MASTER OF SCIENCE : ELECTRONIC SYSTEMS FOR EMBEDDED AND COMMUNICATING APPLICATIONS

RÉSUMÉ DE LA FORMATION

Type de diplôme : Master (LMD)
Domaine ministériel : Sciences, Ingénierie et Technologies
Mention : Aéronautique et espace

ETABLISSEMENTS COACCRÉDITÉS

* INSTITUT MINES-TELECOM
* ECOLE NATIONALE DE L'AVIATION CIVILE
* INSA TOULOUSE
* ISAE TOULOUSE

PLUS D'INFOS

Crédits ECTS : 120

Niveau d'étude : BAC +5

Public concerné
* Formation initiale
* Formation continue

Nature de la formation : Parcours

Stage : Obligatoire (6 months)

EN SAVOIR PLUS

http://www.toulousetech.net/en/programs/master-of-science-XB/sciences-engineering-and-technologies-SIT/msc-electronic-systems-for-embedded-and-communicating-application-eseca-program-program1-msc-electronic-systems-for-embedded-and-communicating-application-eseca-2-en.html

Présentation

2 internships (6 weeks + 6 months) in a laboratory or a company. One individually tutored project in a research team (100h tutoring), plus several project with small groups of students.

Objectifs

Knowledge of analog and digital electronic systems. Knowledge of the embedded systems from the hardware point of view. Antenna and RF systems theory and applications. Signal and image processing in the communications and aeronautics systems. Power management of embedded and autonomous systems.

Savoir faire et compétences

To design electronic embedded systems. To design communicating systems in the radiofrequency domain. To Design power management for embedded systems. To develop signal and image processing in the context of communications and aeronautics.

Contenu de la formation

PhD in the domains of electronics, signal processing, communications, aeronautics and space.

Organisation de la formation

MASTER ELECTRONIC SYSTEMS FOR EMBEDDED AND COMMUNICATING APPLICATIONS M1
MASTER ELECTRONIC SYSTEMS FOR EMBEDDED AND COMMUNICATING APPLICATIONS M2
MASTER ELECTRONIC SYSTEMS FOR EMBEDDED AND COMMUNICATING APPLICATIONS M2

Stages

2 internships (6 weeks + 6 months) in a laboratory or a company. One individually tutored project in a research team (100h tutoring), plus several project with small groups of students.

Conditions d'accès

Bachelor of Science or equivalent in the domain of electronic engineering.

Poursuite d'études

Manufacturers of electronic devices in the aeronautic context. Manufacturers in the hardware for embedded systems. Main companies in the aeronautics and automotive fields

Insertion professionnelle

Manufacturers of electronic devices in the aeronautic context. Manufacturers in the hardware for embedded systems. Main companies in the aeronautics and automotive fields

Composante

École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

Lieu(x) de la formation

Toulouse

Contact(s) administratif(s)

Contact master ESECA
master-eseca @ univ-toulouse.fr

MASTER ELECTRONIC SYSTEMS FOR EMBEDDED AND COMMUNICATING APPLICATIONS M1

PLUS D'INFOS

Crédits ECTS : 60

Organisation de la formation

- **M1 Electronic Systems for Embedded & Communicating Appli.**
  - **Parcours Normal - M1 ESECA Semestre 7**

    A choix: 1 Parmi 1 :
    - **Parcours Standard sem 7 ESECA**
      - **UE UE Social Science & Culture sem 7**
        - **Matière French (FLE) M1 ESECA semestre 7**
        - **Matière Conferences on aeroautics - sem 7**
        - **Matière Communication**
        - **Matière Sport - M1 ESECA**
      - **UE UE Math. - M1 ESECA**
        - **Matière Maths Fourier Analysis**

Objectifs

Become familiar with the basic notion of signals, Fourier series and Fourier Transform. Master the skills to do Fourier analysis of periodic and aperiodic signals in most electronic applications.

To have basic ideas of vector analysis and orthogonal coordinates systems.

