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)

Product modeling ● Product Modelling

1.2. Neptun code

BMEGEGINWPM

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)	1	-
exercise	-	-
laboratory exercise	3	individual

1.5. Type of assessments (quality evaluation)

mid-term grade

1.6. ECTS

5

1.7. Subject coordinator

name:	Dr. Zwierczyk Péter Tamás
post:	adjunct
contact:	z.peter@gt3.bme.hu

1.8. Host organization

Department of Machine and Product Design (http://www.gt3.bme.hu/)

1.9. Course homepage

http://gt3.bme.hu/NWPM

1.10. Course language

english

1.11. Primary curriculum type

mandatory

1.12. Direct prerequisites

Strong prerequisite:	-
Weak prerequisite:	-
Parallel prerequisite:	-
Milestone prerequisite:	-
Excluding condition:	BMEGEGEMW02

(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 get to know and apply the integrated product design process to a comprehensive design task of an industrial nature in the framework of group work. The subject covers the assessment of market demand, conceptual design, preparation of detailed plans, analysis and optimization of the expected behavior of the product and analysis of expected failures. The mid-term task is prepared in the form of weekly presentations, which, following the task schedule, present 3D CAD models, simulation models of different product variants, finite element models, and occasionally motion simulation, for easier understanding of operation.

2.2. Learning outcomes

Competences that can be acquired by completing the course:

A. Knowledge

- Knows the product design process and modern methods.
- The Student is aware of the concepts of integrated product design.
- Informed about conceptual design procedures and classification of design variants.
- The Student is knowledgeable in computer modeling and drawing documentation.
- The Student knows the operation of integrated CAD systems, the peculiarities of modeling.
- The Student is aware of the modeling process that attempts to reveal the expected physical behavior of a product.
- The Student is familiar with the procedures for analyzing expected product failure.
- The Student provides an overview of cost estimation considerations and key steps.
- The Student is aware of the requirements and difficulties of organizing group work.
- The Student is aware of the approximate assumptions and limitations of a virtual prototype.
- Knows the main procedures for making a physical prototype.
- Understands presentation techniques that help illustrate design steps.

B. Ability

- Defines the integrated design system modules required to create a virtual prototype.
- Proposes product requirements based on an analysis of market research results.
- The Student interprets the system of requirements and clarifies it.
- The Student is able to create possible design variants.
- It explores the advantages and disadvantages of design variants.
- Creates a 3D geometric model of the selected product variant.
- Use the relevant modules of the product simulation (thermal, static, dynamic, flow, kinematic, etc.).
- Outline the objective functions and design variables of product optimization.
- Performs the necessary calculations knowing the objective functions and design variables.
- Able to evaluate possible failure modes and make recommendations to avoid them.
- It interprets the design results and, if necessary, further modifies the models.

- Able to present the product design process in the form of a presentation.

C. Attitude

- It regularly reviews its work, results and conclusions.
- It expands your knowledge of state-of-the-art product design through continuous acquisition of knowledge.
- The Student is open to the principles and methods of systematic thinking and problem-solving.
- It strives for accurate and error-free solution, engineering precision.
- It seeks to become familiar with the system of tools required for product design and to master its routine use.
- It applies the principles of sustainability and environmental awareness in product design.

D. Independence and responsibility

- Collaborates with faculty and fellow students to expand knowledge.
- Performs thinking about and solving design tasks and problems on your own and even as part of a group.
- With their knowledge, the Student makes an informed decision based on their analysis.
- Accepts (openly) substantiated critical remarks.
- The Student will critically and constructively and independently comment on the work of their fellow students.
- The Student defends their position by independently articulating their own strengths and outlining their responsibilities in group work.

2.3. Teaching methodology

The subject is taught in the form of lectures and exercises. The lectures, using the technique of frontal education, recall and further expand the information needed to complete product design tasks (design methodology, integrated CAD systems, structure analysis and optimization, etc.). The lectures include learning materials that can be downloaded from the subject website. The practical sessions help to apply and acquire previously acquired knowledge by solving a more comprehensive planning task in the framework of group work. During the internships, students present the subtasks prepared at home, mainly in the form of presentations, and consult with the internship supervisor. The purpose of the presentations is to present the results in a concise way.

