with professors and mates during the studies; C3. The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

Autonomy and responsibility: D1. The student takes responsibility for guiding mates by the highest quality of his/her work and by keeping ethic norms; D2. The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints; D3. The student can friendly accept the well-established constructive criticism and can utilize that in future; D4. The student can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation;

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

Criteria of completing the semester and so getting the signature: participating in 2 aircraft visits and writing a report about them. The final grade is given by examination in the examination period.

19. Opportunity for repeat/retake and delayed completion

Participating in the aircraft visit is obligatory, there is no extra occasion.

20. Learning materials

The presentation about the lectures, simulation guide lines and tutorials provided by the lecturer.

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

Subject description

1. Subject name	**Airworthiness Requirements**				
2. Subject name in Hungarian	Légügyi előírások			**3. Role**	sp
4. Code	**KOVRM641**	**5. Evaluation type**	**m**	**6. Credits**	**3**
7. Weekly contact hours	**0 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for seminars**	14 hours	**Homework**	20 hours
Reading written materials	28 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Veress Árpád
12. Lecturers	Galvácsy Károly

13. Prerequisites	Aircraft Systems and Avionics (KOVRM640), strong; - (-), -; - (-), -

14. Description of lectures

System and the content of the airworthiness requirements. Regulations for aircraft design, production, repair and maintenance; Basic Regulations /(EU)2018/1139 /; Implementing Regulations: Initial Airworthiness /(EU)748/2012/ Part 21 "CS-25" (Certification Specification for Large Aeroplanes); Additional airworthiness specifications /(EU)2015/640/; Part-26 CS-26; Continuing Airworthiness /(EU)1321/2014/, Part –M, Part-145, Part-66, Part-147, Part-T), Airport incl. Security Requirements (EK 300/2008), Special military requirements for air force applications (EMAR).

15. Description of practices

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16. Description of laboratory practices

Access, opening, reading, revising, understanding, analysing and developing (if it is relevant) of documents about airworthiness requirements in printed and electronic formats.

17. Learning outcomes

Knowledge: A1. The student knows and understands the system, processes and the methodology of the airworthiness requirements for having certificate of airworthiness;

Ability: B1. The student can understand and apply airworthiness requirements. She/he can complete and develop tasks, processes and procedures in case of need in conjunction with airworthiness requirements by using available and relevant specifications.

Attitude: C1. 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; C2. The student cooperates with professors and mates during the studies; C3. The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

Autonomy and responsibility: D1. The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms; D2. The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints; D3. The student can friendly accept the well-established constructive criticism and can utilize that in future; D4. The student can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation;

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

The subject closes with the mark given for the performance during the semester. It includes the compulsory participation in the laboratory practice and the evaluation of the performance turned for the task(s) given by the lecturer.

19. Opportunity for repeat/retake and delayed completion

The participation in laboratory practices is compulsory. The replacement is according to the TVSZ (Studying and Examination Regulations).

20. Learning materials

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

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

Subject description

1. Subject name	**Analysis of Aircraft II.**				
2. Subject name in Hungarian	Repülőgépek vizsgálata II.			**3. Role**	sp
4. Code	**KOVRM632**	**5. Evaluation type**	**m**	**6. Credits**	**7**
7. Weekly contact hours	**3 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**210 hours**
Contact hours	70 hours	**Preparation for seminars**	20 hours	**Homework**	50 hours
Reading written materials	58 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Sziroczák Dávid
12. Lecturers	Dr. Beneda Károly, Dr. Sziroczák Dávid, Dr. Veress Árpád

13. Prerequisites	Aircraft design and production I. (KOVRM629), strong; Aircraft analysis I. (KOVRM631), strong

14. Description of lectures

Coordinate systems. Orientation and rotation. Matrix transformations. Euler angles, quaternions, Rodriguez equations. Linear and angular momentum. Euler's equation. Small disturbance theory. State space representation. Complete differentials. Longitudinal and lateral aerodynamic coefficients. Control coefficients. Multibody systems. Simulators, flight control. RPAS technology. Static stability and controllability. Pitching moment. Stick fixed and stick free cases. Trim. CG location and change. Virtual prototyping and analysis of gas turbine components designed within the framework of subject Aircraft design and production I.: CFD simulation of a compressor or turbine stage, structural stress analysis of spool (disc) and blade, eigenfrequency and PSD analysis. Furthermore, in case of interest, CFD analysis of combustion chamber, heat transfer analysis (insulation of the nacelle, turbine blade cooling, secondary flows, etc.) and fatigue assessment (blade, disc and spool).

15. Description of practices

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16. Description of laboratory practices

Demonstration of aircraft analysis methods.

17. Learning outcomes

a) knowledge: - The student knows the preparation of fluid dynamics and structural stress analysis related simulation tasks (CFD simulation of a compressor or turbine stage, structural stress analysis of spool (disc) and blades, eigenfrequency and PSD analysis), the theoretical and practical aspects of the used methods and the evaluation criterions of the results. The student knows the approaches, methods of the analysis process, the characteristics and connections between them. The student knows the used coordinate systems, knows the forms of general equations of motion and the role of Euler's equation;

b) skills: - The student is able to complete CFD simulations, structural stress and vibration analysis using spatially distributed modelling approaches including verification and plausibility check of the results. The student can specify aircraft analysis procedures, determine necessary inputs and outputs and critically evaluate results. The student is able to estimate aerodynamic and control derivatives using literature and simulate aircraft motion in a chosen programming language;

c) attitude: - The student aims to complete his/her specified simulation tasks 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 cooperates with professors and mates during the studies; - The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

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 can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation.

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

Gas turbine analysis: Simulations of gas turbine engine components (2 tasks: compressor or turbine CFD and FEM simulations) based on the steps defined in the subject description via weekly consultations. The outcome of the task is a project report (in MS Word or PowerPoint format). The deadline of completing this document and delivering to the lecturer is the last week of the semester. The students will get grade to the analysis task. The requirement for the midterm grade is the delivered and accepted analysis task. The final grade of the subject equals to the grade given for the analysis tasks.

19. Opportunity for repeat/retake and delayed completion

The delivery date of the calculation documentation is the last week of the semester. If it is not delivered in time, it is also possible to deliver the simulation documentation in the supplementary week besides paying the administration fee.

20. Learning materials

J.D. Mattingly: Elements of Gas Turbine Propulsion, McGraw-Hill, 200-
B.K. Sultanian: Gas Turbines: Internal Flow Systems Modeling. Cambridge Aerospace Series, 20-
A. Boiko, Y. Govorushchenko, A. Usaty: Optimization of the Axial Turbines Flow Paths. Science Publishing Group, 2016, ISBN 978-1-940366-67-8

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

Subject description

1. Subject name	**Computational fluid- and thermodynamics**				
2. Subject name in Hungarian	Hő- és áramlástani számítások			**3. Role**	k
4. Code	**KOVRM606**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	20 hours
Reading written materials	10 hours	**Midterm preparation**	6 hours	**Exam preparation**	10 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Veress Árpád
12. Lecturers	Dr. Veress Árpád

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

14. Description of lectures

Introduction to CFD via industrial applications, Approaches for 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, k-omega and SST 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 boundary conditions at the inlet, Description and characteristics of the most widespread turbulence models, Introduction to discretisation 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, material properties, boundary conditions and their definitions, convergence characteristics, visualisation and presentation of the results in qualitative and in quantitative manner, Completing tutor-guided simulation tasks in ANSYS CFX environment with especial care for heat transfer, compressible and incompressible flow and for supersonic flow.

15. Description of practices

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16. Description of laboratory practices

The students can get experiences in the practical computational steps of the studied CFD methodology by participating in laboratory practices. The following guided simulation tasks are performed during the exercises for example: Flow modelling around a wing profile, CFD analysis of a centrifugal compressor, Numerical flow simulation of particle separation, Free surface flow modelling, CFD analysis of processes developed in combustion chamber, Simulation of turbine stage.

17. Learning outcomes

a) knowledge: A- The student knows the advantages, conditions, application ranges and the theoretical and practical aspects of the most widespread CFD (Computational Fluid Dynamics) methodologies;

b) skills: B- The student can solve CFD simulation tasks independently 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 (in case of interest); B- The student can recognise the fluid and heat transfer phenomena to be improved for increasing the effectivity, can perform the necessary modifications and can check the results of the developments;

c) attitude: C- 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; C- The student cooperates with professors and mates during the studies; C- The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

d) autonomy and responsibility: D- The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms; D- The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints; D- The student can friendly accept the well-established constructive criticism and can utilize that in future; D- The student can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation;

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

Different CFD simulation task (homework) – specified by the lecturer – should be completed by each student via weekly consultations and a project report should be prepared according to the given specifications and format. There will be a midterm exam during the semester about the material given by the lecturer till that time. The midterm exam can be repeated once during the semester in case of absence or having grade unsatisfactory. The homework must be completed till the end of the semester and a grade will be given for that also. The students will get semester grade and so signature for their semester performance as mathematical average of the grade given by the midterm exam and homework in case of these grades are not available or unsatisfactory. The semester work is accepted and the signature is given only in case of the semester grade is exist and is not unsatisfactory. The subject is finished by exam about the full

material given by the lecturer. The final grade is the mathematical average of the semester grade and the grade given for the exam if these are exists and these are not unsatisfactory. If one of these results are not exist or unsatisfactory the final grade is unsatisfactory.

19. Opportunity for repeat/retake and delayed completion

The midterm exam can be repeated once in a semester in case of absence or unsatisfactory results. There is an extra option to complete the midterm exam in the supplementary week (the week followed by the semester directly) in case of absence or unsatisfactory results besides paying the administration fee. The delivery date of the homework is the last week of the semester. If it is not delivered in time, it is also possible to deliver the homework in the supplementary week besides paying the administration fee.

20. Learning materials

The presentation about the lectures, simulation guide lines and tutorials provided by the professor.
John D. Anderson, JR.: Computational Fluid Dynamics, New York, ISBN-10: 0071132104, ISBN-13: 978-0071132107, McGraw-Hill Higher Education; International edition (1995),
Hirsch, Charles: Numerical Computation of Internal and External Flows, Volume 1 and 2, ISBN-10: 0471923850, ISBN-13: 978-0471923855, John Wiley and Sons (2001),
Veress, Á. and Rohács, J.: Application of Finite Volume Method in Fluid Dynamics and Inverse Design Based Optimization, DOI: -5772/38786, ISBN 978-953-51-0445-2 (2012) http://www.intechopen.com/books/finite-volume-method-powerful-means-of-engineering-design/application-of-finite-volume-method-influid-dynamics-and-inverse-design-based-optimization
ANSYS, Inc., ANSYS CFX-Solver Theory Guide, Release - 2, ANSYS, Inc. Southpointe, 275 Technology Derive Canonsburg, PA15317, ansysinfo@ansys.com, http://www.ansys.com, USA, 2012

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

Subject description

1. Subject name	**Computer aided design**				
2. Subject name in Hungarian	Számítógéppel támogatott tervezés (CAD)			**3. Role**	k
4. Code	**KOJSM605**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	20 hours
Reading written materials	12 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Lovas László
12. Lecturers	Dr. Márialigeti János, Devecz János

13. Prerequisites	- (-), -

14. Description of lectures

In this subject, a large spectrum of the advanced computer assisted design tools is presented. Short overview of the parametric 3D CAD systems. Introduction to the top-down design theory. Presentation of reference transmission rules. Surface handling tools: merging, cutting, conversion to solid. Kinetical and kinematical model analysis presentation. Selection possibilities for edges and surfaces, their copy. Setting and verification of the surface slope. Surface loft through various sections. Presentation of curve and surface properties. Building and command of a simple mechanism. Correction of holes, patching. Presentation of lofted unions. Drawing making. Role of the safety theory in the vehicle industry. Notion of failure probability, theoretical and practical estimation of its background. Basic modelling and measuring of irregular load processes. Treatment methods of measured results. Basics of lifetime estimation based on probability theory. Notion of the load collective, its types, standards. Notion of the lifetime curve, its connection to the fatigue curve. Failure probability definition for different load models. Palmgren-Miner and Corten-Dolan methods. Explication of the safety factor based on the probability theory. Lifetime analysis based on the increase of the plastic zone. Methods based on the nominal stress and on the local stress and strain. Cyclic stress-strain curve, cyclic softening and hardening. Strain-lifetime curves and their application in the lifetime computation based on the local deformation process. Bases of the linear elastic fracture mechanics. Handling of structural elements with fractures. Fracture propagation, estimation of remaining lifetime. Fail-safe, safe-life and damage tolerant philosophies.

15. Description of practices

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16. Description of laboratory practices

Individual and guided practice lessons

17. Learning outcomes

a) knowledge: - The student knows the structure of parametric 3D CAD softwares, - knows the Top Down design theory, - knows the principle and tools of surface handling, - knows the basic rules of kinematic and kinetic analysis, - The student knows the theory of random load process, - knows the load analysis tools and the different definitions of failure, - knows the basic rules of small cycle fatigue, - knows the basic rules of linearly elastic fracture mechanics.

b) skills: - The student is able to work in a 3D CAD environment, to build models, and to work on the model of other colleagues, - is able to repair other's models, and to note errors of file conversion, - is able to build animated models, - The student is able to handle a random load process, - is able to find the structure's caracteristic load type form measured data, - is able to analyse load, find the caracteristic values and to estimate lifetime with, - is able to estimate lifetime of a part with a rupture, - is able to work in team.

c) attitude: - The student makes an effort to gather all the available informations in a given domain, - Cooperates with his fellow students and the teacher, - is open minded towards new and innovative ideas and researches, - uses informatical and computational devices for his work

d) autonomy and responsibility: - The student is conscient about his responsibility towards the society and his company, - asks for the colleagues' expertise and judgement when working, - considers challenges with responsibility.

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

1 semestrial project (teamwork), 1 non-compulsory midterm test, 1 shorter homework, 1 exam. Details for computing the final mark can be find in the subject requirements.

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for project work and for the homework

20. Learning materials

Slides and examples in electronic format

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

Subject description

1. Subject name	**Computer aided manufacturing**				
2. Subject name in Hungarian	Számítógéppel támogatott gyártás (CAM)			**3. Role**	k
4. Code	**KOGGM618**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**1 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	18 hours	**Homework**	22 hours
Reading written materials	26 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Markovits Tamás
12. Lecturers	Dr. Markovits Tamás

13. Prerequisites	Advanced materials and technologies (KOGGM601), strong; Computer aided design (KOJSM605), strong; - (-), -

14. Description of lectures

Overview the possibilities of Computer Aided Manufacturing systems (CAM). Application of CAM in case of different production processes. Generation of moving paths and determination of technological data. Different manufacturing strategies. CNC technology and programing. Simulation of production. Reverse Engineering. Additive manufacturing.

15. Description of practices

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16. Description of laboratory practices

Planning the some part of the production in CAM systems. CNC programing. Simulation of manufacturing.

17. Learning outcomes

a) knowledge: Learning the process, the possibilities and limitations of the CAM systems used in the vehicle productions.
b) skills: Able to deepen the practice in CAM systems individually
c) attitude: Openness to the new possibilities of the field
d) autonomy and responsibility: Participate in individual problem solving

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

During the semester 1 midterm test has to be completed with more the 50% of the maximal points.
The reqiurements for obtaining the midterm grade are the taking part on labs, submit the independent task in satisfactory level, completing the midterm test.
The grade is the average of the independent task and the midterm test grades.

19. Opportunity for repeat/retake and delayed completion

The midterm test and the submission of individual task can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Construction of vehicle manufacturing systems I.**				
2. Subject name in Hungarian	Járműgyártás és gyártórendszer tervezés I.			**3. Role**	sp
4. Code	**KOGGM649**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	16 hours
Reading written materials	16 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Markovits Tamás
12. Lecturers	Dr. Markovits Tamás, Dr. Dömötör Ferenc

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

14. Description of lectures

Design procedure of typical manufacturing process parameters, based on plastic deformation of structural materials. Design of machine elements (preliminary products, fitting allowance of technology). Sequence of technological process, selection of machines, selection of individual operations, concentration of operations, cost analysis of the procedure. Structure of manufacturing tools, used in automotive industry. Harmony of the requirements (size, dimensions of the tools). Spring type reaction of the structural material, use of deep drawing method in the automotive industry, special features of deep drawing technology.

Planning processes and system elements for thermal or beam joining (point, arc, laser welding, soldering) technologies for body, vehicle chassis and vehicle elements.

Design steps for system components and processes in welding technology. Introducing internal connections (materials, devices, tools, equipment).

15. Description of practices

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16. Description of laboratory practices

Independent design of system, system components and processes in case of plasting forming and joining processes.

17. Learning outcomes

a) knowledge: Knows the relations in case of forming and welding processes.

b) skills: Ability to develop the processes.

c) attitude: Openness to the new possibilities of the field

d) autonomy and responsibility: Participate in individual problem solving

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.

The reqiurements for obtaining the signature are the taking part on labs, submit the independent task in satisfactory level, completing the midterm test.

The grade can be obtained from the written exam.

19. Opportunity for repeat/retake and delayed completion

Midterm exam can be substitute once, the supplementation of the labs and planing tasks is possible once during the supplementation week.

20. Learning materials

Presentation notes.

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

Subject description

1. Subject name	**Construction of vehicle manufacturing systems II.**				
2. Subject name in Hungarian	Járműgyártás és gyártórendszer tervezés II.			**3. Role**	sp
4. Code	**KOGGM651**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	30 hours
Reading written materials	38 hours	**Midterm preparation**	8 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Pál Zoltán
12. Lecturers	Dr. Takács János, Dr. Göndöcs Balázs, Dr. Szmejkál Attila, Dr. Weltsch Zoltán

13. Prerequisites	- (-), -

14. Description of lectures

Survey of materials of cutting tools and the direction of development. Planning of manufacturing system and system elements for vehicle part-production. In this topic are the followings: planning methods of cutting tools (geometrical planning: chip-space planning, chip disposal planning, cooling solution planning, minimal-greasing), tool production methods: slotmilling, backing off turning, backing off grinding, spark manufacturing. Special tools for hard manufacturing of hybrid materials. Defects: deformations, flash appearence, wearing measurement, renovation of edges, tool sharpening. Tool management systems and economical analyses. Stucture of devices and planning method. Orientation, grip, driving, function, and manufacturing accuracy. manufacturing and renovation of devices. Technological operations, choosing method of machines, machine systems, planning of operation and centralisation of operation and cost analysation. Tooling of machines and devices. Factory planning: method of technical development, planning methods of vehicle production and repair workshops and workplaces on base of project management and requirements of industry - 0. In this topic are the followings: planning of casting-, cutting-, forming-, assembly-, cleaning-, painting-, and repairing workshops and workplaces. New requirements and points of view for building of the future factory.

15. Description of practices

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16. Description of laboratory practices

Studying operating vehicle manufacturing systems. Calibration of tools.

17. Learning outcomes

a) knowledge: Knows the cutting tools and tool systems, knows the tool planning methods, knows the tool production methods, knows the new tool materials, use fields, advantages, disadvantages, knows the planning methods of devices, knows the factory of vehicle production and the workplaces in the factories, knows the new points of view and planning methods of industry, knows the new developments trends and the new requirements.

b) skills: The students can choose the correct engineering method with engineer creativity and can plan cutting tool, device, new workshop, and workplace.

c) attitude: The student wants to learn the knowledgement of subject, he cooperate with the lecturer, in the preparing of excercise, she/he is open to use the newest results of information technology in her/his study and open for use of the new result of industry, and use the new literature in her/his study.

d) autonomy and responsibility: The student feels responsibility for use of the knowledgement in quality. She/he uses the knowledgement with responsibility and regularly develop his study.

