

*Electronics I*  
*Mechatronic Devices (Sensors, Actuators, Motors)*

Code: MK3ERZBR04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Electrotechnics

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Types of sensors, categories of measurable quantities, static characteristics of the sensors. Typical applications of sensor systems. Sensors for high temperature measurement (infrared radiometers, pyrometers). Different level sensors (capacitance, thermal, floating, microwave, rotary paddle, etc.). Different flow sensors (induction, calorimetry, ultrasonic, thermal conductance, electromagnetic, rotameters, etc.). Measurement of kinematic quantities based on different principles: distance, speed, acceleration, vibration. The role of actuators. Types of actuators. Pneumatic actuators, valves, latches and actuators. Piezoelectric actuators. Contactors and electrical contactors. Midget motors.

Literature:

*Compulsory:*

- Robert H Bishop, The Mechatronics Handbook, CRC Press, 2007, ISBN 9780849392573 - CAT# 9257

*Recommended:*

- Sabrie Soloman, Sensors Handbook, Mac-Grow Hill Company, 2010, ISBN : 978-0-07-160571-7, Available on-line at:  
<http://ailab.ijs.si/~blazf/kro/SL/Soloman%20-%20Sensors%20Handbook%202nd%20Edition%20-%202010.pdf>

Schedule

1 <sup>st</sup> week Registration week	
2 <sup>nd</sup> week: Lecture: Definition, types of sensors, main error sources of transducers. Practice: Application of ultrasonic distance sensor.	3 <sup>rd</sup> week: Lecture: Static and dynamic sensor characteristics, environmental impacts on characteristics. Practice: Application of pressure sensor.
4 <sup>th</sup> week: Lecture: Position sensors. Practice: Application of color sensors.	5 <sup>th</sup> week: Lecture: Level sensors. Practice: Application of level sensors.
6 <sup>th</sup> week: Lecture: Flowmeters. Practice: Application of temperature and humidity sensors.	7 <sup>th</sup> week: Lecture: High temperature measurement. Practice: Application of gas sensor.
8 <sup>th</sup> week: 1 <sup>st</sup> drawing week	

9<sup>th</sup> week:  
Lecture: Chemical sensors: humidity, gas sensor, etc.  
Practice: Application of light sensors.

11<sup>th</sup> week:  
Lecture: Force and torque measurement.  
Practice: Application of vibration sensor.

13<sup>th</sup> week:  
Lecture: Electromechanical Actuators: DC Motors, AC Motors, Linear Motors, Stepper Motors, Midget Motors.  
Practice: QNET HVAC trainer.

15<sup>th</sup> week: 2<sup>nd</sup> drawing week

10<sup>th</sup> week:  
Lecture: Measurement of kinematic quantities.  
Practice: Application of acceleration sensor.

12<sup>th</sup> week:  
Lecture: Role of actuators, types of actuators.  
Practice: QNET Mechatronics sensor trainer.

14<sup>th</sup> week:  
Lecture: Piezoelectric actuators, magnetostriction actuators, magneto hydrodynamic activators, memory metal actuators.  
Practice: QNET motors trainer.

## Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory. Attending practices is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. Missed practice classes must be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. The student has to prepare measurement report on every practise and has to submit the reports until deadline.

B, for a grade:

For the mid-semester grade the student has to write two tests. The mid-semester grade is received in scoring system (total 100) by the following:

- 1<sup>st</sup> test with 40 points
- 2<sup>nd</sup> test with 40 points
- quality of the measurement reports with 20 points

The mid-semester grade is given according to the following table:

<i>Score</i>	0-59	60-69	70-79	80-89	90-100
<i>Grade</i>	fail (1)	pass (2)	satisfactory (3)	good (4)	excellent (5)