1. Subject name	**Electronics – electronic measurement systems**				
2. Subject name in Hungarian	Elektronika - elektronikus mérőrendszerek				
3. Code	**BMEKOKAM103**	4. Evaluation type	**mid-term grade**	5. Credits	**4**
6. Weekly contact hours	**2 (9) Lecture**	**1 (5) Practice**	**0 (0) Lab**		
7. Curriculum	**Vehicle Engineering MSc (J)** **Transportation Engineering MSc (K)**	8. Role	**Mandatory (mc) at Vehicle Engineering MSc (J)** **Mandatory (mc) at Transportation Engineering MSc (K)**		
9. Working hours for fulfilling the requirements of the subject					**120**
Contact hours	42	Preparation for seminars	8	Homework	0
Reading written materials	52	Midterm preparation	18	Exam preparation	0
10. Department	**Department of Control for Transportation and Vehicle Systems**				
11. Responsible lecturer	Dr. Szabó Géza				
12. Lecturers	Dr. Szabó Géza, Dr. Hrivnák István, Dr. Borbás Lajos				
13. Prerequisites					

14. Description of lectures

It provides engineering knowledge (and develops BSc knowledge further) about the basic theory of electronics and electronic measurement systems, about modeling them, and about their use in transport systems. Introduces students to the operating principles of the basic elements of electronics and measurement technology, the modeling and analysis methodology of circuitry with active circuit elements. It reviews the methods of measuring various electrical and mechanical quantities and the possibilities of processing the measurement results. It illustrates the possibilities of use through various examples of transport sectors.

Topics: Basics of network analysis, Four Pole Theory; analysis rules for circuit elements and networks. Use of active electronic devices in switching mode, analyzing switched operation. Use of active electronic devices in linear operation; small signal AC models of components and networks and analyzing such networks. The use of operational amplifiers (OpAmps). Frequency dependency, frequency dependent amplifiers.
Basics of measurement technology, measurement theory. Measurement of signals and signal parameters. Measurement characteristics of signaling and signal transformation. Measurement characterization of signal sources. Signal analysis tools. Review of measurement errors in measurement systems, failure analysis and measurement accuracy issues. Transmitters and transducers of the measuring system. Measuring circuits. Features and tools for signal processing and data storage. Measurement of basic electrical parameters. Voltage measurement, current measurement. Frequency and time measurement. Measuring instruments and measuring tools, calibration. Time and frequency domain. Measurements in the frequency domain. Possibilities of electronic measurement of mechanical quantities. Application of computerized measurement environments for measurement, data collection tasks; signal processing methods. Practical demonstration and active measurement with a special mechanical tension and strain gauge. Failure analysis of equipment and subsystems containing rotating elements using noise and vibration tests.

15. Description of practices

Application of the principles presented on the lectures

16. Description of labortory practices

17. Learning outcomes

A. Knowledge

- understand and can apply the circuit analysis techniques of electronic circuits

- has knowledge of measurement and measurement theory related to transport and vehicle engineering

B. Skills

- able to analyze or specify electronic sub-systems (eg. motor control or safety traffic control devices) in the field of transport and vehicle

C. Attitudes

- to participate in solving electric problems in the field of transport or vehicle, to work efficiently and willingly with specialists of other fields (in particular: electrical engineering)

D. Autonomy and Responsibility

- he/she is aware of and treats the responsibility associated with the task solution during electronic system analysis and specification

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

Two midterm tests. The final result based on the average of the tests.

19. Opportunity for repeat/retake and delayed completion

One test can be retried at the end of the semester

20. Learning materials

Lecture Notes

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