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

The students during of semester get homeworks of every part-topic: tool planning, technology planning, device planning, workshop and workplace planning. During the semester the students write one midterm exam. The requirement of the subject: successful midterm exam and the giving of successful home-works for deadline. The final grade is the average of midterm test (50%) and home-works (50%) results.

19. Opportunity for repeat/retake and delayed completion

The midterm exam can be substituted once, the supplementation of one planning work is possible during the supplementation week.

20. Learning materials

E-books and materials provided by the Department.
Serope Kalpakjian: Manufacturing Manufacturing Engineering and Technology (2013)

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

Subject description

1. Subject name	**Control theory**				
2. Subject name in Hungarian	Irányításelmélet			**3. Role**	k
4. Code	**KOKAM142**	**5. Evaluation type**	**e**	**6. Credits**	**3**
7. Weekly contact hours	**2 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**JK**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	42 hours	**Preparation for seminars**	8 hours	**Homework**	0 hours
Reading written materials	13 hours	**Midterm preparation**	12 hours	**Exam preparation**	15 hours

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

Introduction. Recap on the basic concepts of control theory and stability theory (stability conditions, stability of closed loop systems). State space theory (state space representations and properties, transformations). Continuous state space of linear time-variant dynamic systems. Control in state space. State feedback design. Optimal controls. Linear Quadratic Controller Design (LQR). Computer controlled systems. Designing discrete controls. Observability, controllability properties. Stability. State estimation. Kalman filtering. Problems from different means of transport :road, air, logistics. Presentation of design tasks through vehicle, transport and logistic examples. Computer-oriented control theory tasks. Outlook (introductory, problematic). Postmodern techniques. Predictive controls. Error detection and importance in transport. MIMO systems. Nonlinear systems.

15. Description of practices

Implementation of the methods learned during the lectures

16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: - knows the basic dynamic system modeling paradigms, their mathematical background,
- knows the time and frequency range description of linear time-variant systems,
- knows the principles of regulation, their quantitative and qualitative criteria,
- is familiar with various simple feedback control methods,
- knows the basics of modern control theory, the principles of quadratic regulation,
- knows the methods of filter design,
b) skills: - capable of modeling of a specified system,
- is able to independently design a specific system model,
- is able to apply the estimation design methods independently,
- is able to handle the most common control design softwares
c) attitude: - is interested in a mathematical solution to control problems,
- endeavor to effectively apply the word technology knowledge through practical problems,
- acquires system-level thinking
d) autonomy and responsibility: - can independently provide quality and quantity parameters for a system's performance, enabling them to make decisions about system redesign,
- can independently describe a particular system, use the appropriate mathematical formalisms,
- is able to make decisions on the appropriate methods of solving the control task

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

Two midsemester exams, min. 70% presence on lectures and seminars, which are the prerequisite of the final exam. The final grade depends only on the final exam.

19. Opportunity for repeat/retake and delayed completion

Both midsemester exams can be retried once.

20. Learning materials

Lecture Notes, Kailath: Linear Systems, Prentice Hall

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

Subject description

1. Subject name	**Design and testing of railway vehicle systems**				
2. Subject name in Hungarian	Vasúti járművek tervezése és vizsgálata			**3. Role**	sp
4. Code	**KOVRM607**	**5. Evaluation type**	**m**	**6. Credits**	**10**
7. Weekly contact hours	**4 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**300 hours**
Contact hours	84 hours	**Preparation for seminars**	22 hours	**Homework**	60 hours
Reading written materials	122 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Szabó András
12. Lecturers	Németh István, Dr. Balogh Vilmos, Hillier István, Dr. Szabó András

13. Prerequisites	- (-), -

14. Description of lectures

Standard features of the rail vehicle design. Excitation effect of the track. Systemtechnical analysis of railway vehicles. The planning a running facility. Usig movement simulation in the planning procedure. Documentation of the plannind results. Consideration of the operating environment of the vehicle operation. Energetical, mass-stream and info-stream attributions in the plannig. Consideration of the vehicle load-conditions. Real-time simulation methods. Optimization of the components in the vehicle system. Strength computation of the vehicle systems by FEM method. Railway vehicle design project.

15. Description of practices

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16. Description of laboratory practices

The design project connected with the subject needs laboratory work: structure planning (autoCAD), stress analysis (VEM) and solving of further calculation tasks.

17. Learning outcomes

a) knowledge: Understands and applies the mathematical and scientific principles and procedures of the design and analysing of the railway vehicle. Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of railway vehicles design and analysis. Knows and understands the analysing methods and development possibilities of the railway vehicle-technique. Knows and understands the methodology and problem solving techniques of the design and research of railway vehicles.

b) skills: Able to apply in innovative way the required mathematical and scientific principles and procedures for solving the problems connected with the railway vehicles design and analysis. Able to analyze, to evaluate, to document and to develop the methods and informations applied in the railway vehicle design and analysis. Able to global design of the railway vehicles like a complex system on the base of the system approach and the process oriented mentality. Able to execute the condition surveys connected with railway vehicles, and based on this able to elaborate the evaluation and the proposal.

c) attitude: Open and receptive to know and to accept the developments and innovations which are taken place on the field of the speciality of railway vehicles. Accepts the professional and ethical values-system connected with the professional area of the railway. Pursuing to use complex and on system-oriented mentality based approach in the work.

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection of the relevant solution methods. Making decision circumspectly.

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

During the semester there is a midterm test for evaluation of achievements in knowledge and ability. During the semester the FEM task and the complex vehicle design project must be solved (evaluation of knowledge, attitude, autonomy). The marks of the midterm test and the individual tasks are included in the final classification by weight of 50-50%.

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the control works and the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Zobory-Győrik: A maximumelv és a vonatmozgás optimális irányítása. Department's publication.. Bp. 198- , (2- oldal)
Zobory-Zábori: A hullámok terjedése anyagi pontok és rugók által egy hosszú vonatot reprezentáló egyirányban végtelen láncban. Department's publication.. Bp. 198- (- old.)
Győrik: Energetikai szempontból optimális vonatirányítás közelítő meghatározása. Department's publication.. Bp. 199- (20.oldal) Department's publication for planning.

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

Subject description

1. Subject name	**Design of pleasure craft**				
2. Subject name in Hungarian	Kishajó tervezés			**3. Role**	sp
4. Code	**KOVRM625**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	8 hours	**Homework**	15 hours
Reading written materials	40 hours	**Midterm preparation**	0 hours	**Exam preparation**	15 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Simongáti Győző
12. Lecturers	Dr. Simongáti Győző

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

14. Description of lectures

General arrangement of pleasure craft. Hull form optimisation. Design and specification of sail plan and machinery. Aesthetics. Documentation. Case studies.

15. Description of practices

Practice of sub-tasks for pleasure craft design.

16. Description of laboratory practices

-

17. Learning outcomes

a) knowledge: know and understand the theory and practice of pleasure craft design, know the input parameters and boundary conditions, and the calculations and procedures for the preliminary design.

b) skills: based on the knowledge above the student is able to determine the main dimensions of a vessel for a given generally described scope of work, able to prepare a general arangement drawing, preliminary technical description, lines plan and other drawings repateed to preliminary design. Able to use the Internet and CAD software for his/her work.

c) attitude: interested, responsive, take care for the deadlines

d) autonomy and responsibility: the student makes responsible decisions, asks for the professional opinions of others, and takes care of the challenges responsibly.

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

Requirements for signature: 1 semestrial home work

1 exam measuring the theoretical knowledge,

the final result is the average of the parts

19. Opportunity for repeat/retake and delayed completion

Second exam and delayed submission of the homework

20. Learning materials

Dr. Simongáti: Kishajók (in Hungarian)
Dr. Simongáti: Kishajók II. (2018)(in Hungarian)
Sailing Yacht design: Theory
Sailing Yacht design: Practice
Larson: Principles of Yacht Design

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

Subject description

1. Subject name	**Design of Vehicle Automation Systems**				
2. Subject name in Hungarian	Járműautomatizálási rendszerek tervezése			**3. Role**	sp
4. Code	**KOKAM661**	**5. Evaluation type**	**e**	**6. Credits**	**7**
7. Weekly contact hours	**2 lecture**	**0 practice**	**4 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**210 hours**
Contact hours	84 hours	**Preparation for seminars**	32 hours	**Homework**	84 hours
Reading written materials	0 hours	**Midterm preparation**	0 hours	**Exam preparation**	10 hours

10. Department	Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer	Dr. Bécsi Tamás
12. Lecturers	Dr. Gáspár Péter, Dr. Bécsi Tamás, Dr. Aradi Szilárd

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

14. Description of lectures

The main purpose of the subject is to apply the knowledge gained in performing an independent design laboratory task. This is done by the student under the support and supervision of a consultant. Students cover either their own project idea or the full development cycle of the task assigned by the lecturers. On the basis of their knowledge acquired during the course, the students are engaged in a research or development process. The steps are as follows:

- Understanding the problem, studying existing solutions and methods.
- Specification, choose a project schedule and platform.
- Development in which the goal is to develop the task
- Testing, verification and validation
- Documentation and presentation, during which the student prepares the documentation of the whole development process and presents the presentation about the completed task.

During this exercise, the student will hold a weekly consultation with his / her consultant, who will monitor and evaluate the progress

15. Description of practices

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16. Description of laboratory practices

The student will attend weekly consultation with his / her consultant, who will monitor and evaluate the progress

17. Learning outcomes

a) knowledge:
b) skills:
- capable of breaking down a project task into elements based on specification,
- is able to design a development process,
- is able to track and document a development process

c) attitude:
- is open to independently carry out development tasks

d) autonomy and responsibility:
- is able to make responsible decisions in a development project

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

The completed and documented work will be presented by the student at the verbal exam, which determines the final grade. The prerequisite of the exam is the succesful fulfilment of the individual task.

19. Opportunity for repeat/retake and delayed completion

The individual task cannot be delayed completed.

20. Learning materials

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

Subject description

1. Subject name	**Detailed Maintenance Process Procedure**				
2. Subject name in Hungarian	Karbantartási folyamat eljárásrendszere			**3. Role**	sp
4. Code	**KOVRM644**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**1 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	14 hours	**Homework**	30 hours
Reading written materials	34 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Veress Árpád
12. Lecturers	Galvácsy Károly

13. Prerequisites	Aircraft Design Steps and Manufacturing (KOVRM642), strong; Aircraft Maintenance and Documentation (KOVRM643), co-requisite; - (-), -

14. Description of lectures

Having information, knowledge and experiences in processes, procedures and methods of maintenance and repair via the following topics: Evolution of Aircraft Maintenance Program Development, MSG-3 Document, Maintenance Review Board Report, Operators Aircraft Maintenance Program, Compilation of an Actual Aircraft Maintenance Work Pack and Maintenance Plan.

15. Description of practices

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16. Description of laboratory practices

Accessing, opening, reading, revising, understanding, analysing, developing (if it is relevant) and filling (in case of need) of documents about maintenance process procedures in printed and electronic formats.

17. Learning outcomes

Knowledge: A1. The student knows and understands the system, processes, procedures, methods and their conditions for applications including the corresponding documentations of aircraft maintenance and repair;

Ability: B1. The student can understand, apply, use and develop (in case of interest) processes, procedures and methods of aircraft maintenance including the relevant documentations.

Attitude: C1. 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; C2. The student cooperates with professors and mates during the studies; C3. The student continuously increases his/her knowledge independently by having information from the external literature to complete his/her studies given by the lectures;

Autonomy and responsibility: D1. The student takes responsibility for guiding mates by the quality of his/her work and by keeping ethic norms; D2. The student takes responsibility for applying the knowledge in line with the studied conditions, limitations and constraints; D3. The student can friendly accept the well-established constructive criticism and can utilize that in future; D4. The student can accept the form of the cooperation; he/she can work alone or in a team member depends on the actual situation;

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

The condition for fulfilling the subject is to get a mark at the end of the semester. The mark is given by the lecturer for the quality of the completed task(s) during the semester and the performance of all the lab exercises. The requirement for getting mark is the attendance of all the lab exercises.

19. Opportunity for repeat/retake and delayed completion

The participation in laboratory practices is compulsory. The replacement and last possibility for completing the task is according to the TVSZ (Studying and Examination Regulations).

20. Learning materials

Lecture notes, materials and documentations in printed or electronic version.

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

Subject description

1. Subject name	**Diesel and electric traction**				
2. Subject name in Hungarian	Dízel- és villamos vontatás			**3. Role**	sp
4. Code	**KOVRM610**	**5. Evaluation type**	**e**	**6. Credits**	**5**
7. Weekly contact hours	**3 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	10 hours	**Homework**	10 hours
Reading written materials	42 hours	**Midterm preparation**	12 hours	**Exam preparation**	20 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Szabó András
12. Lecturers	Dr. Szabó András, Hillier István, Kiss Csaba

13. Prerequisites	- (-), -

14. Description of lectures

Design properties of railway Diesel engines, dynamical processes of injection and control systems. Turbocharging systems of railway diesel engines. Analysing of the vibrations caused by powertrain elements. Functional properties of Diesel-hydraulic and Diesel-electric powertrain systems, machine-group optimization, transient operation processes. Energy supply of the electric vehicles, pantograph systems, protection and safety-technique features. Electro-mechanical and controlled systems of the electric traction units. Analysis of the work done and energy-consumption of Diesel and electric traction units.

15. Description of practices

In the framework of practical lessons solving tasks connected with the themes of the lectures. Suiting of the transmission systems elements, determination of the interaction curves.

16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: Understands and applies the upload systems of railway diesel engines and the theoretical background of their operation. Understands and can apply the mathematical procedures which are appropriate to solve the problems of the railway power transmission. Understands and competently applies the methods which are appropriate to determine the characteristics of the energetic and environment-load of railway traction.

b) skills: Able to apply the required mathematical and technological knowledge for solving the problems of the railway traction. Able to identify, to evaluate and manage by system-approach the effect mechanism of the railway traction systems and processes. Able to execute the condition surveys connected with diesel and electric traction, and based on this able to elaborate the complex developing proposals.

c) attitude: Open and receptive to know the development possibilities and knowledges which are taken place on the field of the railway traction. Accepts the professional and ethical values-system connected with the professional area of the railway. Pursuing to develop of new the methods and tools connected with the railway traction. Pursuing to use complex and on system-oriented mentality based approach in the work.

d) autonomy and responsibility: Pro-activity in the solution of professional tasks, the self-standing application of the knowledges.

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

During the semester there is necessary the individual solving of some tasks (ability, attitude, responsibility). The criterion of signature is both the active participation at the class (attitude), and the complete solving of the semester's tasks (knowledge, ability, autonomy). During the semester there is necessary to successfully write two midterm tests (knowledge, ability, autonomy). In the fields of attitudes and autonomy the results achieved in the semesters are included in the final classification by weight 50%. At the end of semester there is an examination (knowledge, ability, attitude).

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the control works and the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Gábor P.: Villamos vasutak. Department's publication.
Varga J. (sz): Vasúti Diesel-vontatójárművek, Technical Pulisher, Bp. 197-
Szüle D.: Hidrodinamikus erőátvitel. Techical Publisher, Budapest, 197-
Zobory I.: Hidrodinamikus erőátvitel. Department's publication. BME VJT, Bp. 200-
Szabó A.: Villamos erőátvitel. Department's publication, BME VJT, Bp. 200-
Varga Jenő: Vasúti diesel vontatójárművek. Bp. 197-
Other department's publications.

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

Subject description

1. Subject name	**Discrete Control Design**				
2. Subject name in Hungarian	Diszkrét irányítások tervezése			**3. Role**	sp
4. Code	**KOKAM658**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	20 hours
Reading written materials	8 hours	**Midterm preparation**	8 hours	**Exam preparation**	10 hours

10. Department	Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer	Dr. Gáspár Péter
12. Lecturers	Dr. Gáspár Péter, Dr. Bécsi Tamás

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

14. Description of lectures

System Theory, Theory of Linear Time-Variable Dynamic Discrete Time Systems. Z-transformation. Dynamics and mathematical description of discrete time systems. Design of P, PI and PID controllers. State feedback. Designing observers.

In the second half of the subject, high-level control planning and optimization techniques are described. Soft Computing Methods, Fuzzy Theory, Genetic Algorithms, Optimization.

15. Description of practices

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16. Description of laboratory practices

Implementation of the methods learned during the lectures, by using MATLAB, Simulink and embedded platforms

17. Learning outcomes

a) knowledge:
- is familiar with the theory of describing discrete time linear systems
- knows the basic discrete regulatory design and monitoring design principles
- knows the basics of Fuzzy systems
- knows the basics of genetic algorithms

b) skills:
- is able to design and analyze discrete linear controllers
- is able to apply basic soft-computing techniques

c) attitude:
- is interested in modern IT solutions
- capable of algorithmic thinking that can be applied in other areas,

d) autonomy and responsibility:
- in addition to known environments, it is able to acquire other unknown program languages and development tools in autodidact

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

Two midsemester exams, which are the prerequisite of the final exam. The final grade depends only on the final exam.

19. Opportunity for repeat/retake and delayed completion

Both midterm exams can be retried once.

20. Learning materials

Lecture Notes

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

Subject description

1. Subject name	**Dynamics of vehicle, active- and passive safety**				
2. Subject name in Hungarian	Járműdinamika, aktív- és passzív járműbiztonság			**3. Role**	sp
4. Code	**KOGJM641**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	10 hours
Reading written materials	18 hours	**Midterm preparation**	8 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Török Árpád
12. Lecturers	Dr. Melegh Gábor, Dr. Török Árpád, Vida Gábor

13. Prerequisites	- (-), -

14. Description of lectures

Force on the wheel of the vehicle, modern wheel models, static and dynamic geometric characteristics of the wheel from the point of view of road safety. Analyzing the torque and force ratios of the power transmission system, examining its dynamic characteristics. Geometric design of wheel suspension, use of individual suspension elements. The vibration analysis of the vehicle is the element of the suspension. Dynamic testing of the braking of the vehicle, methods of dividing the braking force per axle, the basic schemes of the braking system, the characteristic use of each element. Dynamic analysis of steering, typical use of individual elements (trapezoidal arm, track bar, steering wheel, steering wheel and shaft, ball joints). Presentation of software suitable for the development of vehicle dynamics models, longitudinal and transverse vehicle dynamics, tools of regulation. Dynamic analysis and modeling of rollover processes. The elements of active and passive vehicle safety are: the presentation of vehicle dynamical control systems, systems for mitigating the consequences of accidents, and familiarizing them with their operational characteristics. A detailed description of the sensors and actuators required for the operation of the above systems, the possibilities of using the data stored in these and their control units in the investigation of accidents, during the reconstruction of the vehicle's movement.

15. Description of practices

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16. Description of laboratory practices

Creating dynamic models using theoretical knowledge, critical analysis of selected vehicle or vehicle unit, subsystem based on traffic safety considerations.

