MSc in Mechanical Engineering Modelling
Fluid Mechanics Specialization
2N-MW0
elective subject

SUBJECT DATA SHEET AND REQUIREMENTS

last modified: 5th December 2013

AERODYNAMICS AND ITS APPLICATION FOR VEHICLES

AERODINAMIKA ÉS ALKALMAZÁSA JÁRMŰVEKRE

1 Code	Semester Nr. or fall/spring	Contact hours/week (lect.+semin.+lab.)	Requirements p / e / s	Credit	Language
BMEGEÁTMW09	4.(3.)fall	2+0+0	p	3	English

2. Subject's responsible:

Name:	Title:	Affiliation (Department):
Dr. Jenő Miklós SUDA	assistant professor	Dept. of Fluid Mechanics

3. Lecturer:

Name:	Title:	Affiliation (Department):
Prof. Tamás LAJOS	professor	Dept. of Fluid Mechanics
Eszter LUKÁCS	assistant research fellow	Dept. of Fluid Mechanics
Prof. József SCHERER	professor (invited lecturer)	MOME Budapest

4. Thematic background of the subject: Basics of Fluid Mechanics

5. Compulsory / suggested prerequisites:
Compulsory: -
Suggested: Fluid Mechanics (BSc level) BMEGEÁTAG01, -AG11, -AE01, -AM01, -AM11, -AM21, -AKM1, -AT01, -MF03

6. Main aims and objectives, learning outcomes of the subject:
To extend the knowledge of students in aerodynamics in general and in vehicle aerodynamics in particular as well as to contribute to development of skills of students in practical use of theoretical knowledge.

7. Method of education: lecture 2h/w, seminar 0h/w, laboratory 0h/w. Interactive lecture presentations and visit of wind tunnel laboratory, individual work on a project.

8. Detailed thematic description of the subject:
1. Introduction, bluff body aerodynamics,
2. Characteristics of atmospheric boundary layer.
3. Basics of car design (in co-operation with MOME: Moholy-Nagy University of Arts and Design Budapest)
4. Aerodynamics of automobiles
4. Aerodynamics of buses and trucks
5. Aerodynamics of racing cars
6. Wind tunnels and their use for vehicle aerodynamics
7. Definition of projects, forming groups of students
8. Measurement of car models evaluation of car bodies from aerodynamic and design point of view(in co-operation with MOME: Moholy-Nagy University of Arts and Design Budapest)
9. Presentations of groups

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Individual project (for student groups of BME + MOME): Passenger car modelling: Students from BME and MOME form one group. Every group will receive two modelling wood of 3 various given dimensions. With the help of plasticine, a passenger car of M 1:20 scale can be created. The relative position of the pieces of woods can be freely chosen, as far as the model resembles a car. The ground clearance (underbody gap) is 11mm, the distance of the axes is 140mm. The diameter of the wheels is 30mm, their width is 8mm. Wheels can be formed of the plasticine provided. In the larger piece of wood – under the passenger compartment – four boreholes are created, in order to attach the model to the scale (aerodynamic force measuring mechanism). Make sure not to cover these holes during modelling. The maximum length of the model is 250mm, its minimum height is 60mm, and its width is between 82 and 90mm. The perpendicular cross section of the model has to be determined (together with the wheels), in order to determine drag and lift coefficients. There is a possibility to place attachments on the car model, like spoilers, ski boxes, etc. Besides the force measurement, there will be a possibility for flow visualization around the car, during which the location and size of the separation bubbles, the size of the dead water region behind the car, effect of spoilers and other attachments, and soiling of the rear face of the car can be observed. The measurements groups have to make a presentation of the project on the last class. The groups have to send their presentation material by e-mail 2 days before the presentation at the latest.

9. Requirements and grading

a) in term-period : The grading is based on 1 mid-term exam (50% in final grade) and individual project work (50% in final grade). The project work consists vehicle modelling (40% = 25% for aerodynamics and 15% for the design), and presentation of the vehicle modelling measurements and visualisation results (10% in final grade).

mid-term exam 1.	11th week	max.50points (min.40% =min.20points)	50% in final grade
vehicle modelling	12th+13th weeks	max.40points (min.40% =min.16points)	40% in final grade
project presentation and report	14th week	max.10points (min.40% =min.4points)	10% in final grade

Totally max. achievable 100 points equal to 100% as base of the final grading. Minimum 40 points (=40%) obtained out of the parts, for each item separately is obligatory.

Grading: 0%-39%: fail(1); 40%-54% pass(2), 55%-69%: satisfactory (3), 70%-84%: good(4), 85%-100%: excellent (5)

b) in examination period: -

c) The students are subject to disciplinary measures against the application of unauthorized means at mid-terms, term-end exams and homework and the application of the 1/2013. (I.30.) Dean's Order must be followed.

10. Retake and repeat

Retake of the mode-term exam 1.: on the 13th week. No other retake is offered. Any further movements are due to the Code of Studies and Exams of BME.

11. Consulting opportunities:

Consultation hours: by email appointments and as it is indicated on the department's website.

12. Reference literature (compulsory, recommended):

Keuthe, A.M. & Chow, C-Y.: Foundations of Aerodynamics. John Wiley & Sons, Inc. 1998. ISBN 0-471-12919-4
Hucho, W. H.: Aerodynamik des Automobils. Springer-Verlag, 1999. ISBN: 3-540-62160-1
Lajos, T.: Az áramlástan alapjai (2008) ISBN: 9789630663823
Downloadable materials: www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATMW09

13. Home study required to pass the subject:

Contact hours	28	h/semester
Home study for the courses	7	h/semester
Home study for the mid-semester checks	15	h/check
Preparation of mid-semester homework	28	h/homework
Home study of the allotted written notes	12	h/semester
Home study for the exam	-	h/semester
Totally:	90	h/semester

14. The data sheet and the requirements are prepared by:

Name:	Title:	Affiliation (Department):
Prof. Tamás LAJOS	professor	Dept. of Fluid Mechanics