



1. Subject name	Advanced Flight Theory				
2. Subject name in Hungarian	Fejlett repüléselmélet				
3. Code	BMEKORHM620	4. Evaluation type	exam grade	5. Credits	4
6. Weekly contact hours	2 (9) Lecture	1 (5) Practice	0 (0) 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					120
Contact hours	42	Preparation for seminars	8	Homework	15
Reading written materials	40	Midterm preparation	0	Exam preparation	15
10. Department	Department of Aeronautics and Naval Architectures				
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

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. Attitudes

- 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

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