Computer aided design

1. Subject name	Computer aided design				
2. Subject name in Hungarian	Számítógéppel támogatott tervezés (CAD)				
3. Code	BMEKOJSM605	4. Evaluation type	exam grade	5. Credits	4
6. Weekly contact hours	2 (10) Lecture	0 (0) Practice	2 (11) Lab		
7. Curriculum	Vehicle Engineering MSc (J)	8. Role	Mandatory (mc) at Vehicle Engineering MSc (J)		
9. Working hours for fulfilling the requirements of the subject					120
Contact hours	56	Preparation for seminars	18	Homework	20
Reading written materials	12	Midterm preparation	4	Exam preparation	10
10. Department	Department of Railway Vehicles and Vehicle System Analysis				
11. Responsible lecturer	Dr. Lovas László				
12. Lecturers	Dr. Márialigeti János, Devecz János				
13. Prerequisites					

14. Description of lectures

In this subject, a large spectrum of the advanced computer assisted design tools is presented. Short overview of the parametric 3D CAD systems. Introduction to the top-down design theory. Presentation of reference transmission rules. Surface handling tools: merging, cutting, conversion to solid. Kinetical and kinematical model analysis presentation. Selection possibilities for edges and surfaces, their copy. Setting and verification of the surface slope. Surface loft through various sections. Presentation of curve and surface properties. Building and command of a simple mechanism. Correction of holes, patching. Presentation of lofted unions. Drawing making. Role of the safety theory in the vehicle industry. Notion of failure probability, theoretical and practical estimation of its background. Basic modelling and measuring of irregular load processes. Treatment methods of measured results. Basics of lifetime estimation based on probability theory. Notion of the load collective, its types, standards. Notion of the lifetime curve, its connection to the fatigue curve. Failure probability definition for different load models. Palmgren-Miner and Corten-Dolan methods. Explication of the safety factor based on the probability theory. Lifetime analysis based on the increase of the plastic zone. Methods based on the nominal stress and on the local stress and strain. Cyclic stress-strain curve, cyclic softening and hardening. Strain-lifetime curves and their application in the lifetime computation based on the local deformation process. Bases of the linear elastic fracture mechanics. Handling of structural elements with fractures. Fracture propagation, estimation of remaining lifetime. Fail-safe, safe-life and damage tolerant philosophies.

15. Description of practices

16. Description of labortory practices

Individual and guided practice lessons.

17. Learning outcomes

A. Knowledge

- knows the structure of parametric 3D CAD softwares
- knows the Top Down design theory
- knows the principle and tools of surface handling
- knows the basic rules of kinematic and kinetic analysis
- knows the theory of random load process
- knows the load analysis tools and the different definitions of failure
- knows the basic rules of small cycle fatigue
- knows the basic rules of linearly elastic fracture mechanics

B. Skills

- is able to work in a 3D CAD environment, to build models, and to work on the model of other colleagues
- is able to repair other's models, and to note errors of file conversion
- is able to build animated models

- is able to handle a random load process
- is able to find the structure's caracteristic load type form measured data
- is able to analyse load, find the caracteristic values and to estimate lifetime with
- is able to estimate lifetime of a part with a rupture
- is able to work in team

C. Attitudes

- the student makes an effort to gather all the available informations in a given domain
- cooperates with his fellow students and the teacher
- is open minded towards new and innovative ideas and researches
- uses informatical and computational devices for his work

D. Autonomy and Responsibility

- the student is conscient about his responsibility towards the society and his company
- asks for the colleagues' expertise and judgement when working
- considers challenges with responsibility

18. Requirements, way to determine a grade (obtain a signature)

1 semestrial project (teamwork), 1 non-compulsory midterm test, 1 shorter homework, 1 exam. Details for computing the final mark can be find in the subject requirements.

19. Opportunity for repeat/retake and delayed completion

Second test possibility for those not present on the test, possibility of delayed deadline for project work and for the homework

20. Learning materials

Slides and examples in electronic format

Effective date	10 October 2019	**This Subject Datasheet is valid for**	2024/2025 semester II