Description

1 . **Fourier Series**:Introduction to signal - Sinewave - Fourier series - Fourier series for conventional signal - Complex form of Fourier series - Electrical signal applications

2 . **Fourier Transform**: From periodic to aperiodic signal: Fourier Transform - Fourier transform of some conventional signals - Basic theorems of Fourier transform - Electrical waveforms and spectra - Applications in electronics - Discrete Fourier Transform

3 . **Vector Analysis**: Introduction - Vector Algebra - Theorem of Vector Algebra - Cartesian coordinates system - Orthogonal coordinate systems - Differential operator on vector field - Useful theorems on vector analysis

· Matière Maths - Complex variable - Vector analysis

Objectifs

Become familiar with complex variable, complex plane, complex derivative and complex integration. Master the skills to do complex integration and real function integration by using residue theorem. Become familiar with Laplace transform for continuous linear systems and Z transform for discrete linear systems.

Description

1 .Complex Plane, complex variables and complex functions

2. Derivative of complex function. Analytic function

3. Integral of complex function.

4. Residue Theorem

5. Laplace Transform

6. Z transform

Bibliographie

1 . ***Complex Variables,*** Robert B. Ash and W. P. Novinger, Dover Publication
2 . ***Schaum's Outline of Theory and Problems of Advanced Mathematics for Engineers and Scientists, Complex Variable,*** Murray R. Spiegel, McGraw-Hill, 1971
3 . ***Cours d'Analyse (in French),*** S. D. Chatterji, Presse Polytechniques et Universitaires romandes

· Matière Maths Probability / Statistics

Objectifs

Become familiar with basic notions of random events and mathematical tools for their modelling. Master the skills to study discrete and continuous random variables and be familiar with the most used probability laws and their applications on modelling of both discrete and continuous random events.

Description

1 . ***Basic Concepts***
2 . ***Random variables***
3 . ***Expectation***
4 . ***Conditional probability***
5 . ***Initiation to reliability***

Bibliographie

1 . ***Basic Probability Theory with Applications,*** Mario Lefebvre, Springer, 2000
2 . ***Basic Probability Theory,*** Robert B. Ash, Dover Publication
3 . ***Probabilité et Statistique Appliquées,*** B. Lacaze, C. Mailhes, J.-Y. Tourneret, , Cépaduès Editions

· UE Programming

· Matière Basis of Programming / Matlab

· Matière C programming

Pré-requis nécessaires

Students must know how to implement code in any programming language

Objectifs

- To apprehend the algorithmic basic concepts and

the basic concepts of the structured programmin

- study fundamental notions of C programming

· Matière Microprocessor

Pré-requis nécessaires

Prerequisites:

- C programming

- Assembly language

Objectifs

- Handle C programming for embedded system

- Handle microprocessor/micro-controller architecture

- Be autonomous on a project

Description

This course will be divided in three section: lessons, labs and project

During labs students will discover the architecture of PIC processor and will implement basic functions in C.

During the project, student will implement an UART communication with an RFID detector. The main objective is to control a step motor. (which represent a door) by a tag RFID.

Méthode d'enseignement
En présence

Langue d'enseignement
English

· UE UE Analog Electronics

· Matière Circuits

Pré-requis nécessaires

semi-conductor devices, filtering (1st & 2nd order low-pass filters) ; Kirchhoff's Current Law,

Compétences visées

Be able to design a stable closed-loop circuit by optimising its gain-bandwidth product

Méthode d'enseignement
En présence

Langue d'enseignement
Anglais

Bibliographie

A. Dziadowiec, M. lescure, Fonctions à amplificateurs Opérationnels, Applications et Simulations, Eyrolles, 1996, ISBN 2-212-09578-3

· Matière Project Analog Electronics

Pré-requis nécessaires

Circuits course and Analog electronics labwork

Objectifs

Objectives:

At the end of Analog electronics project, the student will be able to:

- Use a spectrum analyser

- Describe the basic functions of a heterodyne receiver and characterize these functions

- Make some experiments with a SDR transceiver (transmitter and receiver) in order to "discover how 'Powerfull' SDR is

Description

These courses and labworks are an introduction to the basics of analog and digital data transmission:

- AM, FM modulation

- I/Q modulation

- Features of a heterodyne receiver

- Introduction to SDR (Software Defined Radio) and the IoT (Internet of Things)

· Matière Analog Electronics Pratical

Pré-requis nécessaires

Circuits course

Description

At the end of these electronics labworks, the student will be able to:

- Characterize a passive circuit by its transient response and its frequency response (first and second order circuits).

