



1. Subject name	Measurement systems in vehicle manufacturing				
2. Subject name in Hungarian	Járműgyártási mérés technika				
3. Code	BMEKOGGM652	4. Evaluation type	mid-term grade	5. Credits	5
6. Weekly contact hours	2 (10) Lecture	0 (0) Practice	2 (11) Lab		
7. Curriculum	Vehicle Engineering MSc (J)	8. Role	Specialization (sp) at Vehicle Engineering MSc (J)		
9. Working hours for fulfilling the requirements of the subject					150
Contact hours	56	Preparation for seminars	18	Homework	8
Reading written materials	54	Midterm preparation	4	Exam preparation	10
10. Department	Department of Automotive Technologies				
11. Responsible lecturer	Dr. Bánlaki Pál				
12. Lecturers	Dr. Bánlaki Pál				
13. Prerequisites					
14. Description of lectures					
<p>Basic concepts of measurement technology, measurement methods, measurement errors, systematic errors, accidental errors, law of error summing. Measuring instruments: length gauges, constant values (measuring columns, gauges), variable length gauges, mechanics (caliper, micrometer, fine probes, gauges), optical (optometer, length measuring machine, workshop microscope, laser interferometer), angular measuring tools, methods, pneumatic, electrical sensors and measuring systems. Coordinate measuring machines, spatial measurements.</p> <p>Typical measurement tasks and tools: shape failure measurements, position error measurements, surface characteristics (surface roughness, topography), gear measurements, thread measurements.</p> <p>Design of measurement technology, within the system and at the finished piece. Measuring tool management. Automatic size control. Surface digitization. Process measurement technology (temperature, vibration, force, torque, etc.), monitoring systems.</p> <p>Calibration and calibration of measuring instruments. Statistical Process Control (SPC).</p>					
15. Description of practices					
16. Description of laboratory practices					
Complex Measurements (length, shape, surface, 1D, 2D, 3D measurements. 3D surface and shape digitising, scanning methods.					
17. Learning outcomes					
A. Knowledge					
<ul style="list-style-type: none"> The student has to know the basic measurement procedures and equipments used in the course of vehicle manufacturing processes. The student has to know the theoretical basics of metrology, the problems to be solved in the XXI. century, and the demands connected to Industry - 0 progress. 					
B. Skills					
<ul style="list-style-type: none"> The student is able to apply the learnt procedures and equipments in a professional way. The student is able to support the related research and development processes. 					
C. Attitudes					
<ul style="list-style-type: none"> Strives for active participation in lectures and practices. 					
D. Autonomy and Responsibility					
<ul style="list-style-type: none"> Accepts the frameworks for completing the subject, and performs its tasks independently and responsibly, in accordance with ethical norms. Apply responsibly the knowledge acquired during the course with regard to their validity limits. 					

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

The conditions for obtaining the final signature are the completing the midterm test,(20%), taking part on all the labs, and submitting an acceptable individual task (30%).

The subject can be fulfilled by an written final exam (50%). There is an opportunity to make up each tasks on the base of ad hoc discussions.

19. Opportunity for repeat/retake and delayed completion

The midterm test and the individual task can be retaken once.

20. Learning materials

Slides and presentation notes

Effective date	10 October 2019	This Subject Datasheet is valid for	Inactive courses
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