17. Learning outcomes

a) knowledge: - The student has to know the basic system components defining the dynamic properties of the vehicle; - The student has to know the basic relationships of vehicle dynamics; - The student has to know the most important methods of vehicle dynamics models; - The student has to know the road safety effects of vehicle dynamics; - The student has to be familiar with the operation of the related passive road safety systems; - The student has to be familiar with the operation of related active traffic safety systems;b) skills:

b) skills: - The student is able to build a simplified dynamic vehicle model; - The student is capable of describing and using vehicle dynamic equations; - The student is capable of employing applications to determine vehicle dynamic characteristics;

c) attitude: - The student aims to maximize their abilities by making their studies at the highest possible level, proficient and independent; - The student aims to cooperate with the instructor and the other students to improve knowledge; - The student aims to continue to imrpove the knowledge of the material parts of the lessons through continuous independent learning; - The student aims to use the information technology and computing tools (word processing computer software, mathematical software, image editing software, etc.), but also seeks to use classical devices (paper, ruler, pencil, hand-held calculator, editing, etc.); - The student aims to get to know and routinely use the tools needed to solve the tasks - The student aims to provide accurate, error-free and precise work.

d) autonomy and responsibility: - The student is responsible for setting an example forthe other students rgarding the quality of its work and ethical standards; - The student applies the knowledge acquired during the course in a responsible manner with regard to their validity limits; - The student accepts openly the grounded critical remarks; - The student accepts the framework for cooperation, can do its job independently or as part of a team, depending on the situation. ”

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points. The conditions for obtaining the signature are the completing the midterm test, attending all labs and submitting the homework on accepted level. Final outcome of the subject is defined by the result of the mid-term exam in 30% proportion, the homework in 20% proportion, and the final exam in 50% proportion. All requirements have to be fulfilled to successfully finish the subject.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once. The homework can be delivered once additionally. One lab can be done once additionally.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Electronics – electronic measurement systems**				
2. Subject name in Hungarian	Elektronika - elektronikus mérőrendszerek			**3. Role**	k
4. Code	**KOKAM103**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**JK**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	8 hours	**Homework**	0 hours
Reading written materials	52 hours	**Midterm preparation**	18 hours	**Exam preparation**	0 hours

10. Department	Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer	Dr. Szabó Géza
12. Lecturers	Dr. Szabó Géza, Dr. Hrivnák István, Dr. Borbás Lajos

13. Prerequisites	- (-), -

14. Description of lectures

It provides engineering knowledge (and develops BSc knowledge further) about the basic theory of electronics and electronic measurement systems, about modeling them, and about their use in transport systems. Introduces students to the operating principles of the basic elements of electronics and measurement technology, the modeling and analysis methodology of circuitry with active circuit elements. It reviews the methods of measuring various electrical and mechanical quantities and the possibilities of processing the measurement results. It illustrates the possibilities of use through various examples of transport sectors.

Topics: Basics of network analysis, Four Pole Theory; analysis rules for circuit elements and networks. Use of active electronic devices in switching mode, analyzing switched operation. Use of active electronic devices in linear operation; small signal AC models of components and networks and analyzing such networks. The use of operational amplifiers (OpAmps). Frequency dependency, frequency dependent amplifiers.

Basics of measurement technology, measurement theory. Measurement of signals and signal parameters. Measurement characteristics of signaling and signal transformation. Measurement characterization of signal sources. Signal analysis tools. Review of measurement errors in measurement systems, failure analysis and measurement accuracy issues. Transmitters and transducers of the measuring system. Measuring circuits. Features and tools for signal processing and data storage. Measurement of basic electrical parameters. Voltage measurement, current measurement. Frequency and time measurement. Measuring instruments and measuring tools, calibration. Time and frequency domain. Measurements in the frequency domain. Possibilities of electronic measurement of mechanical quantities. Application of computerized measurement environments for measurement, data collection tasks; signal processing methods. Practical demonstration and active measurement with a special mechanical tension and strain gauge. Failure analysis of equipment and subsystems containing rotating elements using noise and vibration tests.

15. Description of practices

Application of the principles presented on the lectures

16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: understand and can apply the circuit analysis techniques of electronic circuits; has knowledge of measurement and measurement theory related to transport and vehicle engineering.

b) skills: able to analyze or specify electronic sub-systems (eg. motor control or safety traffic control devices) in the field of transport and vehicle.

c) attitude: to participate in solving electric problems in the field of transport or vehicle, to work efficiently and willingly with specialists of other fields (in particular: electrical engineering)

d) autonomy and responsibility: he/she is aware of and treats the responsibility associated with the task solution during electronic system analysis and specification.

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

Two midterm tests. The final result based on the average of the tests.

19. Opportunity for repeat/retake and delayed completion

One test can be retried at the end of the semester

20. Learning materials

Lecture Notes

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

Subject description

1. Subject name	**Engine design I.**				
2. Subject name in Hungarian	Motortervezés I.			**3. Role**	sp
4. Code	**KOGGM670**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	0 hours
Reading written materials	28 hours	**Midterm preparation**	8 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Zöldy Máté
12. Lecturers	Nyerges Ádám, Dr. Bárdos Ádám, Dr. Szabados György

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

14. Description of lectures

Grouping motor simulations. Acoustic motor simulation models, basic equations. Flow, pressure loss and heat transfer in suction and exhaust systems. Acoustic effects and their utilization. Flow junctions. Valve flows, geometry and construction of the combustion chamber. Aspects of hole-stroke ratio, valve dimensions and compression ratio selection. Modeling of combustion processes, main parameters. Laws of Wall Loss. Modeling the motor's mechanical loss. Determining the engine fill pressure and the required fuel dose to achieve the specified power target. Fitting and cooperating with the internal combustion engine. Reduced Characteristics of Uploaders. Regulation of Uploaders. Mechanical and thermal stress on the engine piston. Design and geometry of the piston. The main aspects and methods of scaling. Plunger studs and loads, design procedures.

15. Description of practices

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16. Description of laboratory practices

Planning the combustion space of the engine to be designed, preparing the main workflow simulation, and analyzing the piston's structure.

17. Learning outcomes

a) knowledge: Knowledge of vehicle testing methods.
b) skills: Ability to develop Vehicle Test Methods
c) attitude: Openness to new opportunities in the field
d) autonomy and responsibility: Participate in solving independent tasks

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.
The conditions for obtaining the signature are the completing the midterm test. Final grade equals to the result of the written exam.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Engine design II.**				
2. Subject name in Hungarian	Motortervezés II.			**3. Role**	sp
4. Code	**KOGGM671**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	0 hours
Reading written materials	58 hours	**Midterm preparation**	18 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Zöldy Máté
12. Lecturers	Nyerges Ádám, Dr. Bárdos Ádám, Dr. Szabados György

13. Prerequisites	Engine design I. (KOGGM670), strong; - (-), -; - (-), -

14. Description of lectures

Theoretical questions of engine design. Conditions for cylinder design, engine block selection. Crankshaft Engine Structure. Features of its components, solutions used in automotive engines. Crankshaft, flywheel dimensioning. Methods of mass balancing. Usual solutions. Main bearing cover design, material selection. Essential aspects of valve control, customary solutions, design features. Sizing and selecting material for cylinder head. Technical documentation for the engine design. Typical design, design, dimensioning of engine parts. Developing your lubricating, cooling and starting system.

15. Description of practices

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16. Description of laboratory practices

Calculating, drawing and consulting parts based on the engine's main workflow calculation.

17. Learning outcomes

a) knowledge: Knowledge of engine design.
b) skills: Ability to design an internal combustion engine
c) attitude: Openness to new opportunities in the field
d) autonomy and responsibility: Participate in solving independent tasks

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

In the course of the semester, 1 midterm test shall be completed. The result of closure matched if more than 50% of the maximum score was achieved.
The condition for obtaining a midterm grade is a qualified midterm test. Final grade equals to the result of midterm test.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Environment Sensing in the Vehicle Industry**				
2. Subject name in Hungarian	Járműipari környezetérzékelés			**3. Role**	sp
4. Code	**KOKAM656**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	0 hours
Reading written materials	24 hours	**Midterm preparation**	12 hours	**Exam preparation**	10 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, Törő Olivér

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

14. Description of lectures

The course aims the studying of the technologies developed for the tasks of environment sensing of an automated vehicle, the currently available technologies and the corresponding signal processing techniques.

First, the course introduces the inner sensors of the vehicles, such as position, velocity, translation or rotation, basics of their physical operation and their limitations. After this, the main principles of environment sensing, such as ultrasonic, radar, lidar and machine vision systems are introduced through application examples. To strengthen the robustness of the collected data, several typical sensor fusion techniques are also studied.

15. Description of practices

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16. Description of laboratory practices

During the laboratory courses of the subject, The main goal is the software implementation of the knowledge and methods learned during the lecture and the examination of the known algorithms .

17. Learning outcomes

a) knowledge:
- is familiar with the sensors for measuring vehicle status, their operating principles,
- is familiar with the possibilities and limitations of environmental sensors used today (Radar, Lidar, Ultrasound, Camera Systems),
- is familiar with the sensory fusion techniques used in environmental sensing,
- is familiar with the methods of processing the data of environmental sensors,

b) skills:
- can interpret the data of different sensors,
- is able to design an algorithm for simple determination of the environmental situation based on sensor data,
- is able to select an appropriate sensor architecture for the implementation of a designated driving support / autonomous vehicle function

c) attitude:
- is interested in the latest developments of automotive sensors
- is interested in the algorithmization aspect of the sensor information processing tasks

d) autonomy and responsibility:
- Being able to work in a team responsibly to design an autonomous vehicle function

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

Final exam can be taken in case the two midsemester exams are succesful

19. Opportunity for repeat/retake and delayed completion

One exam can be retried at the end of the semester

20. Learning materials

Lecture Notes

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

Subject description

1. Subject name	**Fixing and sealing**				
2. Subject name in Hungarian	Kötés és tömítéstechnológia			**3. Role**	sp
4. Code	**KOGGM650**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	14 hours	**Homework**	12 hours
Reading written materials	24 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Bán Krisztián
12. Lecturers	Dr. Markovits Tamás, Dr. Göndöcs Balázs

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

14. Description of lectures

Advanced joining technologies used in vehicle productions. Laser joining and other processes. Methods and tools for testing the defects of the joints.

Materials, constructions and assembly technologies of the applied static and dynamic seals in vehicle components. Methods and tools of tightness test and troubleshooting.

15. Description of practices

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16. Description of laboratory practices

Realisation and test of the joining techniques.

Implementating sealing solutions and performing sealing test.

Development of adhesive technology in independent student task.

17. Learning outcomes

a) knowledge: Understanding the presented sealing and joining processes.

b) skills: Ability to develop the technologies.

c) attitude: Openness to the new possibilities of the field

d) autonomy and responsibility: Participate in individual problem solving

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

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

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once. The planning task can be delivered once additionally. One lab can be done once additionally.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Instrumental tests for motor vehicles, measurement technology**				
2. Subject name in Hungarian	Gépjárművek műszeres vizsgálata			**3. Role**	sp
4. Code	**KOGGM668**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**0 lecture**	**0 practice**	**4 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	28 hours	**Homework**	30 hours
Reading written materials	6 hours	**Midterm preparation**	0 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

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15. Description of practices

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16. Description of laboratory practices

In line with the advanced needs of advanced vehicle engineer training, it introduces students to vehicle testing methods and vehicle-specific measurement techniques. Students will learn the methods and tools of dynamic test track measurements. During vehicle dynamics measurements, the behavior of each vehicle system is also focused, such as the braking system, steering system or chassis. According to the development direction of the age, the HIL practices of the test pad are also part of the subject. In addition to vehicle dynamics measurements, it is also important to learn the methods of roadside metering and roller bed benchmarking. Engine brake pad measurements are used to describe the state of the art combustion engine testing methods. But it is not only research that is closely related to development that has been included in the subject matter, but we also introduce the subject's students to the most modern diagnostic systems of our day. Laboratory measurements with test report preparation.

17. Learning outcomes

a) knowledge: Knowledge of vehicle testing methods.

b) skills: Ability to develop Vehicle Test Methods

c) attitude: Openness to new opportunities in the field

d) autonomy and responsibility: Participate in solving independent tasks

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.

The midterm grade is defined by the result of the mid-term exam in 60% proportion and the homework in 40% proportion. All requirements have to be fulfilled to successfully finish the subject.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once. The homework can be delivered once additionally.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Measurement systems in vehicle manufacturing**				
2. Subject name in Hungarian	Járműgyártási méréstechnika			**3. Role**	sp
4. Code	**KOGGM652**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	18 hours
Reading written materials	46 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Hlinka József
12. Lecturers	Dr. Bánlaki Pál

13. Prerequisites	- (-), -

14. Description of lectures

Basic concepts of measurement technology, measurement methods, measurement errors, systematic errors, accidental errors, law of error summing. Measuring instruments: length gauges, constant values (measuring columns, gauges), variable length gauges, mechanics (caliper, micrometer, fine probes, gauges), optical (optometer, length measuring machine, workshop microscope, laser interferometer), angular measuring tools, methods, pneumatic, electrical sensors and measuring systems. Coordinate measuring machines, spatial measurements.

Typical measurement tasks and tools: shape failure measurements, position error measurements, surface characteristics (surface roughness, topography), gear measurements, thread measurements.

Design of measurement technology, within the system and at the finished piece. Measuring tool management.

Automatic size control. Surface digitization. Process measurement technology (temperature, vibration, force, torque, etc.), monitoring systems.

Calibration and calibration of measuring instruments. Statistical Process Control (SPC).

15. Description of practices

-

16. Description of laboratory practices

Complex Measurements (length, shape, surface, 1D, 2D, 3D measurements. 3D surface and shape digitising, scanning methods.

17. Learning outcomes

a) knowledge:

The student has to know the basic measurement procedures and equipments used inthe course of vehicle manufacturin processes.

The student has to know the theoretical basics of metrology, the problems to be solved in the XXI. century, and the demands connected tp to Industry - 0 progress.

b) skills:

The student is able to apply the learnt procedures and equipments in a professional way.

The student is able to support the related research and development processes.

c) attitude:

Strives for active participation in lectures and practices.

d) autonomy and responsibility:

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

Apply responsibly the knowledge acquired during the course with regard to their validity limits.

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

The conditions for obtaining the midterm grade are the completing the midterm test (40%), taking part on all the labs, and submiting an acceptable individual task (60%).

There is an opportunity to make up each tasks on the base of ad hoc discusssions.

19. Opportunity for repeat/retake and delayed completion

The midterm test and the individual task can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Measurement techniques and signal processing in vehicles**				
2. Subject name in Hungarian	Jármű méréstechnika és jelanalízis			**3. Role**	sp
4. Code	**KOKAM635**	**5. Evaluation type**	**e**	**6. Credits**	**8**
7. Weekly contact hours	**4 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**240 hours**
Contact hours	84 hours	**Preparation for seminars**	22 hours	**Homework**	60 hours
Reading written materials	42 hours	**Midterm preparation**	12 hours	**Exam preparation**	20 hours

10. Department	Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer	Dr. Soumelidis Alexandros
12. Lecturers	Dr. Soumelidis Alexandros

13. Prerequisites	- (-), -

14. Description of lectures

Instrumental sensing, measurement as a means of obtaining information and cognition. The role of measurements in the design and operation of vehicle systems. The measurement process. Simple and complex sensors, smart sensors. The concept of sensory fusion. Sensor systems, sensor networks Measuring tools, signal transducers, samplers, quantizers, processing devices. Measuring basic physical quantities. Characteristics of measurement, reduction of errors. Measuring the dynamic energy and thermal characteristics of vehicles. Specificity of instruments used for measurement. Construction of measuring systems for laboratory and operational measurements. Treatment of measurement signals using classical and electronic data collection systems. Measurement of complex vehicle systems. Measuring the status of systems. Status estimation and parameter estimation based on system model. The Principle of Kalman Filtering. System parameter estimation, system identification. Methods to increase the reliability of measurement, redundancy, diversity.

Classification of signals. Signal representations, time and frequency domain, parametric and nonparametric descriptions. The basic methods of signal analysis. Signal Processing Algorithms. Digital signal processing. Hardware and software tools for embedded computing. Devices for distributed task solving. Communication tools, wired and wireless networks. Communication networks, sensor networks. Application of signal processing in vehicle systems. Object and Event Detection. Application in vehicle control systems.

15. Description of practices

-

16. Description of laboratory practices

The course is complemented by laboratory measurements that demonstrate the microcomputer realization of basic measurement and signal processing systems.

17. Learning outcomes

a) knowledge:

Understands and applies circuit analysis techniques for electronic circuits; has knowledge of measurement and measurement theory related to transport, engineering and transport.

b) skills:

Is capable of analyzing or specifying electronic sub-systems (eg motor control or safety control devices) in the field of transport and vehicles.

c) attitude:

Participates in solving electrical problems in the field of transport or vehicles, works efficiently and willingly to work with specialists in other fields (especially electrical engineering)

d) autonomy and responsibility:

Is aware of, and manages the responsibilities associated with, the task solution during electronic system analysis and specification.

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

Two midterm exams and an individual home work which are the prerequisite of the final exam

19. Opportunity for repeat/retake and delayed completion

The midterm exam can be retried

20. Learning materials

Lecture Notes

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

Subject description

1. Subject name	**Mechanics of superstructure materials**				
2. Subject name in Hungarian	Szerkezeti anyagok mechanikája			**3. Role**	sp
4. Code	**KOJSM663**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	20 hours
Reading written materials	12 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Béda Péter
12. Lecturers	Dr. Béda Péter

13. Prerequisites	- (-), -

14. Description of lectures

Material modelling. Role of the constitutive equations, their build up and construction. Material law types. Types of behaviour based on material science experiments. Presentation of elastic and plastic bodies, methods for studies. Rheological models, examples of application.

15. Description of practices

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16. Description of laboratory practices

Individual and guided practice lessons

17. Learning outcomes

a) knowledge:
- The student knows the notion and composition of a constitutive equation,
- knows the material types and the matematical tools needed for their description,
- Knows the modern measuring processes in material study.
- knows the mathematica tools to describe elastic and plastic bodies.
- knows the rheological models and their typical field of application.

b) skills:
- The student is able to identify the type of a given material and to choose the appripriate measuring process.
- is able to discuss the result of a measurement process.
- is able to assemble the appropriate constitutive equation based on measurement results.
- is able to identify the material equation's constants from measurement data.

c) attitude:
- The student makes an effort to gather all the available informations in a given domain,
- Cooperates with his fellow students and the teacher,
- is open minded towards new and innovative ideas and researches,
- uses informatical and computational devices for his work

d) autonomy and responsibility:
- The student is conscient about his responsibility towards the society and his company,
- asks for the colleagues' expertise and judgement when working,
- considers challenges with responsibility.

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

The requirement of the signature determined by the points from 1 semestrial homework, and additionally 1 non-compulsory test. Final grade from exam (100%)

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for homework

20. Learning materials

Lecture notes

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

Subject description

1. Subject name	**Mechatronic design of vehicle systems**				
2. Subject name in Hungarian	Gépjármű-mechatronikai rendszerek tervezése			**3. Role**	sp
4. Code	**KOGGM622**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	58 hours
Reading written materials	18 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Rövid András
12. Lecturers	Nyerges Ádám

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

14. Description of lectures

Elektromechanics fundaments
Electric machine types
Construction of electric machines
Losses, temperature rise and cooling of electric machines
Modeling of electric machines
Power electronics
Losses, temperature rise and cooling of power electronics
Control of actuators
Connectors
Automotive requirements of mechatronic systems
Complex mechatronic systems

15. Description of practices

-

16. Description of laboratory practices

Self chosen mechatronic system evaluation

17. Learning outcomes

a) knowledge: Knowledge of Mechatronics
b) skills: Ability to develop mechatronic units
c) attitude: Openness to new opportunities in the field
d) autonomy and responsibility: Participate in solving independent tasks

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

An individual task fullfilment is required for the midterm grade. The final mark will be provided taking the individual task result into account.

19. Opportunity for repeat/retake and delayed completion

Individual taks replacement one

20. Learning materials

Slides

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

Subject description

1. Subject name	**Mechatronics, microcomputers**				
2. Subject name in Hungarian	Mechatronika és mikroszámítógépek			**3. Role**	k
4. Code	**KOKAM604**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	4 hours
Reading written materials	18 hours	**Midterm preparation**	24 hours	**Exam preparation**	0 hours

10. Department	Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer	Dr. Gáspár Péter
12. Lecturers	Lövétei István

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

14. Description of lectures

The developement and disciplines of mechatronics. Theoretical structures of automats (controlled and regulated machines). A historical overwiev of the development of computing. Integrated circiut technology. Generation of microcontrollers, its main types. Main elements of robot controllers (overwiev). Sensors, actuators. Programming of embedded systems. Tools of the hardware engineering (AutoCad, OrCad, Protel). Simulation softwares (Symula, MatLab). Motor controlling, regulation. Pneumatic machines. Transport application examples (cars platoon on public roads, the 75 Hz train controlling system).

