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## Basics of Electronics B

### Finalità

Providing the students with basic knowledge of the most important semiconductor devices and of analog circuits, with specific focus on linear amplifiers.

### Programma

Basics of semiconductor devices

Metals, insulators, semiconductors. Band structure of semiconductors. Intrinsic semiconductors. n and p doping. Drift and diffusion currents. p-n junction diodes: equilibrium, reverse and forward bias; static I-V characteristics; breakdown; capacitive effects; application: half-wave rectifier. Bipolar Junction Transistor (BJT): I-V static characteristics; forward-active region and saturation; Safe Operating Area (SOA); capacitive effects; Ebers-Moll model. MOSFET: n-channel enhancement MOSFET; static I-V characteristics; linear region and saturation; dynamic effects; SOA; depletion MOSFET; p-channel MOSFET.

Linear analog circuits

Analog and digital signals. Linearity and linearization. Small-signal equivalent circuits: p-n diode, common-emitter npn BJT, saturated n-channel MOSFET. Linear amplifiers: voltage and current gain, input and output impedance. Common emitter amplifier: polarization; small-signal analysis; maximum efficiency under class A operation; hints to class AB, B, and C operations. Common-collector amplifier. Common-base amplifier. Hints to multi-stage amplifiers. High-frequency operation of the common-emitter amplifier. Common-source amplifier. BJT differential amplifier. Feedback: effects of negative feedback on first-order systems; Common emitter amplifier with feedback. Stability of systems with a feedback loop. Ideal operational amplifiers and their applications. Hints to the non-idealities of operational amplifiers.

### Modalità d'esame

The test is made of a written test and an oral test. Students must pass the written test to be admitted to the oral test.

### Propedeuticità

Analisi matematica (ABC). Fisica generale (ABC). Elettrotecnica AB. Fondamenti di Elettronica A.

### Testi consigliati

R. Menozzi, "Appunti di elettronica: dispositivi ed elettronica analogica lineare," Pitagora (Part B)

P. R. Gray, R. G. Meyer, "Analog Integrated Circuits," Mc Graw Hill