2.4. Support materials

a) Textbooks

Horváth I., et. al: Advanced Design Support, Delft University of Technology, 2005. ISBN 7-5062-7444-2

b) Lecture notes

No book or note is yet available for the subject when filling in the form, its earliest publication date is 2020.

c) Online materials

http://gt3.bme.hu/NWPM

2.5. Validity of the course description

Start of validity:	2019. September 1.
End of validity:	2025. July 15.

II. SUBJECT REQUIREMENT

3. ACHIEVEMENT CONTROL AND EVALUATION

3.1 General rules

The evaluation of the study results is mainly based on the planning task developed in the group, as a student separately. This is aided by mid-year performance appraisals (weekly presentation reports, two summary presentations, textual and drawing documentation and a written summary performance measurement.

3.2 Assessment methods

A. Detailed description of mid-term assessments

1. Mid-term assessment

type: formative assessment, project-based, complex

count: 1

purpose, description: The weekly presentation report is for continuous work and consultation. Participating students and the internship leader (often including an industry consultant) discuss the results presented and then identify the next steps. Partial performance can be evaluated with 20 points. This partial performance is used to develop presentation skills and control the pace of work. The purpose of the partial performance evaluation is also to prepare textual and drawing documentation and thus to present the process and final results of the group work. The documentation is evaluated by the practice leader. 30 points can be awarded for documentation. The documentation should present in detail the initial task, the conceptual design variants, the selection of the most favorable variant, the relevant simulation results, including the FMEA analysis. Finally, a comparison of the list of requirements and the results obtained must demonstrate that the final solution is appropriate in all respects.

2. Mid-term assessment

type: formative assessment, point-in-time personal act

count: 1

purpose, description: The purpose of the partial performance evaluation is to examine the existence of the results belonging to the attitude competence group. The way to do this is to present the work done in a systematic way: the first presentation is due in the middle of the semester and the second is due at the end of the semester. The first presentation covers the basic task, competing solutions, conceptual design sketches and evaluates them, then selects the best one. The second summarizes the work done during the semester, covers the final geometric model, simulation results, and so on. The presentation concludes with conclusions. The first presentation can be evaluated with 10 points, the second with 15 points.

3. Mid-term assessment

type: summative assessment

count: 1

purpose, description: The aim of summative assessment is to assess students 'learning outcomes defined by knowledge and ability type competencies. The summative assessment assesses the acquisition of the designated theoretical knowledge and the existence of the knowledge gained in the exercises. Completion will take place at the time specified in the study performance assessment plan, expected in week 13. 25 points can be obtained in the summary performance evaluation. .

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	25 %
3 . Mid-term assessment	25 %

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 90%
very good(5) ● Very Good [B]	85% .. 90%
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 **0%** (rounded down) of lectures.

At least **85% 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?

NO

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 not possible

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 must be performed in the teaching term at pre-arranged appointment

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

incorrectly performed laboratory practice (e.g. Incomplete/incorrect report) can be corrected by repeating the practice

3.8 Study work required to complete the course

Activity	**hours / semester**
participation in contact classes	56
preparation for laboratory practices	14
preparation for summary assessments	16
elaboration of a partial assessment task	30
additional time required to complete the subject	34
summary	**150**

3.9. Validity of subject requirements

Start of validity:	2019. September 1.
End of validity:	2025. July 15.

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 modelling

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 has the knowledge of the organisation and management of research and development tasks, basic communication, including in foreign languages.
- Student has the theoretical and practical knowledge and methodological skills to design, manufacture, model, operate and manage complex engineering systems and processes
- Student has the knowledge of a wide range of problem-solving techniques for research or scientific work.

b) ability

- Student has the ability to apply and put into practice the knowledge acquired, using problem-solving techniques.
- Student has the ability to select, apply and develop appropriate modelling methods in the field of engineering design and technology.
- Student has the ability to solve problems creatively and flexibly, and to engage in lifelong learning.

c) attitude

- Student shall strive for continuous self-training in engineering modelling and in other fields related to student's work, in accordance with student's professional objectives.
- Student is open and receptive to new, modern and innovative processes and methods in engineering modelling.
- Student has the ability to plan and carry out tasks to a high professional standard, either independently or in a team.

d) independence and responsibility

- Student independently selects and applies relevant problem-solving methods when solving professional tasks.
- Student acts independently and proactively in solving technical problems.
- Student has a demonstrated responsibility for sustainability and environmental awareness.

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)	basics of construction and computer modeling

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)	preparation of engineering documentation