15. Description of practices

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16. Description of laboratory practices

Microcontroller - type 8051 - programming by Assembly and C languages. Machine and compiled languages in microcomputer programming. Architectures of microcontrollers, push button and led controlling. Programming of cloks, timers, interrupts and AD converters. Programming of virtual display and Num Pad.

17. Learning outcomes

a) knowledge:
- knows the basics of building embedded systems
- knows the basic serial communication techniques
- knows the basic principles of A / D and D / A conversion
- knows basic signal processing algorithms

b) skills:
- capable of programming embedded systems
- is able to design data collection systems

c) attitude:
- is interested in modern IT solutions

d) autonomy and responsibility:
- is able to apply the knowledge acquired here to other similar, yet unknown systems.

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

2 midterm exams from theory and two individual programming task (one ASM code, one C code). The final grade is the mean of the grades of the four tasks.

19. Opportunity for repeat/retake and delayed completion

Both midterm exams can be retried once, both individual tasks can be delayed completed.

20. Learning materials

Chew/Sen Gupta: Embedded Programming, Second Edition, 2008, ISBN: 978-0-9800541-0-1, Lecture notes

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

Subject description

1. Subject name	**Numerical methods**				
2. Subject name in Hungarian	Numerikus módszerek			**3. Role**	k
4. Code	**KOVRM121**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**1 lab**	**8. Curriculum**	**AJK**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	11 hours	**Homework**	20 hours
Reading written materials	35 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Rohács József
12. Lecturers	Dr. Bicsák György

13. Prerequisites	- (-), -

14. Description of lectures

Introduction: scope of lectures, content and requirements. System analysis, model generation, modelling and simulation. General models, simplifications. Source of errors, model types and solution possibilities. Analytic, geometric and numerical solutions. Functions, vectors, matrices, basic operations. Classical and floating-point error-calculation. Sensitivity and numerical stability. Investigation of solution technics. Representing the solutions, evaluation. Solution of system of equations. Single variable, non-linear equations. Successive approximation, Newton iteration and secant method. Solution of polynomial equation. Horner method and Newton-method. Numerical solution of linear system of equations. Gauss-elimination and LU decomposition. Numerical solution of Eigenvalue problem. Extremum problems, optimization. Linear programming, simplex method. Optimization of non-linear functions. Non-linear programming. Gradient method. Functions, series of functions, approximation. Taylor series, MacLaurin series, Fourier series. Polynomial-interpolation, Newton, Lagrange and Hermite interpolation. Application of Splines. Generating curves and surfaces with using Splines. Bezier polynomials, NURBS surfaces. Approximation, Chebyshev and Padé approximation. Harmonical analysis, fast Fourier transformation (FFT). Numerical differentiation, integration. Approximation of derivatives using finite difference method. Approximation of derivatives using Lagrange and Newton interpolation formulas. Numerical integration, general quadrature formula. Trapezoidal and Simpson formula. Romberg iteration. Initial value problems, ordinary differential equations. Explicit formulas: Euler method, 4th order Runge-Kutta method. Implicit formulas, predictor-corrector methods. Approximation of partial differential equations. Boundary conditions, finite difference method, finite volume method, finite element method. Stochastic process modelling. System input data generation. Monte-Carlo simulation.

15. Description of practices

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16. Description of laboratory practices

MATLAB application of the introduced methods.

17. Learning outcomes

a) knowledge: knowing the fundamentals of numerical approximation methods used in engineering instead of analytic algorithms. Knowing to find and apply the most suitable numerical method for a certain problem.

b) skills: can implement different algorithms to a programming language and to find the best approximation method for a given mathematical problem.

c) attitude: interested, responsive

d) autonomy and responsibility: can work individually and in teamwork

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

2 midterm exams from the theoretical part, 50 points / exam. 1 project work for a group of 4-5 students, for n*100 points (n is the number of students). The points can be divided between the group members according to their whish. Grade calculation: summing all the points, the total points gives the final grade as follows: 0 – 79 - 1; 80 – 109 - 2; 110 – 139 - 3; 140 – 169 - 4; 170 – 5

19. Opportunity for repeat/retake and delayed completion

Because of the point-collection system, no minimum points are determined for the midterm exams or for the project work. The retake possibilities are the following: on the replacement week the 1st midterm exam, or the 2nd midterm exam can be tried again for 50 points, or a combined 1st+2nd midterm exam retake for 100 points.

20. Learning materials

Examples, documents and training materials, given out during lectures, presentations.
György Bicsák, Dávid Sziroczák, Aaron Latty: Numerical Methods
Ramin S. Esfandiari: Numerical methods for engineers and scientists using MATLAB, ISBN 978-1-4665-8570-6
Erwin Kreyszig: Advanced engineering mathematics, 10th edition, ISBN 978-0-470-45836-5

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

Subject description

1. Subject name	**Operation of railway vehicles**				
2. Subject name in Hungarian	Vasúti járművek üzeme			**3. Role**	sp
4. Code	**KOVJM409**	**5. Evaluation type**	**e**	**6. Credits**	**3**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for seminars**	4 hours	**Homework**	0 hours
Reading written materials	36 hours	**Midterm preparation**	12 hours	**Exam preparation**	10 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Csiba József
12. Lecturers	Németh István

13. Prerequisites	- (-), -

14. Description of lectures

Service processes for railway vehicles. Vehicle input, the actual service timing and vehicle output as componenets of a random service process. Inventory problems in the operation of railway vehicles, the theory of minimum cost-storing and purchase. Statistical theory of the operating system of railway vehicles based on the technical state. Analysis of the operation reliability of railway vehicles, reliability-based operation/maintenance (RCM system). Railway vehicle diagnostics, vehicle diagnostics and stationary equipments, stations. Systems for identifying of vehicles and their operational modes. Operational properties of braked trains, braking-difficulties, dynamical- and thermal processes.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: Understands and applies the mathematical and scientific principles and procedures of the railway vehicles operation. Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of the railway vehicles operation. Knows and understands the basic facts, limits and development possibilities of the railway vehicles operation. Knows and understands the traffic, logistic, environment-, work- and fire protection viewpoints of the railway vehicles operation. Knows and understands the information and communication techniques which are connected with the railway vehicles operation.

b) skills: Able to apply in innovative way the required mathematical and scientific principles and procedures for solving the problems connected with the vehicles operation. Able to apply, to analyze and to evaluate the methods applied in the field of the railway vehicles operation. Shows ability to apply integrated knowledges in the field of the railway vehicles operation.

c) attitude: Open and receptive to know and to pass on the developments and innovations which are taken place on the field of the railway vehicles operation. The sense of vocation is depth. Accepts the professional and ethical values-system connected with the professional area of the railway. Pursuing to use complex and on system-oriented mentality based approach to the processes.

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection and application of the solution methods. Making decision circumspectly and responsibility. Takes into account in the decisions the regulations of the environment, the law and the engineering ethics.

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

The criterion of signature is the active participation at the class (attitude). During the semester there is necessary successfully to write two midterm tests (knowledge, ability, autonomy). In the fields of attitudes and autonomy the results achieved in the semesters are included in the final classification by weight 50%. At the end of semester there is an examination (knowledge, ability, attitude).

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the midterm tests, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Zobory: Megbízhatóságelmélet. Department's publication.. Bp.199- 33 o.
Zobory: Vasúti járművek üzemeltetéselmélete. Department's publication.. Bp.199- 48 o.
Kaufmann: Az optimális programozás. MK 198- 415 o.

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

Subject description

1. Subject name	**Practice in technology of manufacturing and materials in vehicle industry**				
2. Subject name in Hungarian	Jármű-anyagtechnológia projekt			**3. Role**	sp
4. Code	**KOGGM648**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**0 lecture**	**2 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	22 hours	**Homework**	26 hours
Reading written materials	6 hours	**Midterm preparation**	0 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Bán Krisztián
12. Lecturers	Dr. Bán Krisztián, Dr. Bánlaki Pál, Dr. Markovits Tamás, Hlinka József, Dr. Takács János, Dr. Lovas Antal

13. Prerequisites	- (-), -

14. Description of lectures

-

15. Description of practices

The student is involved in an industrial R&D process or scientific research related to manufacturing technology or material technology in a department, in a sub-task that is solved with the help of a leading instructor. The student participate in the project meetings and reports held with the customer respectively to have an overview of the whole project process. The student acquires knowledge in the field of research methodology, acquires experimental design, and evaluates the management of measurement data in a computer environment. Student acquires experimental design, handling and evaluating measurement data in a computer environment.

16. Description of laboratory practices

Student carries out experiments, completes measurements as part of a project.

17. Learning outcomes

a) knowledge: - Acquires knowledge of the project process and their design, subdivision and timing. - Acquires knowledge of experimental design. - Acquires knowledge of methods for evaluating measurement data.

b) skills: - Depending on the complexity of the task, in a workgroup or independently she/he is able to plan a project process, break it down into part tasks, and schedule it in time. - Depending on the complexity of the task, she/he is able to prepare an experimental project in a workgroup or independently. - Depending on the complexity of the task, she/he is able to design and execute measurements or experiments in a workgroup or independently. - Depending on the complexity of the task, she/he is able to process and interpret the results in a workgroup or independently. - Able to provide a written or oral summary of the results of the subtask undertaken. - Able to collect literature on a specific topic and compile a summary based on it.

c) attitude: - Strives to apply the knowledge acquired during the practices in the project task. - Open to collaborate with the supervisor and his students. - Seeks to improve communication.

d) autonomy and responsibility - Accepts the frameworks for completing the subject, and performs its tasks independently and responsibly, in accordance with ethical norms. - She/he is aware that the success of the project depends on her/him, so she/he is aware of his responsibilities. - Tries to carry out the task entrusted to him independently and according to his knowledge, and if she/he feels the need, he asks for help from the supervisor. - Apply responsibly to the knowledge acquired during the course with regard to their validity limits.

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

For fulfilling the requirements of signature, students submit a written summary of the completed task. During the verbal exam they report it verbally also, and the results of report gives the basis for the grade.

19. Opportunity for repeat/retake and delayed completion

The supplementation of the written work and oral report is possible during the supplementation week.

20. Learning materials

Educational materials of the department or, depending on the project task, individually agreed resources.

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

Subject description

1. Subject name	**Production process quality assurance in the vehicle industry**				
2. Subject name in Hungarian	Járműipari gyártási folyamatok minőségbiztosítása			**3. Role**	k
4. Code	**KOGGM611**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**J**

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	22 hours	**Midterm preparation**	6 hours	**Exam preparation**	0 hours

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

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

14. Description of lectures

Automotive Production Systems and Quality Assurance System - transition from mass production to customer demand production. Custom manufacture, mass production, customer order production

Quality standards - ISO 9001, TS16949 and other automotive quality assurance standards

Quality Production System Principles - Manufacturing Basics Determined, Business Premises Management Quality Notes

Quality Cost - Quality Role in Marketing and Corporate Strategy. The magic triangle is quality, cost, and regulation. Value approach and main losses

Continuous Quality - PDCA Cycle: Data Collection, Analysis, Measurement and Standardization, Problem Solving at the Reason, A3 Circuit, Control Plan

Example - Automatic translation of the original Poka Yoke

Employee involvement - team work and characteristics of interest

Statistical Methods - SPC, Six Sigma, FMEA

Quality Flow Crawl (QVSM)

Quality and Logo - Just in Time and Just in Sequence

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: Know the qualty processes in the automotive industry

b) skills: Able to use the quality tools

c) attitude: Openness to the new possibilities of the field

d) autonomy and responsibility: Participate in individual problem solving

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.
The conditions for obtaining the credits are the completing the midterm test. The mark of the subject will be the result of midterm test.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Programming in C and Matlab**				
2. Subject name in Hungarian	Programozás C- és Matlab nyelven			**3. Role**	k
4. Code	**KOKAM603**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**1 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**AJ**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	0 hours	**Homework**	0 hours
Reading written materials	24 hours	**Midterm preparation**	54 hours	**Exam preparation**	0 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, Törő Olivér

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

14. Description of lectures

The subject aims the learning of the C and Matlab programming languages and environments. These tools aim the students in the implementation tasks required by other courses.

The goal on one hand is the introduction of the syntax of the two languages: Types, variables, data structures. Flow control, if-then, loops, functions, complex types and data structures. On the other hand, through the learning of syntax, the design and application of basic algorithm design paradigms is also studied.

15. Description of practices

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16. Description of laboratory practices

In the laboratory practice, the goal is to learn the independent use of the syntactic and algorithmic design skills that are known at the lecture. In doing so, students learn the programming of languages through prepared examples in their development environments.

17. Learning outcomes

a) knowledge:
- knows the basic syntax and structure of the two programming environments
- knows how the types, operators, and basic instructions work,
- is familiar with the process control principles and syntax of structured programs, branches, sequences, cycles,
- know the complex data structures, their use,
- knows the basic algorithm design paradigms

b) skills:
- can write simple standalone programs in the two program languages concerned;
- can implement informally or formally specified algorithms,
- can program source code interpretation, error correction,
- is able to test and optimize ready-made programs and modules

c) attitude:
- is interested in modern IT solutions
- capable of algorithmic thinking that can be applied in other areas,

d) autonomy and responsibility:
- in addition to known environments, it is able to acquire other unknown program languages and development tools in autodidact,
- capable of designing and implementing software modules alone, responsibly,
- is able to consult in a team in algorithmic and programming tasks, to make independent decisions

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

Two midterm exams. The final grade is the rounded average of the exams.

19. Opportunity for repeat/retake and delayed completion

One midterm exam can be retried in the delayed completion period.

20. Learning materials

Lecture Notes, Dennis Ritchie: The C programming language, Matlab help

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

Subject description

1. Subject name	**Project**				
2. Subject name in Hungarian	Projektmunka			**3. Role**	sp
4. Code	**KOVRM633**	**5. Evaluation type**	**m**	**6. Credits**	**3**
7. Weekly contact hours	**0 lecture**	**1 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	42 hours	**Preparation for seminars**	18 hours	**Homework**	30 hours
Reading written materials	0 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Veress Árpád
12. Lecturers	Dr. Beneda Károly, Dr. Bicsák György, Dr. Gáti Balázs, Dr. Rohács Dániel, Dr. Rohács József, Dr. Veress Árpád, Jankovics István Róbert

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

14. Description of lectures

-

15. Description of practices

Get acquainted with the industrial and research activities of the Department. Selection of a project work fits with the profile of the hosting Department. Specify subtasks, determine the schedule and timeline. Complete the work by weekly consultations (revision, evaluation and next steps). Prepare and present the results in the requested format and extent including the results of the literature research, the evaluation, verification, plausibility check, validation (if any) and conditions (limitations) with highlighting next steps.

16. Description of laboratory practices

Depending on the task, it is possible to perform the task as well as to consult in the framework of laboratory activities.

17. Learning outcomes

a) knowledge: know the procedure of the given research, know how to prepare report.

b) skills: able to summarize and present the result achieved in the project, able to use the tools of informatics.

c) attitude: interested, motivated, responsive.

d) autonomy and responsibility: independent, takes care for the deadlines.

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

Preparation of a report (or article with presentation) about the project work according to the specification of the supervisor.

19. Opportunity for repeat/retake and delayed completion

The delivery is completed in the last week of the semester. Delayed delivering of the requested document(s) in the delayed completion period after the payment of the fine.

20. Learning materials

Literature based on the selected project, offered by the supervisor

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

Subject description

1. Subject name	**Project work**				
2. Subject name in Hungarian	Projekt feladat			**3. Role**	sp
4. Code	**KOVRM628**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**0 lecture**	**1 practice**	**1 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**60 hours**
Contact hours	28 hours	**Preparation for seminars**	11 hours	**Homework**	21 hours
Reading written materials	0 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Simongáti Győző
12. Lecturers	Dr. Simongáti Győző, Dr. Hargitai L. Csaba

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

14. Description of lectures

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15. Description of practices

Ship design or research poject according to the actual work of industrial partners or the department, preparation of a report of the project.

16. Description of laboratory practices

Work in a computer laboratory.

17. Learning outcomes

a) knowledge: know the procedure of the ship desig or the design related research, know how to prepare a report.
b) skills: able to summarize and present the result achieved in the project, able to use the tools of informatics.
c) attitude: interested, responsive, independent, take care for the deadlines

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

preparation of 1 report about project work

19. Opportunity for repeat/retake and delayed completion

Delayed submission of the homework

20. Learning materials

Related national and international scientific literature

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

Subject description

1. Subject name	**Projectmanagement in automotive industry**				
2. Subject name in Hungarian	Járműipari projektirányítás			**3. Role**	k
4. Code	**KOKKM617**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**60 hours**
Contact hours	28 hours	**Preparation for seminars**	4 hours	**Homework**	10 hours
Reading written materials	6 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Transport Technology and Economics
11. Responsible lecturer	Nagy Zoltán
12. Lecturers	Nagy Zoltán

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

14. Description of lectures

Features of vehicle design projects. Defining project goals. Identifying stakeholders. Methodology for preparing preliminary feasibility studies. Accounting and defining the necessary resources, budget management, time management, scheduling. Risks analysis and management of implementation . Development of project strategy, external-internal communication.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: the student learns the basics and goals of project management, about the stakeholders in vehicle design projects and the rules, is aware of the processes of work breakdown structure (WBS), scheduling, resource and cost estimates, the methods of risk management, knows the applicable communication techniques.

b) skills: the student can define goals and project environment, has the capability of measuring progress, balancing project resources and risks and the capability of effective project communication.

c) attitude: th estudent thinks in komplex manner, recognizes the need for project management, works in a group independently on a high level, looks for cooperation with professionals in connected areas.

d) autonomy and responsibility: the student carries out own solutions, able to make responsible decisions independently, and execute them in consultation with the project stakeholders and attentive to the effects and consequences of the decisions.

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

1 midterm test, 1 (team) homework, weights of requirements in final mark: result of midterm test (50%), homework document and presentation (50%).

19. Opportunity for repeat/retake and delayed completion

Midterm test correction possibility for those not present on the test, possibility of delayed deadline for home work.

20. Learning materials

Presentation slides and electronic course material.

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

Subject description

1. Subject name	**Railway vehicle system dynamics**				
2. Subject name in Hungarian	Vasúti járműrendszer-dinamika			**3. Role**	sp
4. Code	**KOVRM608**	**5. Evaluation type**	**e**	**6. Credits**	**5**
7. Weekly contact hours	**3 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	10 hours	**Homework**	15 hours
Reading written materials	37 hours	**Midterm preparation**	12 hours	**Exam preparation**	20 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Zábori Zoltán
12. Lecturers	Dr. Zábori Zoltán

13. Prerequisites	- (-), -

14. Description of lectures

The railway vehicle as a dynamical system. Main motion and parasitic motions. Railway vehicle vibration analysis. Analysis of the spring and damper elements using the characteristic surface above the state space. The wheel-rail rolling contact. Eigen-frequencies and stability reserves, limit cycles and chaotic motions. The non-linear models. The wheel-rail wear process. The track-vehicle system dynamics. Definition and measurement of track irregularities. Spectral characteristics of the track irregularities. Parameter sensitivity of the track-vehicle system. Parameter optimization. Measurement procedures for examining the vehicle-track system processes.

15. Description of practices

Solving computation tasks connected with the themes of the lectures.

