BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
FACULTY OF MECHANICAL ENGINEERING

SUBJECT DATASHEET

I. SUBJECT DESCRIPTION

1. GENERAL DATA

1.1. Subject name (in Hungarian, in English)

Building and Environmental Aerodynamics • Building and Environmental Aerodynamics

1.2. Neptun code

BMEGEÁTNG36

1.3. Type

study unit with contact hours

1.4. Course types and number of hours (weekly / semester)

course type	number of hours (weekly)	nature (connected / stand-alone)
lecture (theory)	2	-
exercise	-	-
laboratory exercise	1	coupled

1.5. Type of assessments (quality evaluation)

mid-term grade

1.6. ECTS

3

1.7. Subject coordinator

name:	Dr. Balczó Márton (72492387511)
post:	adjunct
contact:	balczo@ara.bme.hu

1.8. Host organization

Department of Fluid Mechanics (http://www.ara.bme.hu/)

1.9. Course homepage

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNG36

1.10. Course language

hungarian

1.11. Primary curriculum type

mandatory elective

1.12. Direct prerequisites

Strong prerequisite: -

Weak prerequisite: -

Parallel prerequisite: -

Milestone prerequisite: -

Excluding condition: -

(the subject cannot be taken if you have previously completed any of the following subjects or groups of subjects)

2. AIMS AND ACHIEVEMENTS

2.1. Aim

The aim of the course is to acquaint the students with the building and environmental aerodynamic phenomena and problems occurring in engineering practice, their investigation methods. Significant emphasis is placed on the study of wind effects on buildings and engineering structures using wind tunnel measurement techniques, in addition to the issues of urban climate, wind comfort and the spread of atmospheric pollutants. The course also describes the characteristics and requirements of the application of flow numerical simulation (CFD) in this field. During the preparation of a group project task, students are introduced to the use of one of the above-mentioned research methods.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- Understands the direct and indirect global, regional and local meteorological effects responsible for the formation of atmospheric wind phenomena.
- He has a comprehensive knowledge of the formation, structure and characteristics of the atmospheric boundary layer, and the physical quantities that describe it.
- He is aware of the characteristics of the flow space formed around blunt bodies, the flow structures that appear, and their effect on wind load and propagation processes.
- Understands the Davenport wind load chain describing the steps in determining the wind load of buildings and structures.
- He understands the structure and calculation method of the European standard describing the wind load of buildings.
- He knows the structure of the boundary layer wind tunnels and the role of their components.
- Understands the conditions for performing building and environmental aerodynamic wind tunnel experiments.
- He was aware of the speed, pressure, force, and concentration measurement methods used in wind tunnel experiments.
- He is aware of the basics of CFD modeling of boundary layer flows and propagation processes.
- It distinguishes between types of dynamic wind effects on buildings and structures.
- He is aware of the process of spreading atmospheric pollutants.

B. Ability

- Analyzes meteorological processes that cause atmospheric wind phenomena.
- It interprets the turbulent spectrum of atmospheric boundary layer flows.
- Able to analyze the result of an atmospheric boundary layer profile measurement.
- It analyzes the flow field around blunt bodies, the occurring flow structures.
- Able to apply the European wind load standard through a simple example.
- Plans to conduct a wind tunnel experiment or CFD simulation.

- Capable of conducting a wind tunnel experiment or CFD simulation with consultant support.
- Interpret the results of a building or environmental aerodynamic wind tunnel experiment or CFD simulation.
- Based on the results of the experiment or simulation, make a proposal to solve the environmental or building erodynamic problem.
- Evaluates the significance of dynamic wind effects for building and structure types with different parameters.
- Identifies the factors that determine the process of atmospheric pollutant spread.

