UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applied Electronics

2122-1-F1701Q116

Aims

Design criteria with feedback amplifiers with (stability and noise). Introduction to the use of transistors in low noise circuits. Filtering criteria for the optimization of the signal to noise ratio. Applications to the readout of signals from particle detectors.

Contents

The student is given the basic instruments to be able to design analog amplifiers, also for low noise applications. An introduction is given to the transistors operation in low noise circuits. Filtering for optimization of signal to noise ratio. The lecturers are for students in physic that are particularly interested in the experimental field.

Detailed program

The concept of amplifier, the Operational amplifier. The concept of feedback of an amplifier. The mathematical approach t to the determination of all the aspects that concern a fed backed amplifier. The frequency domain analysis of the signals with Fourier and Laplace Transforms. The stability of a feed backed network and the compensation criteria. The noise in the electronic systems and the analysis of the noise in linear networks. The concept of the signal t to noise ratio. The charge sensitive preamplifier and the shaping of the signals coming from a nuclear detector of particles.

A short introduction to the physic of semiconductors applied to Bipolar, JFET and MOS transistors. The mathematical modelling and the noise sources in transistors. Transistors in low noise circuits. Circuit solutions for

charge sensitive preamplifiers. A study is given on the basic blocks of Operational Amplifiers: input stage, intermediate stage, output stage and the more common electrical protections.

Investigation of the behaviour of electronics devices at extremely low temperatures, cryogenic temperatures, and in radioactive environments in the contest of experiments about neutrino physics and dark matter and the physics with accelerators.

More details at:

http://pessina.mib.infn.it

Prerequisites

Notions on classical Physics: Electricity and Magnetism

Teaching form

Standard mode:

Lecturers, Exercises, simulation examples with MATLAB Symbolic, MATLAB Simscape-Electronics and PSPICE, 6 cfu, 42 h. Lessons are available on this web resource, only after registering.

"Covid" mode:

Lessons are only available on this web resource and after registration. Regular chats are foreseen and the student can send comments and questions via the web at any time.

Textbook and teaching resource

Slides available on the web page (http://pessina.mib.infn.it).

Textbooks addressed in the slides and at the web page http://pessina.mib.infn.it

Semester

First Semester

Assessment method

Standard mode:

Written and oral exam.

"Covid" mode:

Only remote with chat on google meet platform and google jamboard virtual board, unless the platforms adopted changes.

Office hours

Anytime, upon notice: pessina@mib.infn.it