- Design and implement a filter

- Implement and characterize linear and non linear circuits with operational amplifier components (amplifiers, active filters, comparators, astable circuits, …).

Identify the technical limits of these components in order to learn how to choose them for a specific application

· Matière Semic-conductor devices

· Matière Filtering

Toutes les informations données sur cette page sont indicatives et n'ont pas de valeur contractuelle

Pré-requis nécessaires

None

Objectifs

The aim of this course is to learn the design methods and synthesis techniques for analog filters.

Description

This course falls into seven parts :

- Analog front-end architecture : Heterodyne and super heterodyne architecures. Role and specifications of the filter in the system.

- Determinatiion of a partially known stable filter function : How can we find single or a familly of stable function of with knowledge of part of the electrical response (either magnitude or phase, real or imaginary parts, even or odd parts).

- Synthesis techniques to determine LC networks : Cauer, Foster and Darlington metods.

- Approximation functions : Butterworth, Tchebychev.

- Lowpass filter prototype : design method.

- Frequency transformations : bandpass-, highpass-, stopband-to-lowpass prototype transformations. LC networks transformations.

- Active filters

· Matière Transmission lines

· UE UE Digital Electronics

· Matière Digital electronics

· Matière VHDL - M1 ESECA

Pré-requis nécessaires

Prerequisites:

- Basis of analog and digital electronic (transistor, Flip-flop, LUT etc...)

Objectifs

- Handle VHDL material description language

- Handle the architecture of an FPGA

- Be Autonomous on a project

Compétences visées

- VHDL programming

Méthode d'enseignement
En présence

Langue d'enseignement
English

· Parcours PIM sem 7 - M1 ESECA

· UE UE PIM Commun

· UE UE PIM N7

· Matière Ligne de Transmission

· Matière Circuits RF passifs et actifs

· Matière Antennes

· Matière Programmation C

· M1 ESECA Semestre 8

· UE UE Social Science &Culture sem 8

· Matière Sport semestre D

· Matière Projet Industriel

Responsable(s)
PRIGENT GAETAN

· Matière Langues M1 ESECA

· Matière Anglais 2EN semestre 8

· Matière LV2 M1 ESECA

· Matière Conf. Aéro. Sem 8

· UE UE Digital Electronics

· Matière Projet Numérique

Responsable(s)
BONY FRANCIS

· Matière Front-end acquisition

· UE UE Optics & Telecoms

· Matière Optoelectronics

Objectifs

The aim of this course is to privide students ability to :

- design an optical link for communiation

- design a photodetection system

- design a light emission system with an LED or a laser diode

Description

Fiber optic based communication systems represent the large majority of communication links worldwide in long or mid-range distances.

Beyond the channel that is the optical fibre, these systems require the use of dedicated components where the interaction between the electrons and the photon of the transmitted light is the major phenomenon.

Mastering of these interactions leads to design communications link with performances far beyond the ones of wireless or copper based communications.

The ai of this course thus is the study of the optical fibre properties, the emission components (LED and laser diodes) and the detection components (photodiodes). The global architecture of an optical communication link is given as well as the general principle of sensing using interferometric optical devices.

Bibliographie

Fundamentals Of Photonics 2Ed, Saleh B E A. , Wiley 2012

· Matière Telecoms

Pré-requis nécessaires

Bases en traitement du signal

Objectifs

- Être capable d'expliciter le rôle des différents élément d'une chaine permettant de transmettre une information numérique.

- Être capable d'analyser une chaine de transmission numérique de base (bloc modulateur/démodulateur, canal à bruit additif blanc et Gaussien) en termes d'efficacité spectrale et d'efficacité en puissance.

- Être capable d'implanter numériquement des chaines de transmission numérique de base, de les comparer et de les optimiser en termes d'efficacité spectrale et d'efficacité en puissance.

Description

Cet enseignement aborde les points suivants :

1- Rôle des éléments d'une chaine de communication permettant de transmettre une information numérique.

2- Génération d'un signal à partir d'une information numérique à transmettre (modulateur numérique) :

- en bande de base

- sur fréquence porteuse (modulations de type ASK, PSK, QAM),

- notion d'efficacité spectrale.

3- Modélisation simple du canal de propagation.

4- Mise en place d'un démodulateur numérique optimisé :

- Notion d'efficacité en puissance,

- Notion d'interférence entre symboles et critère de Nyquist,

- Filtrage adapté.

