

## Tárgytematika / Course Description

### Vehicle properties and conceptual design

AJNM\_JFTA006

Tárgyfelelős neve /

Teacher's name: dr. Feszty Dániel

Félév / Semester: 2022/23/1

Beszámolási forma /

Assesment: Folyamatos számonkérés

Tárgy heti óraszám /

Teaching hours(week): 2/2/0

Tárgy féléves óraszám /

Teaching hours(sem.): 0/0/0

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### OKTATÁS CÉLJA / AIM OF THE COURSE

The goal of the course is to give a new, efficient viewpoint to the students about the conceptual phase of vehicle development as well as to practice the process of conceptual design of a vehicle. Conceptual design is the first phase of a new model's development, which outcome is a preliminary design, which should be strong enough to build a complex product onto it, but also flexible enough to be able to handle all later requirements and/or possible design modifications. This can be fulfilled only via a conscious design process from the very first pen stroke. The course was designed by a leading industrial expert in the Conceptual Design of vehicles.

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### TANTÁRGY TARTALMA / DESCRIPTION

#### I. TEACHING PERSONNEL

Course coordinator: Dr. Daniel Feszty, Széchenyi University ([feszty.daniel@sze.hu](mailto:feszty.daniel@sze.hu))

Instructors/Course Designers:

Dr. Matjaz Korman, AUDI AG ([matjaz.korman@audi.de](mailto:matjaz.korman@audi.de))

Dr. Balázs Vehovszky, Széchenyi University ([vehovszky@sze.hu](mailto:vehovszky@sze.hu))

Dr. Daniel Feszty, Széchenyi University ([feszty.daniel@sze.hu](mailto:feszty.daniel@sze.hu))

#### II. WEEKLY BREAKDOWN OF LECTURES AND ASSIGNMENTS:

<b>Week</b>	<b>Topic</b>
1	Introduction
2	Future Vehicle Technologies
3	<b>Overview of a sample Conceptual Design exercise + Term Project Handout</b>
4	Basics of conceptual design and product development
5	Systematic overview of vehicle properties
6	Qualitative and quantitative measures of vehicles
7	Market research techniques, benchmarking
8	Ergonomics - user oriented design
9	Ergonomics - manufacturing-oriented design
10	Tools of conceptual design – Modern materials
11	Tools of conceptual design – Modern manufacturing technologies
12	Tools of conceptual design - Virtual Reality and rapid prototyping
13	<b>Project work presentation</b>

**Notes:**

1) Tutorials (scheduled for 17:20 – 18:50 on Tuesdays) will allow time for project work for the students, with consultation time with the Széchenyi University lecturers about the Term Project.

2) The above schedule might change according to the availability of the industrial expert.

# SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESSMENT'S METHOD

## I. SEMESTER PROJECT

An individual semester project will be assigned to the students. The semester project's goal will be to complete the conceptual design of a vehicle. The exact details of the semester project are laid down in a separate document and handed out to the class at the class indicated in the Course Schedule. Students will be required to present their semester project on Tuesday, 1 December.

## II. COURSE EVALUATION

The course will be evaluated based on the Term Project (60%) as well as a written Final Exam (40%), which will be of 2 hrs length.

## III. FINAL GRADING

The final grade for the course will be allocated based on the following scheme:

<u>Percentage</u>	<u>Grade</u>
0 - 39	1 (Fail)
40 - 54	2
55 - 69	3
70 - 84	4
85 - 100	5

# TERM PROJECT

**Task:** to complete the conceptual design of a passenger vehicle with the following parameters:

- CO2 emission of no more than 80 g/km in Germany and China
- Level 4 autonomous capability
- Minimum 500 km range
- Minimum 130 km/h cruising speed
- Maximum 30 minutes re-charging time or refueling time during highway drive
- Capacity of minimum 4 adult passengers and corresponding luggage
- Optional built-in “Last mile” solution for a Park and Ride situation

## **Breakdown of tasks:**

- Market analysis
- Competitor analysis
- Definition of vehicle properties
- Definition of the derived engineering characteristics
- Details of novelties/innovations
- Sketches of vehicle concept options
- Ergonomic considerations
- Basic sizing of chassis, key elements of powertrain, and proof of achieving the desired performance characteristics
- Outline of engineering design
- Concept of manufacturing
- 3-view conceptual drawing of the vehicle with all main components (e.g. engine, gearbox, battery, seats, passengers, etc.) shown, proving that the requirements have been met
  - o Optional: 3D CAD model + 3D printing of best concept
- Market announcement documentation

**The Term Project has to be developed by student individually.**

## **Deliverables:**

- Progress report presentation in halftime (up to the sketch drawings of the vehicle) – 15 min.
- Final presentation (30 min) in PPT form at the end of the project

**Evaluation:**

Overall evaluation criteria:

- concept
- engineering design
- report quality

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**KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL**

**LECTURE NOTES:**

Electronic lecture notes will be provided to the students.

**TEXTBOOKS:**

There are no set textbook required for this course. However, the following references might be useful for the students:

(1) Julian Happian-Smith: Introduction to modern vehicle design, ISBN 978-0-0805-2304-0

(2) Anthony Harding and Ronald Barker: Automobile Design, ISBN of 978-1-56091-210-1

(3) Ivo Ferreira: Enhancing the conceptual design phase of complex engineering systems, ISBN 978-3-6599-4883-1