C. Attitude

- It strives for a thorough acquisition of environmental and building aerodynamic knowledge.
- He strives for active participation in the lecture, for interactivity.
- He / she independently expands his / her knowledge on the topic of the chosen semester task by processing the literature.
- Supports your classmates in solving a measurement or simulation group task.
- It strives to complete the task on schedule, to overcome existing obstacles.
- Develops your skills for the demanding, high-quality, precise presentation of measurement / simulation results in the task report.

D. Independence and responsibility

- Collaborates with the instructor and fellow students to expand knowledge.
- He feels a responsibility for an in-depth understanding of the issues surrounding environmental and building aerodynamics.
- They are responsible for the completion and quality of the joint task.
- If necessary, direct the work of the group during the (partial) task.
- Accepts critical remarks about the work done.

2.3. Teaching methodology

The teaching of the subject takes place in the framework of lectures and laboratory practice. The lectures basically introduce the students to the information defined by the knowledge competence elements using the technique of frontal education. During the second half of the semester, several invited industry speakers will give lectures on each chapter of the topic. The application and skill-level acquisition of knowledge takes place in laboratory exercises, where an issued project work has to be solved in groups, which also develops teamwork skills. The project work must be presented at the end of the semester in the form of a written report and a presentation. In addition, one or more laboratory demonstrations / demonstration measurements will take place.

2.4. Support materials

a) Textbooks

Lajos T .: Fundamentals of Fluid Mechanics, 2015, Budapest, ISBN 978 963 12 2885 4.

John D. Holmes: Wind Loading of Structures, 3rd edition. 2015, Boca Raton, Florida. ISBN: 978 1 482 22922 6

Emil Simiu, DongHun Yeo: Modern Structural Design for Wind, 4th Edition, 2019, Wiley. ISBN: 978 1 119 37588 3

b) Lecture notes

T. Lajos: Bluff body aerodynamics for subjects Building Aerodynamics and Vehicle Aerodynamics, 2012, Budapest

c) Online materials

http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATNG36

2.5. Validity of the course description

Start of validity: 2020. March 3.

End of validity:	2024. August 31.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

Learning outcomes are assessed on the basis of a mid-year written summary performance measurement as well as a partial performance measurement. Summative academic performance appraisal is a complex, written way of assessing the knowledge and ability type competence elements of the subject in the form of an in-house dissertation, which requires the necessary lexical knowledge during the performance appraisal, the available working time is 90 minutes. Partial performance assessment (homework): a complex way of evaluating the knowledge, ability, attitude, and autonomy and responsibility type competence elements of the subject, the form of which is the homework prepared in groups.

3.2 Assessment methods

A. Detailed description of mid-term assessments

1. Mid-term assessment

type: summative assessment

count: 1

purpose, description: Cumulative performance evaluation (in-house), which is expected to take place in the 8th week of education. 50 points can be obtained in the summary performance evaluation. A minimum of 40% is achievable. The aim of performance appraisal is to check the acquired knowledge and ability competencies with theoretical, short essay-type questions and simple practical numerical examples. The performance evaluation covers all the knowledge materials given in the lecture until the 7th educational week.

2. Mid-term assessment

type: formative assessment, simple

count: 1

purpose, description: The method of partial performance evaluation is the preparation of a project task to be prepared in groups, followed by a presentation of the subject to the students. Assignments and assignments for groups of up to 4 should be finalized by the second week of education. The content and form requirements and evaluation principles of the prepared project dissertation are included in the terms of reference. It will be completed on the date specified in the study performance assessment plan, expected to be in the 14th week of education. A maximum of 50 points can be obtained with the task, a minimum of 40% can be achieved.