5- Calcul de taux d'erreur binaire.

6- Notion d'enveloppe complexe et de chaine passe-bas équivalente pour les transmissions sur fréquence porteuse.

7- Exemple de chaine de transmission numérique de base : couche physique du DVB-S.

Volume horaire
4 cours, 6 TPs

Responsable(s)
THOMAS Nathalie
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Tel. 2236

Méthode d'enseignement
En présence

Langue d'enseignement
Anglais

Bibliographie

- M. Joindot, A. Glavieux, Introduction aux communications numériques, Dunod

- J.C. Bic, D. Duponteil, J.C.Imbeaux, Eléments de communications numériques, Dunod

· Matière Pratical Hyper / Opto

· Matière Laser and optical fiber sensing techniques

Pré-requis nécessaires

Optoelectronics

Compétences visées

Be capable to do a critical analysis of the different operating principles of optical measuring sensors for displacement, position, thickness, velocity, profile and 2D/3D dimension with laser-based devices.

Be able to select the correct sensor technology for your specific measurement task.

Méthode d'enseignement
En présence

Langue d'enseignement
English

· UE UE RF

· Matière Antennas

· Matière Passive RF

· Matière Active RF circuits

· Matière MEMS

· Matière Hyper Frequence Project

· UE UE Signal and Image

· Matière Signal processing

· Matière Digital Sign.Proc.

· Matière Image processing

· Matière Signal & Image processing project

Composante

École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

MASTER ELECTRONIC SYSTEMS FOR EMBEDDED AND COMMUNICATING APPLICATIONS M2

PLUS D'INFOS

Crédits ECTS : 60

Organisation de la formation

- **M2 Electronic Systems for Embedded & Communicating Appli.**
  - **M2 ESECA Semestre 10**
    - **UE M2 ESECA Soutenance PFE**

A choix: 1 Parmi 1 :

- **M2 ESECA Circuits Intégrés pour Systèmes Embarqués Sem. 9**
  - **UE Sciences Humaines et Sociales**
    - **Matière Soutenance de stage**
    - **Matière Langue M2 ESECA (option ICES et SIP) semestre 9**
    - **Matière Relations entreprises**
    - **Matière Métiers et fonctions de l'Ingénieur dans l'industrie**
  - **UE Architecture des systèmes mixtes**
    - **Matière VHDLAMS**
    - **Matière Internet des objets**
    - **Matière Architecture, mise en oeuvre et fiabilité des systèmes embar**

· Matière Projet plate forme mobile autonome

· UE Systèmes optoélectroniques

· Matière Composants et Circuits optoélectroniques en HF

Responsable(s)
PERCHOUX JULIEN

· Matière Projet liaison optique embarquée

· Matière Capteurs laser et à fibre optique

· UE Circuits intégrés

· Matière Synthèse numérique

Responsable(s)
BONY FRANCIS
REBOLLO TONY

· Matière Technologie du silicium

Responsable(s)
LECESTRE AURELIE

· Matière CAO technologique SILVACO

Responsable(s)
TAP HELENE
MOUTAYE EMMANUEL

· Matière Initiation Cadence Layout XL / Sprectre

Responsable(s)
BERNAL OLIVIER
TAP HELENE

· Matière Convertisseurs CAN et CNA

· Matière System on Chip

· Matière Conception VHDL

· Choix option Analogique ou Numérique

A choix: 1 Parmi 1 :

· Option Analogique

· Matière Circuits Intégrés Analogiques

· Matière Intégration de Chaînes d'Instrumentation

· Matière ASIC analogique

Pré-requis nécessaires

Knowledge of the basic concepts related to the transistor main characteristics (parameters, technology, MOSFET / BJT) as well as the basics of the analog design (common emitter/collector stage, input differential stage, push-pull, etc…).

Objectifs

At the end of the part dedicated to the design of the integrated linear regulator at the transistor level, the students can make the right choices regarding the topology improvement of the built-in analog functions due to the fact that they are able to analyze the main behavior of an analog circuit to determine its overall performances.

After the second part dedicated to the layout of the circuit using Cadence^{TM} tools, the students will be able to draw the masks of an analog integrated circuit and make the relevant choices by showing that they master the concepts of component matching, required to implement specific properties such as the ratio of the transistor sizes or that of passive components.

