Electronic Energy Electrical Automatic

ECTS credits
4 credits

In brief

Course langage: French

Presentation

Prerequisites

Solving differential equations, Fourier series and transform, Laplace transform, Boolean algebra, combinatorial logic, sampling theory.

Learning objectives

The E3A core curriculum allows students to acquire and master methods of analysis and synthesis of electronic systems in the broadest sense of the term, enabling them to grasp complex and transdisciplinary problems.

In particular, the student will be able to :
- master the concepts allowing to establish a specification and to synthesize an assembly by using the appropriate tools.
- understand, analyse and design a filtering and amplification system for a real analogue signal, source or sensor.
- master the basic tools of Automatic Control, be able to associate the temporal behaviour of a system with a model.
- To master the circuits specific to digital electronics, and to be able to put into practice the methods of synthesis of sequential functioning assemblies using memories, finite state machines, and Arithmetic and Logic units.
- to know the architecture of a basic system and to present elements of a simple microprocessor-based system.
- evaluate the criteria for choosing a D/A and A/D conversion system according to the type of application.
- acquire the basic knowledge necessary to understand electrical energy conversion systems by mastering the various functions that make up these systems.

Description of the programme

Analog electronics:

- Linear systems and signals.
- Filtering, representation.
- Input/output/gain impedances.
-Notion of quadrupoles, parameterization, and associations.
- Real operational amplifiers.

Automation of linear systems:
- Introduction to the position of automation in the engineering profession.
- Modelling of systems: knowledge model, driving model for systems of order higher than two, identification.
- Analysis of the behaviour of looped systems.
-Stability study: Algebraic method, Evans locus, frequency method.
- Accuracy.
- Synthesis of a control from a specification.

Digital electronics:
- Digital and embedded electronics.
- Comparative characteristics of analogue and digital signals.
- Design of circuits based on combinational logic, sequential logic and state machine elements.
- Memories and microprocessors.
- A/D and D/A converters.

Electrical power:
- Single and three phase, balanced and unbalanced electrical circuits.
-Operation and characteristic mechanisms of power electronics components in switching.
- Electrical power conversion systems.

Microcontrollers:
- Basic system architect.
- Programming / instruction set.
- Microprocessors, microcontrollers and DSP.

Generic central skills and knowledge targeted in the discipline

- the ability for a student to identify the elements necessary for understanding complex electronic systems (analogue and/or digital) and then to grasp all their scientific and technical dimensions.
- mastery of the basic methods and tools of analysis and synthesis of digital electronic systems
- mastery of the basic methods and tools for the analysis and synthesis of the control of linear servo systems.
- the ability to understand the basic principles and purpose of power electronics and AC/DC converters.
- the ability to understand all the scientific and technical dimensions of all the elements of an electrical energy conversion chain from a specification.

How knowledge is tested

The assessment of the EU E3A is done by continuous assessment, in the form of supervised table and/or online and/or oral assignments during the TA or TD sessions. The number of continuous assessments is a maximum of 10. The practical work is

also assessed and forms part of the final assessment. The final grade of the evaluation is a weighted average of the grades of the different evaluations.

Bibliography

Schubert,Kim, "Fundamentals of electronics", Morgan & Claypool publishers, 2013. Floyd, Buchla, « Electronics Fundamentals Circuits, Devices, and Applications », 8th edition, 2014, Pearson. Floyd, « Digital Fundamentals », 11th edition, Pearson, 2015. Larminat , « Commande des systèmes linéaires », Hermes Science publication,1996. Granjon, « Automatique 3ème édition », 2015, Dunod

Teaching team

Lætitia ABEL-TIBERINI, Nicolas BERTAUX, Mohamed BOUSSAK, Thierry GAIDON, Guillaume GRATON, Alain KILIDJIAN, Fabien LEMARCHAND + vacataires

Sustainable Development Goal

Affordable and clean energy

Sustainable cities and communities

Responsible consumption and production

Total des heures		**72h**
CM	Master class	32h
TD	Directed work	22h
AA		18h

Useful info

Name responsible for EU

Lead Instructor

Fabien Lemarchand

fabien.lemarchand@centrale-med.fr