16. Description of laboratory practices

-

17. Learning outcomes

a) knowledge: Understands and applies the mathematical and scientific principles, relations and procedures necessary to cultivate professional area of the railway vehicle-dynamic. Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of railway vehicle-dynamics. In details knows and understands the data collection methods and problem solving techniques of the railway vehicle-dynamics. Knows and understands the methods of the computer modelling and simulation which are connected with the railway vehicle-dynamics. Knows the problem solving techniques which are applicable in the research or scientific work.

b) skills: Able to apply the required mathematical and scientific principles and procedures for solving the problems coming up in the railway vehicle-dynamics. Able to apply in innovative way the principles and terminologies of the railway vehicle-dynamics. Able to identify, to evaluate and manage by system-approach the effect mechanism of the dynamical processes coming up in the railway vehicles.

c) attitude: Open and receptive to know and to accept the developments and innovations which are taken place on the field of the speciality of railway vehicle dynamics. Accepts the professional and ethical values-system connected with the professional area of the railway. Pursuing to develop of the new methods and tools connected with the railway vehicles. Pursuing to use complex and on system-oriented mentality based approach to the processes.

d) autonomy and responsibility: Pro-activity in the solution of professional tasks, the self-standing selection of the solution methods.

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

The criterion of signature is both the active participation at the class (attitude), and the complete solving of the semester's tasks (knowledge, ability, autonomy). During the semester there is necessary to successfully write two midterm tests (knowledge, ability, autonomy). In the fields of attitudes and autonomy the results achieved in the semesters are included in the final classification by weight 50%. At the end of semester there is an examination (knowledge, ability, attitude).

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the control works and the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Simonyi A.: Vasúti járművek dinamikája, Közlekedési dokumentációs Kft., Bp. 199-
Department's publications.

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

Subject description

1. Subject name	**Reliability, Safety and Security in the Vehicle Industry**				
2. Subject name in Hungarian	Biztonság és megbízhatóság a járműiparban			**3. Role**	sp
4. Code	**KOKAM660**	**5. Evaluation type**	**m**	**6. Credits**	**3**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	28 hours	**Preparation for seminars**	8 hours	**Homework**	0 hours
Reading written materials	36 hours	**Midterm preparation**	18 hours	**Exam preparation**	0 hours

10. Department	Department of Control for Transportation and Vehicle Systems
11. Responsible lecturer	Dr. Bécsi Tamás
12. Lecturers	Dr. Bécsi Tamás, Dr. Török Árpád

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

14. Description of lectures

Definition of the safety and the reliability, intoduction. Basic specification and analysis techniques. Introduction to vehicle industry standards with particular regard to the standard ISO 26262 . Safety levels, classification of functions.

Safety issues of the information systems of vehicules (cyber security). Vehicle vulnerabilities through classic automotive networks. Safety risks and defense in the vehicles connected to the internet or using V2X communication.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge:
- knows the guidelines of the ISO 26262 standard for the automotive industry
- is familiar with the concepts and mathematical apparatus of basic safety and risk analysis,
- is familiar with the development methods of safety-critical systems and safety architectures,
- is familiar with the numerical descriptive tools of reliability and the related calculation methods

b) skills:
- capable of performing safety calculations based on a specification,
- can perform risk analysis calculations

c) attitude:
- is interested in the safety and reliability issues of autonomous vehicles

d) autonomy and responsibility:
- does its work in autonomous and responsible way

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

For midterm grade: successful completion of the midterm exam. The final grade equals to the result of the midterm exam.

19. Opportunity for repeat/retake and delayed completion

The midterm exam can be retried once.

20. Learning materials

Lecture Notes

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

Subject description

1. Subject name	**Requirements for superstructure designers**				
2. Subject name in Hungarian	Felépítményezői ismeretek			**3. Role**	sp
4. Code	**KOJSM662**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**0 lecture**	**2 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	22 hours	**Homework**	20 hours
Reading written materials	8 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Béda Péter
12. Lecturers	Dr. Galambosi Frigyes

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

14. Description of lectures

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15. Description of practices

Manufacturer's guidelines for superstructure makers. Differences and similarities among manufacturers. Manufacturers guidelines for different types of superstructures and vehicle assembling.Hungarian and international technical requirements, the legal environment. Programming the manufacturing. Requirements for pricing. Individual and guided practice lessons

16. Description of laboratory practices

Individual and guided practice lessons

17. Learning outcomes

a) knowledge:
- The student knows the truck makers' recommendations for the superstructure builders.
- knows the national and european rules for superstructure application, vehicle transformation and vehicle building.
- knows the national and european rules concerning trucks.

b) skills:
- The student is able to understand the operation of the given superstructure.
- is able to prepare the manufacturing of the sperstructure or that of a subassembly, is able to prepare its technical documentation.
- knowing the manufacturing technology and having specific knowledge, he is able to prepare the quotation.
- is able to participate the superstructure design process, to perform a subtask individually.

c) attitude:
- The student makes an effort to gather all the available informations in a given domain,
- Cooperates with his fellow students and the teacher,
- is open minded towards new and innovative ideas and researches,
- uses informatical and computational devices for his work

d) autonomy and responsibility:
- The student is conscient about his responsibility towards the society and his company,
- asks for the colleagues' expertise and judgement when working,
- considers challenges with responsibility.

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

The requirement of the signature determined by the points from 1 semestrial homework, and additionally 1 non-compulsory test. Final grade from exam (100%)

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for project work

20. Learning materials

Lecture notes

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

Subject description

1. Subject name	**Research and devlopment process in the vehicle industry**				
2. Subject name in Hungarian	Járműipari kutatás és fejlesztés folyamata			**3. Role**	k
4. Code	**KOGGM614**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**J**

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 Automotive Technologies
11. Responsible lecturer	Dr. Zöldy Máté
12. Lecturers	Domina Ádám, Wahl István

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

14. Description of lectures

Research, development and quality. Quality Function Deployment (QFD). Creativity and innovation in research development. The relationship between automotive research and development and continuous innovation activity. Innovation management. Production strategy, quality strategy. Process of product strategy development, product life cycle planning. Innovation management. Managing and evaluating new product ideas. Continuing product ideas into acquisition, development and serial projects. Concept and process of research projects. Features and steps of basic and applied research. List of requirements and product specification. Benchmarking. Concept and process of development projects. Set cost and quality goals. Concept development, concept decision. Preparing and evaluating a feasibility study. Concept of A, B and C patterns. Continuation of the pre-development project into series development. Making a business plan. The concept and process of serial development, product introduction. Steps of serial development, checking and certifying product requirements. V-model concept and steps. Tracking and monitoring the development steps and processes. Production approval process, steps. Raising production, production support. Feedback from experience and production to the research and development process.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: Knowledge of the relationship between research and development and quality.

b) skills: Ability to improve the relationship between research and development and quality

c) attitude: Openness to new opportunities in the field

d) autonomy and responsibility: Participate in solving independent tasks

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.

The conditions for obtaining the midterm grade is the completing the midterm test, the midterm grade reflects the result of the midterm test.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Road safety, legislative environment, human factors**				
2. Subject name in Hungarian	Közlekedésbiztonság, jogi környezet, emberi tényezők			**3. Role**	sp
4. Code	**KOGGM653**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	12 hours
Reading written materials	18 hours	**Midterm preparation**	6 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Török Árpád
12. Lecturers	Dr. Melegh Gábor, Dr. Török Árpád, Vida Gábor

13. Prerequisites	- (-), -

14. Description of lectures

Legal knowledge: Summary of constitutional law, civil and procedural law, criminal law, criminal procedural law, traffic offenses, basic compensation issues. Human factors in transport: Personal characterisitcs, behavioral forms, health protection, age-related problems, weather effects, seasons, specifically related issues of vegetation and fauna, wild animal related issues. Injuries: Human body, physiological features, injury classification, accident investigation in the face of personal injury, blood alcohol tests, examples of medical accident analysis work.

15. Description of practices

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16. Description of laboratory practices

In connection with the topics discussed, students can gain practical experience at external locations and institute visits and deepen their knowledge.

17. Learning outcomes

a) knowledge: - The student is familiar with the legal framework needed to understand the legal environment of road safety; - The student has to know the basic components of the process of legislation and law enforcement; - The student has to know the basic purpose and means of transport law; - The student has to know the online and printed aids and applications needed to apply traffic law;

b) skills: - The student is able to interpret the related legislation; - The student is able to apply and use relevant traffic laws; - The student is able to support the law-making and regulating processes;

c) attitude: - The student aims to maximize their abilities by making their studies at the highest possible level, proficient and independent; - The student aims to cooperate with the instructor and the other students to improve knowledge; - The student aims to continue to imrpove the knowledge of the material parts of the lessons through continuous independent learning; - The student aims to use the information technology and computing tools (word processing computer software, mathematical software, image editing software, etc.), but also seeks to use classical devices (paper, ruler, pencil, hand-held calculator, editing, etc.); - The student aims to get to know and routinely use the tools needed to solve the tasks - The student aims to provide accurate, error-free and precise work.

d) autonomy and responsibility: - The student is responsible for setting an example forthe other students rgarding the quality of its work and ethical standards; - The student applies the knowledge acquired during the course in a responsible manner with regard to their validity limits; - The student accepts openly the grounded critical remarks; - The student accepts the framework for cooperation, can do its job independently or as part of a team, depending on the situation. ”

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.

The conditions for obtaining the signature are the completing the midterm test, attending all labs and submitting the homework on accepted level.

Final outcome of the subject is defined by the result of the mid-term exam in 30% proportion, the homework in 20% proportion, and the final exam in 50% proportion. All requirements have to be fulfilled to successfully finish the subject.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once. The homework can be delivered once additionally. One lab can be done once additionally.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Ship design**				
2. Subject name in Hungarian	Hajótervezés			**3. Role**	sp
4. Code	**KOVRM615**	**5. Evaluation type**	**e**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**2 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	12 hours	**Homework**	40 hours
Reading written materials	22 hours	**Midterm preparation**	0 hours	**Exam preparation**	20 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Simongáti Győző
12. Lecturers	Dr. Simongáti Győző

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

14. Description of lectures

Ship design methods. Design spiral. Conceptual design. Economical aspects of ship design. Determination of main dimensions. Weight estimation. Dedsign of Lines. Freeboard and subdivision. Design of propulsion systems, selection of machinery. Tender documentation.

15. Description of practices

Worked examples for supporting the theory.

16. Description of laboratory practices

-

17. Learning outcomes

a) knowledge: know and understand the theory and practice of merchant ship design, know the input parameters and boundary conditions, and the calculations and procedures for the preliminary design.

b) skills: based on the knowledge above the student is able to determine the main dimensions of a vessel for a given generally described scope of work, able to prepare a general arangement drawing, preliminary technical description, lines plan and other drawings repateed to preliminary design. Able to use the Internet and CAD software for his/her work.

c) attitude: interested, responsive, take care for the deadlines

d) autonomy and responsibility: the student makes responsible decisions, asks for the professional opinions of others, and takes care of the challenges responsibly.

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

Requirements for signature: 1 semestrial home work

1 exam measuring the theoretical knowledge,

the final result is the average of the parts

19. Opportunity for repeat/retake and delayed completion

Second exam and delayed submission of the homework

20. Learning materials

Péter Pál Lehel: Hajótervezés (in Hungarian)
Watson: Practical Ship Design (Elsevier, 1998)
Papanikolaou: Ship Design-Methodologies of Preliminary Design (Springer, 2014)
case studies

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

Subject description

1. Subject name	**Ship hydrodynamics**				
2. Subject name in Hungarian	Hajó-hidrodinamikai számítások			**3. Role**	sp
4. Code	**KOVRM626**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**1 lecture**	**1 practice**	**1 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	13 hours	**Homework**	23 hours
Reading written materials	42 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Hargitai L. Csaba
12. Lecturers	Dr. Simongáti Győző, Dr. Hargitai L. Csaba

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

14. Description of lectures

Introduction of numerical and analytical calculation methods for determining of hull resistance, wave, speed and pressure field around the hull. Basics of ship specific numerical fluid dynamics calculations, international recommendations for calculation parameters and methods. The method of propeller design and defining propeller open water characteristics.

15. Description of practices

In the exercises, the students practice the ship hydrodynamic calculations.

16. Description of laboratory practices

In laboratory practice, students are trained to determine ship resistance and rudder forces using computer programs.

17. Learning outcomes

a) knowledge: Knows the basics of numerical and analytical flow calculation techniques to determine hull resistance, waveform, and vessel velocity and pressure field. He/She is familiar with basics of ship specific numerical fluid dynamics calculations, international recommendations for calculation parameters and methods. He/She knows method of propeller design and defining propeller open water characteristics.

b) skills: Able to use ship specific parameters in a finite element program, in determining the hull resistance and the rudder forces.

c) attitude: interested, responsive, independent, take care for the deadlines

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection of the relevant solution methods. Making decision circumspectly.

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

Mid-term requirement: preparing 1 semestrial home work, the final grade equals to the result of semestrial home work.

19. Opportunity for repeat/retake and delayed completion

Delayed submission of the homework

20. Learning materials

Dr. Kovács A.-Dr. Benedek Z.: A hajók elmélete
Volker Bertram: Practical ship hydrodynamics
ITTC recommendations
Scientific publications of the department

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

Subject description

1. Subject name	**Ship motions**				
2. Subject name in Hungarian	Hajók dinamikája			**3. Role**	sp
4. Code	**KOVRM624**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**1 practice**	**1 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	15 hours	**Homework**	15 hours
Reading written materials	19 hours	**Midterm preparation**	0 hours	**Exam preparation**	15 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Hargitai L. Csaba
12. Lecturers	Dr. Hargitai Csaba

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

14. Description of lectures

Coordinate systems of ships and their relationship. Motion equations of ships based on Newtonian mechanics. The theory of maneuver, the theory of seakeeping. Concept and calculation of added masses. Methods for representation of forces acting on the hull in motion equations. Elemental maneuvers with motion equations. Basics of wave equations, wave spectra. Dynamics of propulsion system.

15. Description of practices

Students are practicing different ship dynamics calculations.

16. Description of laboratory practices

In laboratory practice, students use a computer program to calculate the seakeeping properties of a ship and analyze the results.

17. Learning outcomes

a) knowledge: Knows and understand the coordinate systems that are used to describe ship motions and their relationships. She/he is familiar with the motion equations of ships based on Newtonian mechanics. She/he knows the concept of added masses and basic methods of calculation. She/ he knows the elementary oscillations of ships and their calculations with motion equations. Based on the linear maneuver theory, she/he knows how to calculate elementary maneuvers with motion equations. She /he knows the basics of wave equations and wave spectra. Knows the principles and structure of roll stabilisation systems used on ships.

b) skills: She/he can perform seakeeping tests using a computer program. She/he can estimate the expected maneuverability characteristics of a ship. She/he can calculate the propulsion system dynamics.

c) attitude: interested, responsive, independent, take care for the deadlines

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection of the relevant solution methods. Making decision circumspectly.

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

Mid-term requirement: preparing 1 semestrial home work

Final grade: 1 exam (measuring the theoretical knowledge), 1 semestrial home work, the final grade is the average of the parts

19. Opportunity for repeat/retake and delayed completion

second exam and delayed submission of the homework

20. Learning materials

Dr. Kovács A.-Dr. Benedek Z.: A hajók elmélete
Komm F.: Hajók kézikönyv
Hargitai Cs.: Hajók dinamikája
J. Brix: Manoeuvring Technical Manual
E. Trupper: Basic ship theory
E. Lewis: Principles of naval architectures

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

Subject description

1. Subject name	**Ship strength**				
2. Subject name in Hungarian	Hajó-szilárdsági számítások			**3. Role**	sp
4. Code	**KOVRM621**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**1 lecture**	**1 practice**	**1 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	13 hours	**Homework**	23 hours
Reading written materials	42 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Hargitai L. Csaba
12. Lecturers	Dr. Simongáti Győző, Dr. Hargitai L. Csaba

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

14. Description of lectures

Ship structure model types. The ship specific details of numerical strength calculation methods, and its special parameters by ships. Numerical strength calculation methods to determine global and local ship structure loads. Conformity of hull strength in accordance with applicable laws, standards and rules of ship classification societies.

15. Description of practices

Students are practicing ship strength calculations based on rules of ship classification societies, national/ international laws and standards.

16. Description of laboratory practices

Students are practicing hull strength calculation with computer programs.

17. Learning outcomes

a) knowledge: Knows and understands the theoretical and practical process of hull strength calculation. Knows the hull structure modells for strength calculation, is familiar with the basics of numerical strength calculation methods, and the calculations of ship-specific parameters. Knows the methodology for defining global and local hull loads. He/She is familiar with the system and the structure of the laws, standards and classification regulations applicable to ship strength calculations.

b) skills: Based on his knowledge, he/she is able to check the strength of a ship's structure in accordance with the requirements of the regulations, laws and standards.

c) attitude: interested, responsive, independent, take care for the deadlines

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection of the relevant solution methods. Making decision circumspectly.

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

Mid-term requirement: preparing 1 semestrial home work, the final grade equals to the result of semestrial home work.

19. Opportunity for repeat/retake and delayed completion

Delayed submission of the homework

20. Learning materials

Hadházi Dániel: Hajóépítés -
P. Rigo-E. Rizzuto: Analysis and Design of Ship Structure
ISO standards
Rules of ship classification societies
Scientific publications of department

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

Subject description

1. Subject name	**Structural vibrations**				
2. Subject name in Hungarian	Szerkezetek lengései			**3. Role**	sp
4. Code	**KOJSM665**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	20 hours
Reading written materials	12 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Béda Péter
12. Lecturers	Dr. Béda Péter, Dr. Pápai Ferenc

13. Prerequisites	Mechanics of superstructure materials (KOJSM663), strong;

14. Description of lectures

Application of the Lagrange equation of second kind for holonomic and scleronomic conservative sytems.Study and conditions of existence of stable equilibrium. Small vibrations, approximative determination of natural frequencies. Oscillation of bars, axles, strings and membranes. Basics of modal analysis. Criterion of motion stability. Study methods for nonlinear problems. Bifurcation, post-critical states, soft and hard loss of stability

15. Description of practices

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16. Description of laboratory practices

Individual and guided practice lessons

17. Learning outcomes

a) knowledge:
- The student knows the Lagrange equations of the second kind describing holonomic and scleronomic sytems,
- knows the existence criteria of the stable equilibrium,
- knows the equations describing longitudinal, torsional and bending vibrations of rods,
- knows the vibration theory of shafts, cords and membranes,
- knows the basics of modal analysis,
- knows the motion stability criterium for both linear and nonlinear cases,
- knows the notions of bifurcation and postcritic state, as well as the theory of stability loss.

b) skills:
- The student is able to check the stability of a structure,
- is able to analyze the possible vibrations,
- is able to build linear and non-linear models,
- is able to study models and to discuss results.

c) attitude:
- The student makes an effort to gather all the available informations in a given domain,
- Cooperates with his fellow students and the teacher,
- is open minded towards new and innovative ideas and researches,
- uses informatical and computational devices for his work

d) autonomy and responsibility:
- The student is conscient about his responsibility towards the society and his company,
- asks for the colleagues' expertise and judgement when working,
- considers challenges with responsibility.

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

For signature: 2 semestrial homeworks, 2 midter tests with 50% result. Final mark equals to the result of the exam.

