

FUNDAMENTALS OF AUTOMATION AND ELECTRONICS 2 FIELD_11 ECTS

Introducing

Description

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

 Toulouse

Electronics project

Introducing

Description

- * LTspice training (OP, AC, DC, Step, Sweep)
- * study of differential stage
- * common emitter stage study, active load, current sources
- * output stage design
- * transistor heating, heat sink sizing
- * optional routing, PCB construction of the Hifi amplifier studied and designed.

Objectives

The aim of this project is to design and build an audio amplifier using discrete transistors, with a power of around 20W, on a test plate. The power stages are studied (push-pull Darlington, etc...) as well as all the classic architecture of an operational amplifier (differential, active load...). The problem of output dynamics is clearly defined (blocking/saturation limit). The technology used is the bipolar transistor.

Necessary prerequisites

- * essential: good understanding of basic electrical laws
- * strongly recommended prerequisites: bipolar transistor, polarization, dynamic small signal circuits

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Practical info

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 Toulouse

Telecommunication systems

Introducing

Description

Telecommunications systems: data rates, eye diagrams, transmission lines, baseband coding, analog and digital modulation, constellation diagrams, frames, multiplexing, channel access (FDMA, TDMA, CDMA), spread spectrum. The tutorials will go into greater depth on the concepts seen in class, and will focus on well-known applications of telecommunications systems (e.g. USB, Bluetooth, FM radio, etc.). Lab classes will address the design of analog and digital modulations

Objectives

At the end of this module, the student should have understood and be able to explain (main concepts) the operating principles of telecommunication systems. The student will be able to design the architecture of a telecommunication system: choice of the modulation, choice of the media access type, etc.

Necessary prerequisites

Signal Processing courses
Analog and digital electronics courses

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Practical info

Location(s)

 Toulouse

Random signals

Introducing

Description

- Introduction : deterministic signals and spectral characterization
- Probability theory and random signal
- Stochastic processes and random signals : first and second order characteristics, stationarity, ergodicity, discrete-time random signals
- Spectral analysis: Wiener-Kintchine Theorem
- Linear filtering

Objectives

Introduce the main concepts allowing a characterization of random signals. In particular, the main properties : stationarity, ergodicity, needed for a spectral characterization useful in electronics and automatic control, are specifically developed. The linear filtering of random signals concludes the course

Necessary prerequisites

Probability theory, random variable, Fourier Series, Fourier Transform, Linear invariant systems (Transfer function)

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Practical info

Location(s)

 Toulouse

Control of continuous linear systems

Introducing

Description

State-space control: specifications, observability-commandability, state feedback (pole placement), observers, algebraic methods (1- and 2-degree-of-freedom correctors).

Objectives

At the end of this module, the student should have understood and be able to explain (main concepts): the main methods for synthesizing state-space control laws for linear time-invariant systems

The basic principles of observer synthesis for linear time-invariant systems.

The student should be able to :

Define the major characteristics of the control law from the specifications

Design the control law in state space (pole placement)

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Practical info

Location(s)

 Toulouse

Necessary prerequisites

Linear algebra

Évaluation

Modeling and control of discrete-event systems

Introducing

Location(s)

 Toulouse

Description

Modeling and Control of Discrete Event Systems: modeling tools (finite state machines, Petri nets, Statecharts) and associated implementation techniques (PLC, FPGA, real-time target)

Objectives

At the end of this module, the student should have understood and be able to explain (main concepts):

- Basic principles of discrete-event system modeling tools (Finite State Machines, Statecharts, Petri nets),

- Different techniques for controlling a discrete-event system (FPGA, PLC, real-time target).

The student should be able to:

- model and implement the control of a discrete-event system

Évaluation

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Practical info