Compétences visées

- Know how to design and implement a linear regulator using a submicron CMOS technology,

- Have a deep understanding of the analog design flow,

- Be able to make the right choices concerning the transistor-level topology improvement,

- Obtain a good understanding the method of design of the analog circuit and the related Layout recommendations.

Description

The project is divided into three main parts:

-1- The design at the transistor-level of the circuit using very simple 1st-order models of MOSFET transistors.

-2- Perform the circuit validation using Pspice/Spectre simulator involving the accurate technology parameters. First, several temperature cases have to be considered and finally all the worst-case parameters have to be taken into account to validate the sizing of the transistors. The influence of the dispersions is also highlighted by Monte Carlo analysis.

-3- Draw the layout of the circuit using Cadence^{TM} tools with respect to the basic rules of component matching.

Volume horaire
3.5 HC + 35 HBE

Responsable(s)
COUSINEAU Marc
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Tel. 2431

Méthode d'enseignement
En présence

Langue d'enseignement
Both English and French

Bibliographie

R. Gregorian, G.C. Temes, “Analog MOS Integrates Circuits for Signal Processing” Wiley-Interscience

P.R. Gray, R.G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley

W. Sansen, “Advanced Anaolg IC Design Courses”, KU Leuven

K. Bult, “Transistor Level Analog IC Design Courses”, EPFL

· Option Numérique

· Matière Projet ASIC, Traitement du Signal

· UE Systèmes embarqués

· Matière Convertisseur d'Energie DC/DC

Pré-requis nécessaires

Knowledge of the basic concepts related to Kirchhoff laws and the MOSFET transistor (static and dynamic characteristics, Spice model level 1).

Objectifs

At the end of the first part of the training dedicated to the analysis of the SMPS topology analysis, the students will be able to master correctly all the equations and the main notions attached to the study of a DC/DC converter by showing that they are able to analyze the state-variable waveforms in steady-state to determine the performances of the system.

After the second part dedicated to the study of the voltage and current control loops, the students will be able to determine the type of controller required to regulate the state-variables of the system by showing that they are able to compute the pole and zero of the open-loop transfer function when it is necessary to insure the stability of a SMPS-type DC/DC converter.

Compétences visées

- understand the principles of lossless energy transfer using SMPS topologies,

- know the different architectures used to provides an output voltage higher or lower than the input voltage : Buck converter, Boost converter, Buck-boost converter, SEPIC converter.

- be able to find the analytical expression of each characteristic of the converter using a waveform analysis method,

- understand the different method used to regulate the output voltage value for any type of load or any value of input voltage,

- be able to compute the poles and zeros of the controller in order to implement an unconditional stable control loop for the output voltage regulation.

- be able to understand the datasheet of an SMPS.

Description

The course is divided into 3 distinct parts :

- 1) the study of the Buck converter topology (waveform analysis, CCM vs DCM, basic voltage control loop),

- 2) the study of the Boost converter topology (waveform analysis, CCM vs DCM, basic voltage control loop including a peak-current detection method)

- 3) the small-signal analysis of a Sample-Mode-Power-Supply: introduction to the state-variable analysis method, transfer function identification, design of the controller to insure the stability of the regulated system.

Practical work session using Cadence-Pspice simulator helps to illustrate the different concepts discussed in the course, namely: understand the shape of the several waveforms observed with the Buck converter, be able to design of a simple voltage control loop and measure the phase margin.

Volume horaire
8.75 HC + 10.5 HBE

Responsable(s)
COUSINEAU Marc
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Méthode d'enseignement
En présence

Langue d'enseignement
Anglais

Bibliographie

D.M. Mitchell, “DC-DC Switching Regulator Analysis”, McGraw-Hill Companies.

Enseignants ENSEEIHT Génie Electrique, “Méthodes d’Étude des Convertisseurs Statiques”, Mentor Sciences.

Unitrode Application Notes U-97, U-93, U-111, U-140 and DN-62.

· Matière Drivers et Intégr. - Transf. Intégrés

Pré-requis nécessaires

Knowledge of the basic concepts related to the power transistor main characteristics (parameters, technology, MOSFET / IGBT) as well as the basics about Switch Mode Power Supply.