B. Detailed description of assessments performed during the examination period (if relevant)

Elements of the exam:

1. written partial exam
   -
2. oral partial exam
   -
3. practical partial exam
   -
4. inclusion of mid-term results

-

3.3 The weight of mid-term assessments in signing or in final grading

identifier	weight
1 . Mid-term assessment	50 %
2 . Mid-term assessment	50 %

3.4 The weight of partial exams in grade (if relevant)

type	weight
written partial exam	0 %
oral partial exam	0 %
practical partial exam	0 %
inclusion of mid-term results	0 %

3.5 Determination of the grade

grade ● [ECTS]	the grade expressed in percents
very good(5) ● Excellent [A]	above 85%
very good(5) ● Very Good [B]	85% .. 85%
good(4) ● Good [C]	70% .. 85%
satisfactory(3) ● Satisfactory [D]	55% .. 70%
sufficient(2) ● Pass [E]	40% .. 55%
insufficient(1) ● Fail [F]	below 40%

The lower limit specified for each grade already belongs to that grade.

3.6 Attendance and participation requirements

Must be present at at least **70%** (rounded down) of lectures.

At least **70% of** laboratory practices (rounded down) must be actively attended.

3.7 Special rules for improving, retaken and replacement

The special rules for improving, retaken and replacement shall be interpreted and applied in conjunction with the general rules of the CoS (TVSZ).

Need mid-term assessment to individually complete?

yes

Can the submitted and accepted partial performance assessments be resubmitted until the end of the replacement period in order to achieve better results?

yes

The way of retaking or improving a summary assessment for the first time:

each summative assessment can be retaken or improved

Is the retaking-improving of a summary assessment allowed, and if so, than which form:

retake or grade-improving exam possible for each assesment separately

Taking into account the previous result in case of improvement, retaken-improvement:

new result overrides previous result

The way of retaking or improving a partial assessment for the first time:

partial assesment(s) in this group can be improved or repeated once up to the end of the repeat period

Completion of unfinished laboratory exercises:

missed laboratory practices may be performed in the teaching term at pre-arranged appointment, non-mandatory

Repetition of laboratory exercises that performed incorrectly (eg.: mistake in documentation):

incorrectly performed laboratory practice (e.g. Incomplete/incorrect report) can be corrected upon improved re-submission

3.8 Study work required to complete the course

Activity	**hours / semester**
participation in contact classes	42
preparation for laboratory practices	14
preparation for summary assessments	16
elaboration of a partial assessment task	4
additional time required to complete the subject	14
summary	**90**

3.9. Validity of subject requirements

Start of validity: 2020. March 3.

End of validity: 2024. August 31.

4. ADDITIONAL INFORMATION

4.1 Primary course

The primary (main) course of the subject in which it is advertised and to which the competencies are related:

mechanical engineering

4.2 Link to the purpose and (special) compensations of the Regulation KKK

This course aims to improve the following competencies defined in the Regulation KKK>

a) knowledge

- Student is familiar with the general and specific mathematical, scientific and social principles, rules, contexts and procedures needed to operate in the field of engineering.
- Student has the knowledge of metrology and measurement theory in the field of mechanical engineering.
- Student has the detailed knowledge of the rules for the preparation of technical documentation.

b) ability

- Student has the ability to apply the general and specific mathematical, scientific and social principles, rules, relationships and procedures acquired in solving problems in the field of engineering.
- Student has the ability to apply the theories and related terminology in an innovative way when solving problems in a given field of engineering.
- Student has the ability to deal with problems creatively, to solve complex problems in a flexible way, and to engage in lifelong learning and commitment to diversity and value-based approaches.

c) attitude

- Student strives to meet and enforce quality standards.
- Student strives to plan and carry out tasks to a high professional standard, either independently or in a team.

- Student is open and receptive to learning, embracing and authentically communicating professional, technological development and innovation in engineering.

d) independence and responsibility

- Student has the ability to work independently on engineering tasks.
- Student takes initiative in solving technical problems.
- Student takes responsibility for the sub-processes under student's management.

4.3 Prerequisites for completing the course

Knowledge type competencies	
(a set of prior knowledge, the existence of which is not obligatory, but greatly facilitates the successful completion of the subject)	-
Ability type competencies	
(a set of prior abilities and skills, the existence of which is not obligatory, but greatly contributes to the successful completion of the subject)	-