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for homework

20. Learning materials

Lecture notes

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

Subject description

1. Subject name	**Structure analysis**				
2. Subject name in Hungarian	Szerkezetanalízis			**3. Role**	k
4. Code	**KOJSM609**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**1 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	18 hours	**Homework**	20 hours
Reading written materials	26 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Béda Péter
12. Lecturers	Dr. Béda Péter, Devecz János

13. Prerequisites	- (-), -

14. Description of lectures

Notion of numerical structure analysis. Numerical model generation from a geometrical model. Theory and application of the finite element analysis in the vehicle technology. Theoretical background of the finite element analysis method (FEA). Improvement of the solution using discretization and polynomial degree increase, method of p-elements and h-elements. Material models: linear, elasto-plastic and hyperelastic ones. Structure of finite element models. Simplification possibilities of geometrical models. Geometry discretisation: mesh generation, notion of mesh independence. Structure of a stiffness analysis: load types, forces, torques, bearing-like loads. Constraints: ideally stiff constraints, elastic constraints. Evaluation of deformation and stress fields. The Galerkin method. Elliptical and parabolic partial differential equations and their solutions. Eigenvalue exercises. The Navier equation and the convection-diffusion energy equation. Matrices of the discretized equations (mass, damping, stiffness). Unicity conditions of the result, initial and limit conditions. Structure of a thermal (convective-diffusive) analysis. Load types, heat sources, convection, heat radiation. Constraints, fixation of temperatures and gradients. Evaluation of temperature and thermal flux fields. Structure of a natural frequency analysis. Evaluation of natural frequencies and vibration modes. Application of FEA for lifetime optimisation for load varying in time. Bases of structure optimisation (size, shape, topology) theory. Methods for gradient free optimum seeking in the structure optimization. Model building, setup of design variables, parameters and conditions. Evaluation of the optimization result. New model building from the result of the optimization process. Consideration of ability for manufacturing and realisation. Application of reverse engineering methods during rebuilding the model. Comparative FEA of the original and the optimised model.

15. Description of practices

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16. Description of laboratory practices

Guided and individual problem solving

17. Learning outcomes

a) knowledge: - The student knows the finite elements theory and the model building, - knows the limits of the approximative solution and methods to increase precision, - knows the various material models and their application, - knows the methods for loading and constraining, - knows the mathematical background of the solution and the convergence properties, - knows the variuos modeling techniques to extract a given physical quantity as result, - knows methods for part optimisation.

b) skills: - The student is able to build a finite elements model that suits the geometry of the given structure, - is able to build up a model that produces the results that have to be studied , - is able to get a result with required precision and to estimate its plausibility, - is able to optimize the model upon the given conditions, - is able to create a new geometry based on the optimisation results, - is able to evaluate the realized work upon the numerical results.

c) attitude: - The student makes an effort to gather all the available informations in a given domain, - Cooperates with his fellow students and the teacher, - is open minded towards new and innovative ideas and researches, - uses informatical and computational devices for his work

d) autonomy and responsibility: - The student is conscient about his responsibility towards the society and his company, - asks for the colleagues' expertise and judgement when working, - considers challenges with responsibility.

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

For signature: determined points from 1 semestrial project (teamwork), 1 non-compulsory test, 1 shorter homework. Final grade equals to the result of the exam.

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for project work

20. Learning materials

Slides and examples in electronic format

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

Subject description

1. Subject name	**Superstructure control technics**				
2. Subject name in Hungarian	Felépítmények vezérléstechnikája			**3. Role**	sp
4. Code	**KOJSM666**	**5. Evaluation type**	**e**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	50 hours
Reading written materials	12 hours	**Midterm preparation**	14 hours	**Exam preparation**	0 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Béda Péter
12. Lecturers	Dr. Pápai Ferenc

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

14. Description of lectures

Basics of hydraulic, electrohydraulic control and sensors. Basics of built in electrical devices. Recognition of limit cases for stability and load, impeachment of overloading, accident prevention.

15. Description of practices

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16. Description of laboratory practices

Individual and guided practice lessons

17. Learning outcomes

a) knowledge:
- The student knows the theory of the purely hydraulic control,
- knows the elements of the hydrostatic drives: motors, pumps, cylinders, valves,
- knows the electrhydraulic sensors, actuators and command units,
- knows the layout and specifications of a superstructure electric network,
- knows the stability and load limits of the superstructure,
- knows about the rules for avoiding failures and accidents.

b) skills:
- The student is able to understand the requirements for the electric, electronic and hydraulic systems of the superstructure,
- is able to design electrical and hydraulic systems for a superstructure,
- is able to recognize the stability and safety limit situations during the superstructure operation,
- is able to design systems fulfilling the actual safelty rules.

c) attitude:
- The student makes an effort to gather all the available informations in a given domain,
- Cooperates with his fellow students and the teacher,
- is open minded towards new and innovative ideas and researches,
- uses informatical and computational devices for his work

d) autonomy and responsibility:
- The student is conscient about his responsibility towards the society and his company,
- asks for the colleagues' expertise and judgement when working,
- considers challenges with responsibility.

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

For midterm grade: 2 semestrial homeworks, 2 midterm tests with min. 50% result. Final mark is their average.

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for homework

20. Learning materials

Lecture notes

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

Subject description

1. Subject name	**Superstructure preliminary design**				
2. Subject name in Hungarian	Felépítmény előtervezés			**3. Role**	sp
4. Code	**KOJSM664**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	20 hours
Reading written materials	12 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Lovas László
12. Lecturers	Dr. Galambosi Frigyes, Dr. Susánszki Zoltán

13. Prerequisites	Requirements for superstructure designers (KOJSM662), strong; - (-), -; - (-), -

14. Description of lectures

Construction layouts, special links. Connections among tubular profiles, metal sheets and elastic coverings. Cooperation between vehicle frame and rigid superstructure with special function.

15. Description of practices

-

16. Description of laboratory practices

Conception of the geometry and kinematics of a given superstructure. Preliminary stress computation with CAD tools.

17. Learning outcomes

a) knowledge:
- The student knows the usual superstructure construction layouts,
- Knows about joining and linking tubes, sheet metals and elastic coverings,
- Knows about the application of thermally insulating composit structures for superstructures,
- Knows the description of the vehicle-superstructure cooperation even for a superstructure with individual function, either when working together or separately.

b) skills:
- The student is able to understand the working principle of a superstructure layout of given type,
- Can undestand and modelize the vehicle-superstructure connection,
- Is able to participate to the superstructure design process, to solve an individual subtask,
- Is able to build a model of a superstructure main unit with enough details.

c) attitude:
- The student makes an effort to gather all the available informations in a given domain,
- Cooperates with his fellow students and the teacher,
- is open minded towards new and innovative ideas and researches,
- uses informatical and computational devices for his work

d) autonomy and responsibility:
- The student is conscient about his responsibility towards the society and his company,
- asks for the colleagues' expertise and judgement when working,
- considers challenges with responsibility.

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

1 semestrial project work, 1 non-compulsory test, 1 exam. Details for computing the final mark can be find in the subject requirements.

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for homework

20. Learning materials

Lecture notes

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

Subject description

1. Subject name	**Surface Engineering**				
2. Subject name in Hungarian	Felületi technológiák			**3. Role**	sp
4. Code	**KOGGM647**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	12 hours
Reading written materials	20 hours	**Midterm preparation**	4 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Markovits Tamás
12. Lecturers	Dr. Markovits Tamás, Dr. Takács János, Dr. Hlinka József

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

14. Description of lectures

Interpretation of surface properties. Function and role in the vehicle constructions. Surface preparation and modification processes. Plasma processes and laser technologies (laser basics, beam sources, beam guiding, laser-material interaction, laser surface treatments). Advanced investigation techniques of layers and surfaces.

15. Description of practices

-

16. Description of laboratory practices

Investigation of laser technologies (preparation, interactions, quality, safety). Wetting tests. Surface examination methods.

17. Learning outcomes

a) knowledge: Understanding the role of the presented surface properties and technologies.

b) skills: Ability to develop the processes.

c) attitude: Openness to the new possibilities of the field

d) autonomy and responsibility: Participate in individual problem solving

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.

The reqiurements for obtaining the signature are the taking part on labs, submit the independent task in satisfactory level, completing the midterm test.

The grade can be obtained from the written exam.

19. Opportunity for repeat/retake and delayed completion

The midterm test and the submission of individual task can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Suspension design**				
2. Subject name in Hungarian	Futómű-tervezés			**3. Role**	sp
4. Code	**KOGJM613**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	0 hours
Reading written materials	26 hours	**Midterm preparation**	10 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Zöldy Máté
12. Lecturers	Dr. Harth Péter, Dr. Szabó Bálint

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

14. Description of lectures

The analysis of the forces acting on the wheel of the vehicle is a function of modern wheel models, the static and dynamic geometric characteristics of the wheel for planning. Geometric design of wheel suspension, strength dimensioning of individual suspension elements (rods, arms, ball joints, rubber pads). Vibration analysis of the vehicle for the requirements of the design of the suspension, geometry and strength dimensioning of the elements of the springs (springs, shock absorbers, stabilizers, limiting elements). Dynamic testing of vehicle braking to determine design requirements, methods of dividing brake force per axle, designing the braking system in principle, geometry, strength, heat and flow geometry of each element. Based on dynamic analysis of steering, defining the starting data required for the design of the steering system, constructing the steering mechanism, geometric and strength dimensioning of each element (trapezoidal arm, track bar, steering wheel, steering wheel and shaft, ball joints).

15. Description of practices

-

16. Description of laboratory practices

Semester planning task desgin on computer, consultation.

17. Learning outcomes

a) knowledge: Knowledge of vehicle dynamics.
b) skills: Able to improve vehicle dynamics
c) attitude: Openness to new opportunities in the field
d) autonomy and responsibility: Participate in solving independent tasks

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

The conditions for obtaining the signature is to prepare the project work fulfilling the minimum requirements until the deadline.

19. Opportunity for repeat/retake and delayed completion

The project work can be submitted second time at a later deadline.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**System technique and analysis**				
2. Subject name in Hungarian	Rendszertechnika és rendszeranalízis			**3. Role**	k
4. Code	**KOVRM129**	**5. Evaluation type**	**m**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	42 hours	**Preparation for seminars**	12 hours	**Homework**	0 hours
Reading written materials	54 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Zábori Zoltán
12. Lecturers	Dr. Zábori Zoltán, Németh István

13. Prerequisites	- (-), -

14. Description of lectures

Characterisation of engineering systems by block-diagrams, structure graps and sigjnal-flow graphs. Construction of the input-output system equations. Application of Lagrangean procedure. The theoryh of linear dynamic systems. Weighting function, transition function in the time domain. Convolution theorem. Complex frequency function in the frequency domain. Periodic, aperiodic and stationary stochastic excitations. Determination of the system response. Elements of the coherency analysis.

15. Description of practices

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

16. Description of laboratory practices

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17. Learning outcomes

a) knowledge:

Understands and applies the mathematical and scientific principles and procedures of system technique and system analysis.

Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of system technique and system analysis.

Knows and understands the basic facts, limits and development possibilities of system technique and system analysis.

Knows and is capable to understand in details the methods of modelling in system technique and system analysis.

b) skills:

Able to apply in an innovative way the required mathematical and scientific principles as well as procedures for solving problems connected with system technique.

Able to apply, analyze and evaluate the methods applied in the field of system analysis.

Shows ability to apply integrated knowledges in the field of system analysis.

c) attitude:

Open and receptive to know and to pass on the developments and innovations which are taken place on the field of system technique. The sense of vocation is depth.

Accepts the professional and ethical values-system connected with the professional area of vehicle engineering.

Pursuing to use complex and on system-oriented mentality based approach to technical processes.

d) autonomy and responsibility:

Pro-activity in professional work, self-standing selection and application of solution methods.

Making decision circumspectly and with responsibility.

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

During the semester necessary the active participation at the class (attitude), and during the semester there is two midterm tests for evaluating the knowledge, the ability, the autonomy and the attitude. The attitude and the autonomy mean 15-15 % and the knowledge and the ability mean 35-35 % in the final classification.

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the midterm tests.

20. Learning materials

Zobory I.: Rendszertechnika és rendszeranalízis. Department's publication of BME VJT. Budapest, 20-
Zobory I.: Gépészeti rendszertechnika. Jegyzet.Department's publication of BME VJT, Bp. 199-
Szabó I. szerk.: Gépészeti rendszertechnika. Technical Publisher, Bp. 198-
Further publications od Department.

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

Subject description

1. Subject name	**Theory of Ships III.**				
2. Subject name in Hungarian	Hajók elmélete III.			**3. Role**	sp
4. Code	**KOVRM616**	**5. Evaluation type**	**e**	**6. Credits**	**3**
7. Weekly contact hours	**2 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	42 hours	**Preparation for seminars**	8 hours	**Homework**	15 hours
Reading written materials	10 hours	**Midterm preparation**	0 hours	**Exam preparation**	15 hours

10. Department	Department of Aeronautics and Naval Architecture
11. Responsible lecturer	Dr. Simongáti Győző
12. Lecturers	Dr. Simongáti Győző

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

14. Description of lectures

Floatation and stability of damaged and grounded ships. Floodable length calculation. Deterministic and probabilistic methods for calculation of damaged stability. Stability of unconventional ships (such as split barges, floating cranes, etc.)

15. Description of practices

Stability calculations of different vessel types.

16. Description of laboratory practices

-

17. Learning outcomes

a) knowledge: know and understand the methods for damaged stability calculations, know and understand the methods for grounded ship flotation and stability calculations, know and understand the methods for calculation of floodable length, know and understand the methods for deterministic and probabilistic damaged stability calculations, know and understand the calculation methods for floating cranes, split barges, know the softwares supporting the above calculations, know and understand the rules and regulations for damaged stability calculations, know the methods for preparing damaged stability documentation

b) skills: able to find and interpret relevant rules, able to perform damaged stability calculations and prapare documentation, and able to interpret the results of calculations from the designers point of view

c) attitude: interested, responsive, take care for the deadlines

d) autonomy and responsibility: the student makes responsible decisions, asks for the professional opinions of others, and takes care of the challenges responsibly.

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

Requirements for signature: 1 report and submission of the seminar report

1 exam measuring the theoretical knowledge

the final result is the average of the parts

19. Opportunity for repeat/retake and delayed completion

Second exam and delayed submission of the homework

20. Learning materials

Related national and international scientific literature

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

Subject description

1. Subject name	**Traction mechanics**				
2. Subject name in Hungarian	Vonattovábbítás mechanikája			**3. Role**	sp
4. Code	**KOVRM619**	**5. Evaluation type**	**e**	**6. Credits**	**3**
7. Weekly contact hours	**2 lecture**	**1 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**90 hours**
Contact hours	42 hours	**Preparation for seminars**	8 hours	**Homework**	0 hours
Reading written materials	13 hours	**Midterm preparation**	12 hours	**Exam preparation**	15 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Németh István
12. Lecturers	Németh István

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

14. Description of lectures

Movement factors of the train: the traction force, the brake force, the track-force. The control of the traction and brake effort by the control of the torsion affairs of the rotational system. Determination of the train mass which can be start-moved by traction unit; the construction of the Koreff-diagram. Determination of the velocity-time diagram by dynamical model based simulation. Consideration of the limit-force which can be transferred in the rolling contact. The train as a longitudinal swingsystem. The dynamic of the train-tear. The dynamic of the special train movements: the shunting, the sorting, the sorting hump. Energy requirement to move the train, the simulation of the energy consumption in cases of the diesel and electric traction. Outlook on the question of the energy-optimal train-control, the principle of the determination of the optimal tractive and brake effort, the numerical implementation of the latter.

15. Description of practices

Processing of the numerical data and characteristic curves of the vehicles and tracks. Integration methods of the train motion equation in MATLAB environment. Computation of the energy consumption of the train motion realized by the diesel and electric vehicles. Numerical processing and graphical representation of the characteristic surfaces of the longitudinal structure connections. Numerical realization of the optimal train movement in MATLAB environment. Determination and analyzation of the movement diagrams of the special train movements. Determining data for construction of the schedule.

16. Description of laboratory practices

-

17. Learning outcomes

a) knowledge:

Understands and applies the mathematical and scientific principles and procedures of the train traction mechanics.

Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of train forwarding.

Knows and understands the basic facts, limits and development possibilities of the train forwarding.

Knows and understands the traffic, logistic, environment-, work- and fire protection viewpoints of the train forwarding.

Knows and understands the information and communication technology which are connected with the train forwarding.

Knows and understands the methods of the computer modelling and simulation which are connected with the train forwarding.

b) skills:

Able to apply in innovative way the required mathematical and scientific principles and procedures for solving the problems connected with the train forwarding.

Able to apply, to analyze and to evaluate the methods applied in the field of the train forwarding.

Shows ability to apply integrated knowledges in the field of the train forwarding.

c) attitude:

Open and receptive to know and to pass on the developments and innovations which are taken place on the field of the train forwarding. The sense of vocation is depth.

Accepts the professional and ethical values-system connected with the professional area of the railway.

Pursuing to use complex and on system-oriented mentality based approach to the processes.

Pro-activity in professional work, the self-standing selection and application of the solution methods.

Making decision circumspectly and responsibility.

d) autonomy and responsibility:

Takes into account in the decisions the regulations of the environment, the law and the engineering ethics.

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

During the semester there is necessary the individual solving of some tasks (ability, attitude, responsibility). The criterion of signature is both the active participation at the class (attitude), and the complete solving of the semester's tasks (knowledge, ability, autonomy). During the semester there is necessary to successfully write two midterm tests (knowledge, ability, autonomy). In the fields of attitudes and autonomy the results achieved in the semesters are included in the final classification by weight 50%. At the end of semester there is an examination (knowledge, ability, attitude).

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the control works and the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Kopasz Károly: A vonattovábbítás mechanikája.
Wende, D.: Fahrdynamik. Verlag für Verkehrswesen. Berlin, 200-

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

Subject description

1. Subject name	**Transmission system design**				
2. Subject name in Hungarian	Erőátvitel tervezése			**3. Role**	sp
4. Code	**KOGJM612**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	0 hours
Reading written materials	26 hours	**Midterm preparation**	10 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Zöldy Máté
12. Lecturers	Dr. Harth Péter, Nyerges Ádám

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

14. Description of lectures

Design of a selected power transmission unit (camshaft, gearbox or driven bridge) for an internal combustion engine, hybrid drive chain, or electric vehicle. Determination of main dimensions based on vehicle dynamics calculations, geometric dimensioning of individual components, gears, shafts, bearing strength and lifetime of bearings, design and dimensioning of actuating mechanisms, design of enclosure housings, mounting elements.

15. Description of practices

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16. Description of laboratory practices

Semester planning task desgin on computer, consultation.

17. Learning outcomes

a) knowledge: Knowledge of power units.
b) skills: Ability to develop power units
c) attitude: Openness to new opportunities in the field
d) autonomy and responsibility: Participate in solving independent tasks

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.
The conditions for obtaining the signature are the completing the midterm test. Final grade equals to the result of the written exam.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Vehicle automation systems**				
2. Subject name in Hungarian	Járművek automatizálási rendszerei			**3. Role**	sp
4. Code	**KOGGM659**	**5. Evaluation type**	**e**	**6. Credits**	**4**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**120 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	16 hours
Reading written materials	20 hours	**Midterm preparation**	0 hours	**Exam preparation**	10 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Szalay Zsolt
12. Lecturers	Dr. Török Árpád, Pethő Zsombor, Bokor László (VIK)

13. Prerequisites	- (-), -

14. Description of lectures

The aim of the course is to introduce the communication systems of classic and highly automated vehicles. ECU level communication, and in-vehicle communication protocols like CAN, LIN, MOST, FlexRay and Automotive Ethernet. Inter-vehicle communication, V2X. Communication protocols. Automotive cybersecurity issues. Electromagnetic compatibility. Testing and validation of communication systems. Vehicle diagnostics. Intelligent transport systems, implementation. Computer network basics, protocols. Introduction to vehicle communication (V2X communication). Vehicle to vehicle communication (V2V), vehicle to infrastructure communication (V2I). V2X architectures and protocols. Standard V2X security and privacy. Electronic Control Units (ECUs) and ECU level communication (UART, SPI, I2C). Automotive in-vehicle communication protocols and their applications (CAN, LIN, FlexRay, MOST, Automotive Ethernet). Cybersecurity of in-vehicle communication systems. Electromagnetic compatibility of communication systems. Diagnostic capabilities of communication systems. Testing and validation of vehicle communication systems.

