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| 1. Subject name | **Measurement techniques and signal processing in vehicles** | | | | |
| 2. Subject name in Hungarian | Jármű méréstechnika és jelanalízis | | | | |
| 3. Code | **BMEKOKAM635** | 4. Evaluation type | **exam grade** | 5. Credits | **8** |
| 6. Weekly contact hours | **4 (19) Lecture** | **0 (0) Practice** | **2 (9) 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 | | | | | **240** |
| Contact hours | 84 | Preparation for seminars | 22 | Homework | 60 |
| Reading written materials | 42 | Midterm preparation | 12 | Exam preparation | 20 |
| 10. Department | **Department of Control for Transportation and Vehicle Systems** | | | | |
| 11. Responsible lecturer | Dr. Soumelidis Alexandros | | | | |
| 12. Lecturers | Dr. Soumelidis Alexandros | | | | |
| 13. Prerequisites | | | | | |

## 14. Description of lectures

Instrumental sensing, measurement as a means of obtaining information and cognition. The role of measurements in the design and operation of vehicle systems. The measurement process. Simple and complex sensors, smart sensors. The concept of sensory fusion. Sensor systems, sensor networks Measuring tools, signal transducers, samplers, quantizers, processing devices. Measuring basic physical quantities. Characteristics of measurement, reduction of errors. Measuring the dynamic energy and thermal characteristics of vehicles. Specificity of instruments used for measurement. Construction of measuring systems for laboratory and operational measurements. Treatment of measurement signals using classical and electronic data collection systems. Measurement of complex vehicle systems. Measuring the status of systems. Status estimation and parameter estimation based on system model. The Principle of Kalman Filtering. System parameter estimation, system identification. Methods to increase the reliability of measurement, redundancy, diversity. Classification of signals. Signal representations, time and frequency domain, parametric and nonparametric descriptions. The basic methods of signal analysis. Signal Processing Algorithms. Digital signal processing. Hardware and software tools for embedded computing. Devices for distributed task solving. Communication tools, wired and wireless networks. Communication networks, sensor networks. Application of signal processing in vehicle systems. Object and Event Detection. Application in vehicle control systems.

## 15. Description of practices

## 16. Description of labortory practices

The course is complemented by laboratory measurements that demonstrate the microcomputer realization of basic measurement and signal processing systems.

## 17. Learning outcomes

A. Knowledge

- Understands and applies circuit analysis techniques for electronic circuits; has knowledge of measurement and measurement theory related to transport, engineering and transport.

B. Skills

- Is capable of analyzing or specifying electronic sub-systems (eg motor control or safety control devices) in the field of transport and vehicles.

C. Attitudes

- Participates in solving electrical problems in the field of transport or vehicles, works efficiently and willingly to work with specialists in other fields (especially electrical engineering).

D. Autonomy and Responsibility

- Is aware of, and manages the responsibilities associated with, the task solution during electronic system analysis

and specification.

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

Two midterm exams and an individual home work which are the prerequisite of the final exam

## 19. Opportunity for repeat/retake and delayed completion

The midterm exam can be retried

## 20. Learning materials

Lecture Notes

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