1. Subject name	**Analysis of Aircraft II.**				
2. Subject name in Hungarian	Repülőgépek vizsgálata II.				
3. Code	**BMEKOVRM632**	4. Evaluation type	**mid-term grade**	5. Credits	**7**
6. Weekly contact hours	**3 (17) Lecture**	**0 (0) Practice**	**2 (11) Lab**		
7. Curriculum	**Vehicle Engineering MSc (J)**	8. Role	**Specialization (sp) at Vehicle Engineering MSc (J)**		
9. Working hours for fulfilling the requirements of the subject					**210**
Contact hours	70	Preparation for seminars	20	Homework	50
Reading written materials	58	Midterm preparation	12	Exam preparation	0
10. Department	**Department of Aeronautics and Naval Architectures**				
11. Responsible lecturer	Dr. Sziroczák Dávid				
12. Lecturers	Dr. Beneda Károly, Dr. Sziroczák Dávid, Dr. Veress Árpád				
13. Prerequisites	**strong: KOVRM629 - Aircraft design and production I.** **strong: KOVRM631 - Aircraft analysis I.**				

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

16. Description of labortory 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. Attitudes

- 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

Effective date	10 October 2019	**This Subject Datasheet is valid for**	Inactive courses