15. Description of practices

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16. Description of laboratory practices

The lab enables the practical implementation of individual student work. Some of the systems presented in the presentation are also presented in practice.

17. Learning outcomes

a) knowledge:
- knows the automotive communication systems,
- knows the communication technologies of the automotive industry,
- is familiar with the communication security issues of automotive systems,
- knows electromagnetic compatibility issues of communication systems, their testing and validation

b) skills:
- is able to use in-vehicle communication protocols,
- is capable of designing appropriate communication interfaces
- can select a protocol for a particular autonomous vehicle function,

c) attitude:
- responsive to understanding new communication solutions

d) autonomy and responsibility:
- takes responsibility of the work done

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

Signature: completion of mid-term assignments and lab exercises
The grade is the result obtained in the examination.

19. Opportunity for repeat/retake and delayed completion

Delayed completion of individual homework.

20. Learning materials

Slides and lecture notes

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

Subject description

1. Subject name	**Vehicle evaluation, traffic environment**				
2. Subject name in Hungarian	Járműértékelés, közlekedési környezet			**3. Role**	sp
4. Code	**KOGJM640**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	10 hours
Reading written materials	58 hours	**Midterm preparation**	8 hours	**Exam preparation**	0 hours

10. Department	Department of Automotive Technologies
11. Responsible lecturer	Dr. Török Árpád
12. Lecturers	Dr. Melegh Gábor, Dr. Török Árpád, Vida Gábor

13. Prerequisites	- (-), -

14. Description of lectures

The students listen to the auditions, the calculation of the damage, the limitation of the damage, the technical tasks and expectations concerning the change of value. Information is provided on the key areas of expertise, issues and mediation. Insurance Knowledge (GFB, Casco) Getting to know the catalog system commonly used for vehicle evaluation and repair calculations. Special repairability, depreciation issues, individual assessment methodology. Demonstration and analysis of human factors, reaction, perception, perception of the vehicle.

15. Description of practices

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16. Description of laboratory practices

To deepen the knowledge of the methods and procedures of the presentations by solving practical examples.

17. Learning outcomes

a) knowledge: - The student has to know the main cornerstones of the legislative environment that determines the process of vehicle evaluation; - The student has to know the steps of the vehicle evaluation process; - The student has to know the purpose and means of vehicle evaluation; - The student has to know the online and printed guidlines and applications supporting vehicle evaluation; - The student has to know the related technical/instrumental analysis; - The student has to know the methods of vehicle evaluation analysis;

b) skills: - The student is able to evaluate the documentation related to the vehicle evaluation; - The student is able to describe and calculate vehicle value indicators; - The student is able to apply the necessary tools to determine vehicle evaluation;

c) attitude: - The student aims to maximize their abilities by making their studies at the highest possible level, proficient and independent; - The student aims to cooperate with the instructor and the other students to improve knowledge; - The student aims to continue to imrpove the knowledge of the material parts of the lessons through continuous independent learning; - The student aims to use the information technology and computing tools (word processing computer software, mathematical software, image editing software, etc.), but also seeks to use classical devices (paper, ruler, pencil, hand-held calculator, editing, etc.); - The student aims to get to know and routinely use the tools needed to solve the tasks - The student aims to provide accurate, error-free and precise work.

d) autonomy and responsibility: - The student is responsible for setting an example forthe other students rgarding the quality of its work and ethical standards; - The student applies the knowledge acquired during the course in a responsible manner with regard to their validity limits; - The student accepts openly the grounded critical remarks; - The student accepts the framework for cooperation, can do its job independently or as part of a team, depending on the situation. ”

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

During the semester 1 midterm test has to be completed with more the 50 % of the maximal points.

The conditions for obtaining the midterm grade are the completing the midterm test, attending all labs and submitting the homework on accepted level.

Final outcome of the subject is defined by the result of the mid-term exam in 60% proportion, and the homework in 40% proportion. All requirements have to be fulfilled to successfully finish the subject.

19. Opportunity for repeat/retake and delayed completion

The midterm test can be retaken once. The homework can be delivered once additionally. One lab can be done once additionally.

20. Learning materials

Slides and presentation notes

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

Subject description

1. Subject name	**Vehicle operation, reliability and diagnostics**				
2. Subject name in Hungarian	Járműüzem, megbízhatóság és diagnosztika			**3. Role**	k
4. Code	**KOVRM602**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**J**

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 Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Csiba József
12. Lecturers	Németh István

13. Prerequisites	- (-), -

14. Description of lectures

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

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge: Understands and applies the mathematical and scientific principles and procedures of the operation and reliability of the vehicle. Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of vehicle operation, reliability and diagnostic. Knows and understands the basic facts, limits and development possibilities of the vehicle operation, reliability and diagnostic. Knows and understands the traffic, logistic, environment-, work- and fire protection viewpoints which are connected with the vehicles operation. Knows and understands the information and communication techniques which are connected with the vehicle operation, reliability and diagnostic. Knows and understands the methods of the computer modelling and simulation which are connected with the vehicle operation, reliability and diagnostic.

b) skills: Able to apply in innovative way the required mathematical and scientific principles and procedures for solving the problems connected with the vehicle operation, reliability and diagnostic. Able to apply, to analyze and to evaluate the methods applied in the field of the vehicle operation, reliability and diagnostic. Shows ability to apply integrated knowledges in the field of the vehicle operation, reliability and diagnostic.

c) attitude: Open and receptive to know and to pass on the developments and innovations which are taken place on the field of the speciality. The sense of vocation is depth. Accepts the professional and ethical values-system connected with the technical professional area. Pursuing to use complex and on system-oriented mentality based approach to the processes.

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection and application of the solution methods. Making decision circumspectly and responsibility. Takes into account in the decisions the regulations of the environment, the safety, the economy and the engineering ethics.

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

During the semester necessary the active participation at the class (attitude), and during the semester there is two midterm tests for evaluating the knowledge, the ability, the autonomy and the attitude. The attitude and the autonomy mean 15-15 % and the knowledge and the ability mean 35-35 % in the final classification.

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the midterm tests.

20. Learning materials

Benedek T.- Győri J.- Zobory I.: Járműrendszer diagnosztika. Publication of the BME VRHT., Budapest 200-
Gál Z.- Kovács Z.: Megbízhatóság, karbantartás. Publisher of University of Veszprém. Veszprém 2000.
Zobory I.: Járműüzem, megbizhatóság és diagnosztika . Department's publication., 20-

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

Subject description

1. Subject name	**Vehicle simulation and optimisation**				
2. Subject name in Hungarian	Járműszimuláció és optimálás			**3. Role**	sp
4. Code	**KOVRM638**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**2 practice**	**0 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	12 hours	**Homework**	0 hours
Reading written materials	60 hours	**Midterm preparation**	22 hours	**Exam preparation**	0 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Zábori Zoltán
12. Lecturers	Dr. Zábori Zoltán

13. Prerequisites	- (-), -

14. Description of lectures

The real vehicle system and its investigation model. The discrete and distributed parameter models, hybrids. Formulation of the system model giving the basis of the simulation procedura. Typical techniques: linearization, considering the non-linearities. Parameter space, state space, and excitation space. The stair-like simulation technology. Possibilities for the solution of the system equations: time-domain and frequency-domain analyses. Numerical solutions by using digital simulation. Special solvers for differential equations. Real-time simulations. Prediction of the motion and loading conditions of vehicles. Statistical analysis of the simulation results. Stochastic simulation. The problem of system optimization. Selection of the optimization objective function, action-parameters and constraint conditions. Analytical and numerical optimization techniques. Problems leading linear programming (LP). Algorithm of the generalized gradient method . Procedure in case of a random variable valued objective function (stochastic field).

15. Description of practices

Solving tasks connected with the theoretical material. Application and comparison of the linearization methods. Model construction. Comparison and evaluation of the solutions given by the different system prameters.

16. Description of laboratory practices

-

17. Learning outcomes

a) knowledge: Understands and applies the mathematical and scientific principles and procedures of vehicle simulation and optimization. Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of vehicle simulation and optimization. Knows and understands the basic facts, limits and development possibilities of the vehicle simulation and optimization. In details knows and understands the modeling methods of the vehicle simulation and optimization.

b) skills: Able to apply in innovative way the required mathematical and scientific principles and procedures for solving the problems connected with the vehicle simulation and optimization. Able to apply, to analyze and to evaluate the methods applied in the field of the vehicle simulation and optimization. Shows ability to apply integrated knowledges in the field of the vehicle simulation and optimization.

c) attitude: Open and receptive to know and to accept the developments and innovations which are taken place on the field of the vehicle simulation and optimization. The sense of vocation is depth. Accepts the professional and ethical values-system connected with the professional area of the vehicle engineering. Pursuing to use complex and on system-oriented mentality based approach to the processes.

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection and application of the solution methods. Making decision circumspectly and responsibility.

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

The criterion of midterm grade are both the active participation at the classes (attitude), and during the semester successfully written two midterm tests (knowledge, ability, autonomy). In the fields of attitudes and autonomy the results achieved in the semesters are included in the final classification by weight 50%.

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the midterm exams, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Zobory i.: Járműszimuláció és optimálás. Deparment's publication.. Bp. 2000.
Department's publication about of special simulation problems of the vehicle systems.

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

Subject description

1. Subject name	**Vehicle superstructure design**				
2. Subject name in Hungarian	Járműfelépítmény tervezés			**3. Role**	sp
4. Code	**KOJSM667**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	50 hours
Reading written materials	22 hours	**Midterm preparation**	4 hours	**Exam preparation**	0 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Lovas László
12. Lecturers	Dr. Galambosi Frigyes, Dr. Susánszki Zoltán

13. Prerequisites	Superstructure preliminary design (KOJSM664), strong; - (-), -; - (-), -

14. Description of lectures

Construction layouts, regarding manufacturing and tooling. Optimisation of superstructures (manufacturing, weight, stiffness).

15. Description of practices

-

16. Description of laboratory practices

Complete superstructure design using CAD tools.

17. Learning outcomes

a) knowledge:
- The student knows the usual processes in superstructure manufacturing,
- knows the special requirements for manufacturing tubes, sheet metals, elastic covers,
- knows the superstructure optimisation possibilities concerning shape, size and weight,
- knows the principles fo the continous improvement in vehicle industry.

b) skills:
- The student is able to prepare the core of a superstructure design of a given type,
- is able to prepare a design for easy manufacturing,
- is able to optimize the superstructure layout upon given requirements,
- is able to perform a superstructure design task alone,
- is able to realize the sufficiently detailed numerical model of a superstructure.

c) attitude:
- The student makes an effort to gather all the available informations in a given domain,
- Cooperates with his fellow students and the teacher,
- is open minded towards new and innovative ideas and researches,
- uses informatical and computational devices for his work

d) autonomy and responsibility:
- The student is conscient about his responsibility towards the society and his company,
- asks for the colleagues' expertise and judgement when working,
- considers challenges with responsibility.

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

1 semestrial project work, 1 non-compulsory test. Details for computing the final mark can be find in the subject requirements.

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for homework

20. Learning materials

Lecture notes

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

Subject description

1. Subject name	**Vehicle system dynamics and control**				
2. Subject name in Hungarian	Járműrendszerdinamika és kontroll			**3. Role**	sp
4. Code	**KOVRM636**	**5. Evaluation type**	**e**	**6. Credits**	**8**
7. Weekly contact hours	**3 lecture**	**2 practice**	**1 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**240 hours**
Contact hours	84 hours	**Preparation for seminars**	21 hours	**Homework**	60 hours
Reading written materials	50 hours	**Midterm preparation**	0 hours	**Exam preparation**	25 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Zábori Zoltán
12. Lecturers	Dr. Zábori Zoltán, Dr. Gáspár Péter

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

14. Description of lectures

Analysis of dynamical models apt for examining the main motion of vehicles and vehicle-strings, as well as traffic flows. The non-linear dynamic model of the force transfer in rolling contact with regard to stochasticity coming from tribological properties. Motion equations of lumped parameter models capable for vibrations describing vehicle system. The forces and motion excitation, as well as parametric excitations. The stochastic ordinary differential equation system of the discrete dynamical system. Constraction of motion equation systems of distributed parameter vehicle systems. The stochastic partial differential equation system of the distributed parameter dynamical system. The vehicle dynamical systems as a controlled or regulated section. Formulation of some typical vehicle dynamical task for control, with operation-technical explanation of the control signals. The vehicle control problem formulated by model based methods. Methods apt for designing vehicle control. Failure detecting in the vehicle control system. Design of vehicle control of reconfigurating and fault-toleranting character. Design of integrated control and inspection control. Case studies concerning controlled vehicle dynamical systems.

15. Description of practices

Exercising of the theoretical material by the solving of the numerical examples in MATLAB computation environment.

16. Description of laboratory practices

Analysis, comparison and evaluation of the simulation procedures in MATLAB environment.

17. Learning outcomes

a) knowledge:

Understands and applies the mathematical and scientific principles, relations and procedures necessary to cultivate professional area of the vehicle system dynamic and the vehicle control.

Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of vehicle system dynamics and vehicle control.

In details knows and understands the methods and problem solving techniques of the vehicle system dynamics and vehicle control.

Knows and understands the tools and methods of the computer modelling and simulation which are usable in the vehicle system dynamics and vehicle control.

Knows the problem solving techniques which are applicable in the research or scientific work.

b) skills:

Able to apply the required mathematical and scientific principles and procedures for solving the problems connected with the vehicle system dynamics and vehicle control.

Able to apply in innovative way the principles and terminologies of the vehicle system dynamics and vehicle control.

Able to identify, to evaluate and manage by system-approach the effect mechanism of the vehicle system dynamics and vehicle control processes.

c) attitude:

Open and receptive to know and to accept the technology developments and innovations which are taken place on the field of the speciality of vehicle system dynamics and vehicle control.

Accepts the professional and ethical values-system connected with the technical professional area.

Pursuing to use complex and on system-oriented mentality based approach to the processes.

Pursuing to use complex and on system-oriented mentality based approach to the processes.

d) autonomy and responsibility:

Pro-activity in the solution of professional tasks, the self-standing selection of the solution methods.

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

During the semester there is necessary to solve some simulational subtasks (for the evaluation of the knowledge, ability, attitude and autonomy)(2 pieces). The final evaluation of the knowledge and ability will be at in the framework of an examiantion, at the end of the semester. The criterion of signature is the complete solving of all tasks of the semester.

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Zobory I.: Járműrendszerdinamika. (Lineáris időinvariáns rendszerek)
Bokor J., Gáspár P., Kohut M., Kurutz K.: Szabályozástechnika I.
Gillespie, T.D.: Fundamentals of vehicle dynamics
Kiencke U., Nielsen L.: Automotive control systems

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

Subject description

1. Subject name	**Vehicle system informatics**				
2. Subject name in Hungarian	Járműinformatika			**3. Role**	sp
4. Code	**KOVJM437**	**5. Evaluation type**	**m**	**6. Credits**	**5**
7. Weekly contact hours	**2 lecture**	**0 practice**	**2 lab**	**8. Curriculum**	**J**

9. Working hours for fulfilling the requirements of the subject					**150 hours**
Contact hours	56 hours	**Preparation for seminars**	18 hours	**Homework**	30 hours
Reading written materials	46 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Railway Vehicles and Vehicle System Analysis
11. Responsible lecturer	Dr. Kolonits Ferenc
12. Lecturers	Dr. Kolonits Ferenc

13. Prerequisites	- (-), -

14. Description of lectures

Vehicle Computing System as info. storage, transmission, grouping, sorting, processing: data representation, data input, storage, retrieval, transmission, distribution. Determining document structure. Document description of the main tools: SGML, HTML, XML and DTD. XSL. DTD: name structure, syntax, terminal descriptors. Standard and generic items. Attribute syntax. Namespace applications. Application type descriptor (entity). Vehicle-document hierarchical structure and structural levels battery unit, structure, group, division, sub vehicle. Enlargement of the structure. The event codes ordering parts. XML editors: XML mind morph, Xerlin, Web download software use. Clarity. Document Processing: XSL various tools: Finding the XML document elements, navigating structural axes. Implementation mechanism of the template. Targeted info. Extraction. Processing Software: COOKTOP (free downloadable software) review of the principal lines. Using XSL-generator program. The Xtract software. Vehicle Document Management: performing elementary operations XSLT routines scenarios and bills of withdrawal of the document specified. Description of vehicle structural links: contact and containment relations. The functional areas and roads setting - the possibilities and the processing pathes. Graph theoretical analysis of the failure groups. Production data structures for vehicle system reliability analysis. The statistical processing programs to connect preparation.

15. Description of practices

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16. Description of laboratory practices

In the framework of the computer laboratory practice solution of the concrete vehicle-informatic tasks of the data-sorting, the vehicle-reliability and the maintenance.

17. Learning outcomes

a) knowledge: Understands and applies the mathematical and scientific principles and procedures of the vehicle informatics. Understands and can apply in a wide circle the theories and terminologies elaborated for professional area of informatics. Knows and understands the basic facts, limits and development possibilities of the vehicles informatics. Knows and understands the information and communication technology which are connected with the vehicles informatics.

b) skills: Able to apply in innovative way the required mathematical and informatics principles and procedures for solving the problems connected with the vehicle informatics. Able to apply, to analyze and to evaluate the methods applied in the field of the vehicle informatics. Shows ability to apply integrated knowledges in the field of the vehicle informatics.

c) attitude: Open and receptive to know and to pass on the developments and innovations which are taken place on the field of the vehicle informatics. The sense of vocation is depth. Accepts the professional and ethical values-system connected with the professional area of the vehicle informatics. Pursuing to use complex and on system-oriented mentality based approach to the processes.

d) autonomy and responsibility: Pro-activity in professional work, the self-standing selection and application of the solution methods. Making decision circumspectly and responsibility. Takes into account in the decisions the regulations of the law and the engineering ethics.

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

The criterion of midterm grade are both the active participation at the classes (attitude), and the complet solving of the semester's tasks (knowledge, ability, autonomy). In the fields of attitudes and autonomy the results achieved in the semesters are included in the final classification by weight 50%.

19. Opportunity for repeat/retake and delayed completion

Possibility to refit the homeworks, to repeat the examination, properly to the Study and Exam Regulations.

20. Learning materials

Department's publications.

