



UNIVERSITÀ
degli STUDI
di CATANIA



DIPARTIMENTO DI **FISICA E ASTRONOMIA**
“**ETTORE MAJORANA**”

DOTTORATO DI RICERCA IN FISICA
CICLO XLII A.A. 2026/2027

Analog and Digital electronics for modern detectors

2 CFU

Teaching staff

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Reception hours: Monday and Friday 9:00 – 11:00

Program of the course:

- Introduction to detection mechanisms: simplified model of the detector and calculation of electronic noise, signal-to-noise ratio (SNR).
- Operational amplifiers and feedback circuits: voltage, current and charge amplifiers, oscillators and multivibrators.
- The preamplifier and the shaper: role of signal integration and shaping and their effect on signal-to-noise ratio.
- Analysis of electronics chains and measurement strategies: optimization of SNR and its influence in the measure of time, charge, energy and event rate.
- Ideal and lossy transmission lines in time and frequency domains.
- Introduction and guide to SPICE: electronic circuit simulations.
- Mechanism of Analog sampling and analog-to-digital conversion (ADC);
- Overview of Digital electronics: combinatorial and synchronous logic.

Bibliography:

Scientific paper and slides provided by the teacher