

**Title: Industrial Electronics**

(Industrijska elektronika, 2.stopnja, 1.letnik)

**Lecturer:** doc. dr. Zajec Peter

**Aim of the course:**

To give basic understanding of the operation, selection and dimensioning of passive electronic components and semiconductor in the case of basic and more complex circuits in the fields of measurement and control techniques.

**Required (pre)knowledge:**

Fundamentals of Electrical Engineering

**Contents:**

Acquaintance with the characteristics of real electronic components and circuits is the basis for critical assessment of the whole mechatronic system and identification of possible errors and deviations. Deepen insight into the:

- a) Passive components: resistor, thermistor, varistor, capacitor and choke: U/I and other static characteristics. Dynamic and thermal constraints. Criteria for sizing and selection of passive components.
- b) Properties and characteristics of semiconductor diodes, bipolar and unipolar transistors. Equivalent circuits and mathematical representation of semiconductor components for DC conditions and small signal analysis.
- c) Operational amplifier. Characteristics of an ideal operational amplifier and the deviations of the real: the impact of the frequency bandwidth, input and output resistance, the bias current, offset voltage, common mode attenuation. The basic linear and nonlinear operational amplifier circuits: adder, subtractor, integrator, differentiator, logarithmic and exponential amplifier, multiplier. Important circuits for measurement and control techniques (current/voltage and voltage/current converter), bridge circuits with operational amplifier, instrumentation amplifier, peak and effective values meter, precision half-wave and full-wave rectifier, reference circuits, controllers, limiters and voltage limiter). Active filters. Switching circuits with and without switching hysteresis and function generators. Series and parallel circuit voltage stabilizer.

**Selected references:**

T.E. Price: Analog Electronics, Prentice Hall, London, 1997.

J.M. Jacob: Analog Integrated Circuit Applications, Prentice Hall, New Jersey, 2000.

R.F. Coughlin & F.F. Driscoll: Operational Amplifiers and Linear Integrated Circuits, Prentice Hall, New Jersey, 2001.

D.A. Bell: Operational Amplifiers, Prentice Hall, New Jersey, 1990.