List of offered elective economics courses

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

Subject description

1. Subject name	**Argumentation, Negotiation and Persuasion**				
2. Subject name in Hungarian	Érvelés, tárgyalás, meggyőzés			**3. Role**	kv
4. Code	**GT41MS01**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

9. Working hours for fulfilling the requirements of the subject					**60 hours**
Contact hours	28 hours	**Preparation for seminars**	8 hours	**Homework**	0 hours
Reading written materials	0 hours	**Midterm preparation**	24 hours	**Exam preparation**	0 hours

10. Department	Department of Philosophy and History of Science
11. Responsible lecturer	Dr. Láng Benedek István
12. Lecturers	Szabó Krisztina

13. Prerequisites	- (-), -

14. Description of lectures

During the course of Argumentation, Negotiation,Persusion, students can acquire the basic theoretical and practical knowledge of all three subjects. In the persuasion-technical block we examine the techniques, psychological assumptions and social significance of manipulation, influence and persuasion. The lessons will be about rational decision-making processes, inter-group conflicts, norm-tracking and group thinking from the point of view of social psychology. Students will become familiar with the concepts of dissonance theories, perception, remembrance, framing, social categorization and attitude change through everyday examples and case studies, so they will be able to recognize and correctly interpret the relevant processes of the media and advertising industry. During the argumentation technique we discuss the peculiarities of the various types of disputes, especially the rational discussion. Students can develop their reasoning, discussion, and lecture skills by analyzing real-world dialogues, video details and personal examples, using the toolbox of logic to be able to stand their place in both the argument and rhetoric of work and private life. In negotiation techniques, we discuss the basic types and strategies of negotiation, the pitfalls of negotiating situations, and the proposed ways of avoiding them. During the lessons, the theory is put into practice through case studies and small group exercises, simulating real negotiating situations, where students can sharply" test, improve their negotiating skills, and thus prepare for the challenges of the labor market. "

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge - Knows the widely used problem-solving techniques for research or scientific work. - Knows the management tools and methods related to management, and the legislation needed to practice the profession.

b) skills - Being able to design and manage the use of technical, economic, environmental, and human resources.

c) attitude - Being open and responsive to the knowledge and acceptance of professional, technological development and innovation in the field, and to the provision of authentic mediation. - Seeks to adhere to and adhere to the ethical principles of work and organizational culture, and to compliance with quality requirements.

d) autonomy and responsibility - Takes decisions carefully, in consultation with representatives of other fields of expertise (primarily legal, economic, energy and environmental), with full responsibility. - Being responsible for sustainability, health and environmental awareness. - Decisions take into account the principles and principles of environmental protection, quality, consumer protection, product liability, equal access, health and safety at work, technical, economic and legal regulations, and engineering.

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

To complete the course, 2 midterm tests must be written during the semester. Type of midterms: multiple choice test and essay. 1st midterm: max. 40 points available. 2nd midterm: max. 60 points available. So a total of 100 points can be collected from the two midterms. Student can earn extra points for midterm scores as follows:

Visiting lectures is not a must, there is no catalog, but anyone who enters and enriches the lesson with the sessions of the curriculum has an extra point, which is recorded at the end of each hour. It is important that students have to come and write down their points after every hour. You cannot enter a point backwards. If students send links, advertisements, a few paragraph analyzes, etc. to the curriculum, we can also reward them with extra points. Plus points can be earned no later than the last hour, then no longer.

19. Opportunity for repeat/retake and delayed completion

Up to one of the 2 midterm tests can be replaced or improved during the delayed completion period.

20. Learning materials

https://www.filozofia.bme.hu/

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

Subject description

1. Subject name	**Economic Analysis of Technological Processes**				
2. Subject name in Hungarian	Műszaki folyamatok közgazdasági elemzése			**3. Role**	kv
4. Code	**GT30MS02**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

9. Working hours for fulfilling the requirements of the subject					**60 hours**
Contact hours	28 hours	**Preparation for seminars**	0 hours	**Homework**	0 hours
Reading written materials	20 hours	**Midterm preparation**	12 hours	**Exam preparation**	0 hours

10. Department	Department of Economics
11. Responsible lecturer	Dr. Major Iván
12. Lecturers	Dr. Vigh László

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

14. Description of lectures

In everyday practice - unfortunately - a technical and economic solution to a problem they are looking separately, in extreme cases, the experts of the two areas do not understand each other's language. The object In this context, we are trying to link these two disciplines, primarily from the economic point of view. In doing so, several technical processes (production, innovation, raw material management (costs), etc.) from an economic point of view, we show the relevant economic aspects. In addition, we examine the market environment of companies, which has a decisive impact on product sales and revenue. Our goal is for future engineers to recognize the economic elements of their activities, which will certainly make the acceptance of their products easier.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge
- Knows the role of the production process, the cost of technology,
- knows the benefits of capacity utilization and economies of scale
- knows the market environment of companies and its impact on production and sales activities,
- knows the relationship between technology and market structures,
- knows the potential and benefits of technological innovation, innovation in the markets.

b) skills
- Ability to design, organize and conduct independent learning,
- is able to apply the general and specific economics principles, rules, relationships, procedures in solving problems in the technical field;
- is capable of complex planning and management of the use of technical and economic resources,
- is able to identify the external market environment and its changes,
- is able to analyze and evaluate market opportunities,
- is able to theoretically base economic decisions.

c) attitude
- Collaborates with the instructor and student fellows to expand knowledge
- expands your knowledge through continuous knowledge
- open to the use of information technology tools,
- seek to understand the economic tools needed to solve technical problems,
- strives for accurate and error-free task solving.

d) autonomy and responsibility
- Openly accepts well-founded critical remarks,
- independently performs the analysis of economic problems, the evaluation of related tools,
- openly accept well-founded critical remarks,
- uses his systemic approach in his thinking.

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

Learning outcomes are assessed on the basis of two mid-term tests: a complex, written assessment of knowledge, skills, attitudes, and independence and responsibility types of the subject in the form of midterm tests. The tests are on the one hand test questions, which

are the interpretation of certain concepts and the connection between them, as well as the calculation tasks, which examine the problem-solving-ability. The topic of tests is determined by the lecturer, the available working time is 45 minutes/test. A prerequisite for obtaining a midterm grade is that the student does not have to make a replacement in the case of half of the midterm tests (i.e. one student has to reach at least 40% from one midterm test). If the student does not participate in any of the midterm tests, the course will be assessed as "Not fulfilled" (based on Code of Studies). 50-50% of the results of the two midterm test scores are counted in the final grade.

19. Opportunity for repeat/retake and delayed completion

Midterm tests can be replaced once during the term. In the delayed completion period, according to the Code of Studies, the midterm tests may be supplemented by the paying a delayed completion fee.

20. Learning materials

http://kgt.bme.hu/

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

Subject description

1. Subject name	**Investments**				
2. Subject name in Hungarian	Befektetések			**3. Role**	kv
4. Code	**GT35M004**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

9. Working hours for fulfilling the requirements of the subject					**60 hours**
Contact hours	28 hours	**Preparation for seminars**	8 hours	**Homework**	0 hours
Reading written materials	0 hours	**Midterm preparation**	24 hours	**Exam preparation**	0 hours

10. Department	Department of Finance
11. Responsible lecturer	Dr. Bethlendi András
12. Lecturers	Póra András

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

14. Description of lectures

The main objective of the course is to familiarize students with: the operation of stock markets, stock exchanges, institutions and indexes on the market, the basic theoretical background of stock analysis, its main methods, and the main portfolio management strategies. During the semester, emphasis will be placed on the methodology of fundamental stock analysis.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge

- Knows the widely used problem-solving techniques for research or scientific work.
- Knows the management tools and methods related to management, and the legislation needed to practice the profession.

b) skills

- Being able to design and manage the use of technical, economic, environmental, and human resources.

c) attitude

- Being open and responsive to the knowledge and acceptance of professional, technological development and innovation in the field, and to the provision of authentic mediation.
- Seeks to adhere to and adhere to the ethical principles of work and organizational culture, and to compliance with quality requirements.

d) autonomy and responsibility

- Takes decisions carefully, in consultation with representatives of other fields of expertise (primarily legal, economic, energy and environmental), with full responsibility.
- Being responsible for sustainability, health and environmental awareness.
- Decisions take into account the principles and principles of environmental protection, quality, consumer protection, product liability, equal access, health and safety at work, technical, economic and legal regulations, and engineering.

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

1st midterm test from the first quarter. 2nd midterm test from the second quarter.

All midterm test are 45 minutes long for 50 points; Multiple choice tests and calculation tasks.

19. Opportunity for repeat/retake and delayed completion

Both midterm test can be rewritten by once.

20. Learning materials

http://www.finance.bme.hu/

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

Subject description

1. Subject name	**Leadership and Applied Management Psychology**				
2. Subject name in Hungarian	Alkalmazott vezetéspszichológia			**3. Role**	kv
4. Code	**GT52MS01**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

9. Working hours for fulfilling the requirements of the subject					**60 hours**
Contact hours	28 hours	**Preparation for seminars**	0 hours	**Homework**	32 hours
Reading written materials	0 hours	**Midterm preparation**	0 hours	**Exam preparation**	0 hours

10. Department	Department of Ergonomics and Psychology
11. Responsible lecturer	Dr. Répáczki Rita
12. Lecturers	Dr. Hámornik Balázs Péter

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

14. Description of lectures

The aim of the subject is to develop practical skills in addition to the theoretical knowledge of leadership psychology. Within this, the issues of the process of managerial maturity, the managerial personality, the role and the role are also elaborated. The aim is also to develop practical skills, the importance of which is important for effective leadership.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge

- Knows the widely used problem-solving techniques for research or scientific work.
- Knows the management tools and methods related to management, and the legislation needed to practice the profession.

b) skills

- Being able to design and manage the use of technical, economic, environmental, and human resources.

c) attitude

- Being open and responsive to the knowledge and acceptance of professional, technological development and innovation in the field, and to the provision of authentic mediation.
- Seeks to adhere to and adhere to the ethical principles of work and organizational culture, and to compliance with quality requirements.

d) autonomy and responsibility

- Takes decisions carefully, in consultation with representatives of other fields of expertise (primarily legal, economic, energy and environmental), with full responsibility.
- Being responsible for sustainability, health and environmental awareness.
- Decisions take into account the principles and principles of environmental protection, quality, consumer protection, product liability, equal access, health and safety at work, technical, economic and legal regulations, and engineering.

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

Participation in 70% of the lessons, preparation of two individual reports.

19. Opportunity for repeat/retake and delayed completion

According to Code of Studies

20. Learning materials

http://www.erg.bme.hu/

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

Subject description

1. Subject name	**Managerial Accounting**				
2. Subject name in Hungarian	Vezetői számvitel			**3. Role**	kv
4. Code	**GT35M005**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

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

10. Department	Department of Finance
11. Responsible lecturer	Dr. Böcskei Elvira
12. Lecturers	Dr. Böcskei Elvira

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

14. Description of lectures

Systematic, practice-oriented acquisition of close and contact topics in managerial accounting from theoretical and methodological knowledge of traditional cost management and responsible management accounting to new approaches.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge

- Knows the widely used problem-solving techniques for research or scientific work.
- Knows the management tools and methods related to management, and the legislation needed to practice the profession.

b) skills

- Being able to design and manage the use of technical, economic, environmental, and human resources.

c) attitude

- Being open and responsive to the knowledge and acceptance of professional, technological development and innovation in the field, and to the provision of authentic mediation.
- Seeks to adhere to and adhere to the ethical principles of work and organizational culture, and to compliance with quality requirements.

d) autonomy and responsibility

- Takes decisions carefully, in consultation with representatives of other fields of expertise (primarily legal, economic, energy and environmental), with full responsibility.
- Being responsible for sustainability, health and environmental awareness.
- Decisions take into account the principles and principles of environmental protection, quality, consumer protection, product liability, equal access, health and safety at work, technical, economic and legal regulations, and engineering.

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

Semester tasks:

1. A midterm grade can be obtained with a substantial mid-term job, which means that students will attend 70% of the lecture, and the lesson tasks received at the moodle will be solved on the day of the lecture, no later than midnight. (The hourly tasks allow you to reach 15 * 4 = 60 points, this is already sufficient. You can upload individual and group standalone tasks in the moodle until the deadline for each task. (You can also get 60 points for independent tasks that can be added in full. for points earned from hourly work if it reaches or exceeds 40 points The marks of the semester's performance that can be assessed in this way will be added to Neptune by end of last but one week and students will be exempt from writing in their home.

2. If during the semester you are unable or unwilling to obtain the task in the manner described in point 1, you can complete the subject with a successful solution of at least 50% on a midterm test what is located on the moodle interface. In this case, a midterm grade can be improved by one grade from the acquired intermediate points.

19. Opportunity for repeat/retake and delayed completion

The midterm can be rewritten once.

20. Learning materials

http://www.finance.bme.hu/

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

Subject description

1. Subject name	**Quality Management**				
2. Subject name in Hungarian	Minőségmenedzsment			**3. Role**	kv
4. Code	**GT20M002**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

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

10. Department	Department of Management and Corporate Economics
11. Responsible lecturer	Dr. Kövesi János
12. Lecturers	Dr. Topár József, Erdei János

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

14. Description of lectures

Within the framework of the subject, students will become familiar with current issues and methods of developing quality management systems. They get an overview of the quality philosophies applied in the production sectors and the basics of quality management methods that support their implementation.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge

- Knows the widely used problem-solving techniques for research or scientific work.
- Knows the management tools and methods related to management, and the legislation needed to practice the profession.

b) skills

- Being able to design and manage the use of technical, economic, environmental, and human resources.

c) attitude

- Being open and responsive to the knowledge and acceptance of professional, technological development and innovation in the field, and to the provision of authentic mediation.
- Seeks to adhere to and adhere to the ethical principles of work and organizational culture, and to compliance with quality requirements.

d) autonomy and responsibility

- Takes decisions carefully, in consultation with representatives of other fields of expertise (primarily legal, economic, energy and environmental), with full responsibility.
- Being responsible for sustainability, health and environmental awareness.
- Decisions take into account the principles and principles of environmental protection, quality, consumer protection, product liability, equal access, health and safety at work, technical, economic and legal regulations, and engineering.

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

The subject ends with a mid-term grade. 80% of the grade will be determined by the results of the midterm tests held in the semester and 20% by the group or individual task result. Information about the task will be published on the presentations and on the briefings available on the website. The task is mandatory. Without this, the requirements of the subject cannot be met. The task must be submitted electronically (by e-mail) by the deadline set by the lecturer. Midterm test are 50-50 point each, task is with a maximum of 20 points. Criteria: a minimum of 45 points from the two midterms and a minimum of 18 points on each midterm test, submission of the task. Final grade: sum of midterm scores * 0.8 + task score.

19. Opportunity for repeat/retake and delayed completion

Midterms can be rewritten during the delayed completion period in accordance with the regulations of Code of Studies. There is no possibility to delayed complete the semester task.

20. Learning materials

http://mvt.bme.hu/

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

Subject description

1. Subject name	**Social and Visual Communication**				
2. Subject name in Hungarian	Társadalmi és vizuális kommunikáció			**3. Role**	kv
4. Code	**GT43MS02**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

9. Working hours for fulfilling the requirements of the subject					**60 hours**
Contact hours	28 hours	**Preparation for seminars**	8 hours	**Homework**	0 hours
Reading written materials	0 hours	**Midterm preparation**	24 hours	**Exam preparation**	0 hours

10. Department	Department of Sociology and Communication
11. Responsible lecturer	Dr. Bárány Tibor
12. Lecturers	Dr. Szabó Levente

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

14. Description of lectures

It is impossible to communicate! And it is impossible to communicate… The general and social framework of communication. What is communication? Possible definitions, concepts. Disaster images. Representations in the media. Communication as an exchange of information. The information that is unlikely ... And the disorder that increases the information? Shannon's model. Communication as reporting property. Information you didn't want to inform? Communicative pictures? Barnlund's model. Communication as interaction. The group is above all… Illusion that consensus is emerging? Newcomb's model. Communication as participation. The ingenious stupid ants. Participation in incomprehensible group communication. Horányi's theory. Communicated. The user of the device is communicating, revolutionizing the pegasus and arbitrary symbols. Code and social systems. Politics, science, economy, art speak different languages? The institutional reality. When money is not in the tree. Image theory, perception theory. Why is the image effective? What are visual illusions about? The formation of writing. From pictorial representation to no-show signs. The agents of social communication. Rational roles and irrational individuality? A summary of social communication.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge

- He / she knows all the important elements of the concept of social science, understands the relationships that underlie the scientific interpretation of society and social communication.
- You know and understand the operating mechanisms of social phenomena and subsystems studied by communication and media science.

b) skills

- Is able to compare the basic theories and concepts of social communication, to elaborate rational arguments, ie to form opinions and defend their opinions during the various stages of communication.
- In the field of communication and media research, it is able to make realistic value judgments based on the processed information and to formulate independent proposals based on the conclusions drawn from them.

c) attitude

- It accepts that cultural phenomena are historically and socially defined and variable.
- Consciously represents the methods he uses in his own profession and accepts the different methodological features of other disciplines.
- Open to all forms of professional innovation, inclusive, but not mindful of theoretical, practical and methodological innovations.

d) autonomy and responsibility

- It displays its views as a sovereign player in professional and social forums, and represents its profession, organization and professional team responsibly.

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

Two midterm tests must be written (with at least pass (2) assessments) in the course of the study period, and all of the processed texts can be downloaded on the website of the course. The curriculum processed at each lecture will appear separately on the website of the course after the given lecture (so the obligatory readings for the given midterm test will be gathered here).

Points for each midterm test can be increased by 1-1, 3-3, by answering the question in hours (1st midterm can be increased by one of the 3 hours prior to 1st midterm, the 2nd midterm can be increased by one of the 3 between 1st and 2nd midterm) with an hourly response).

Individual performance with a thesis: discussed in individual consultations. This option is for those who want to deal with some of the topics in addition to the opportunities provided by the lessons, they need extra performance (eg I would like to present my thesis at a Scientific Student Conference (TDK)). Conditions: until the time of the first midterm, the choice of this alternative must be agreed with the instructor, a sketch of the ideas must be prepared, and the possibility of writing the thesis should be discussed in a personal consultation. After that, at least two times the subject has to be consulted on the process, the progress of the text, and at the end of the semester the completed thesis will be discussed, evaluated and, if necessary, additional opportunities beyond the semester will be assessed (eg participation in TDK). The thesis must be submitted by the specified date. Visiting the lessons: according to Code of Studies.

The components of the semester grade are: 1st midterm 50% and 2nd midterm 50%.

19. Opportunity for repeat/retake and delayed completion

The condition for participating in the supplementary midterm test is to fulfill the 1st midterm test (with a minimum of pass (2) result).
Replacement options: 2 (see Semester Scheduled Program)
Both midterms are rewritable for the purpose of increasing the mark, and the final mark takes the best results.
The results can be viewed on the course website and discussed at the weekly consultation time or by email consultation.

20. Learning materials

https://szoc.bme.hu/

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

Subject description

1. Subject name	**Technology Management**				
2. Subject name in Hungarian	Technológiamenedzsment			**3. Role**	kv
4. Code	**GT20M005**	**5. Evaluation type**	**m**	**6. Credits**	**2**
7. Weekly contact hours	**2 lecture**	**0 practice**	**0 lab**	**8. Curriculum**	**JKL**

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	12 hours	**Midterm preparation**	16 hours	**Exam preparation**	0 hours

10. Department	Department of Management and Corporate Economics
11. Responsible lecturer	Dr. Pataki Béla
12. Lecturers	Dr. Pataki Béla

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

14. Description of lectures

Course objectives:
- highlight the fundamental importance of technology for the successful operation of the organization;
- to promote a deeper understanding of the competitive nature of technology;
- introduce some of the best practices in technology management.

15. Description of practices

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16. Description of laboratory practices

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17. Learning outcomes

a) knowledge
- You will be aware of the competitive nature of technology.
- Understand the role of technology and engineering in the success of organizations.
- You will know some of the best practices in technology management.

b) skills
- Will be able to carry out his engineering tasks taking into account business, economic and management aspects.
- Being in a technology area with a lower level managerial position will be able to perform basic engineering manager tasks.

c) attitude
- He strives to put his engineering skills into a business, economic, and management context.
- Responsive to innovation, constant monitoring of technical progress, active participation in development.

d) autonomy and responsibility
- He can make his decisions carefully, in consultation with representatives of other disciplines.

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

To complete the subject, students need to write two, 30-minute long, max. 50-50-point midterm tests. The midterm grade is the total score available for the two midterm tests. There is no score limit to be met in any midterm tests.

19. Opportunity for repeat/retake and delayed completion

Each midterm tests can be written immediately after each other.

20. Learning materials

http://mvt.bme.hu/