Objectifs

At the end of the first part of the training dedicated to the analysis of the power transistor switching mechanisms, the students will be able to determine correctly the dynamic performance of a complete eletrical system involving the Driver circuit in its environment by showing that they are able to analyze waveforms when it is necessary to determine the overall losses associated with the switchings.

After the second part dedicated to the study of the disturbances due to the presence of parasitic components, the students will be able to read a data sheet and make relevant choices by showing that they master the concepts related to Driver circuits and its EMC issues when it is necessary to implement the switching-cells of a SMPS-type converter.

Compétences visées

- Know how to read the datasheet of a Driver circuit, to estimate the losses related to the control circuit,

- Have a depth knowledge of the switching-cell behavior,

- Be able to make the right choices for the components in the design of a power board,

- Obtain a good understanding of the design rules related to the PCB drawing to minimize EMI issues due to the switchings.

Description

The course is divided into 3 distinct parts:

- 1) the behavior of a MOSFET or IGBT transistor during a turn-on event is analysed in detail (gate-to-source V_{gs} vs gate charges Q_g, behavior of the capacitors C_{gs}, C_{gd}, C_{ds}, the Miller plateau, dI_d/dt and dV_{ds}/dt equations),

- 2) the peripheral functions of the driver: bootstrap circuitry, charge pump, isolated power supplies, transmission of isolated control signal and immunity to dv/dt, synchronous rectification, dead-time notion, influence of parasitic components (inductive and capacitive) during a switching event,

- 3) the physical implementation of the Driver circuit (IC level) and study of the resonant topologies (principle and efficiency analysis).

Practical work session using Cadence-Pspice simulator helps to illustrate through waveform analysis the several concepts covered in the course, namely: the turn-on and turn-off events, the design of a charge-pump circuit, the behavior of a resonant driver topology.

Volume horaire
5.25 HC + 7 HBE

Responsable(s)
COUSINEAU Marc
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Tel. 2431

Méthode d'enseignement
En présence

Langue d'enseignement
Anglais

Bibliographie

A. D. Pathak, « MOSFET/IGBT Drivers Theory And Applications » - IXYS Colorado.

B. Multon, S. Lefebvre, « MOSFET et IGBT : circuits de commande », TI, D3 233.

Yuhui Chen and all,« A resonant MOSFET gate driver with efficient energy recovery », IEEE Trans. on Power Electronics, Vol. 19, No. 2, March 2004.

· Matière CCMB

· Matière Procédés MEMS

· Matière Projet SIP

· Matière Compatibilité électromagnétique des circuits intégrés

· M2 ESECA Micro-Wave Engineering Semestre 9

· UE EQUIPEMENTS

Responsable(s)
PRIGENT GAETAN

· Matière Equipement RF

· Matière Dimensionnement Charge Utile

· Matière MEMS

· Matière Mesures Optiques et Micro-Ondes

· UE Physique appliquée 2

Responsable(s)
RAVEU NATHALIE

· Matière Technologie du silicium

· Matière Composants actifs

· Matière Physique des Plasmas

· Matière Optoélectronique MO

· UE Projet Recherche

· UE Enseignements Communs

· Matière Conférences MO

· Matière Conférences métiers

Responsable(s)
MAILHES CORINNE
BERNAL OLIVIER
FRANC ANNE-LAURE

· Matière Soutenance de stage d'été

· Matière Langue Vivante 3EN sem 9

Pré-requis nécessaires

Aucun.

Objectifs

Développer ses compétences en communication professionnelle en éffectuant des tâches de communication courantes, écrites et orales, en anglais.

Compétences visées

1) Rédiger un abstract de 2000 mots en anglais

2) Rédiger un rapport sur son stage de 2ième année / M1 en anglais.

3) Présenter son projet longue de 3ième année / M2.

Description

1 semestre de 12 séances interactives et hebdomadaires.

Volume horaire
21 heures

Méthode d'enseignement
En présence

Langue d'enseignement
Anglais

Bibliographie
Abstracts and the writing of abstracts

Bass, C. (2017). *Write to Influence!: Personnel Appraisals, Resumes, Awards, Grants, Scholarships, Internships, Reports, Bid Proposals, Web Pages, Marketing and More.* Gatekeeper Press.

Duarte, N. (2012). *HBR guide to persuasive presentations.* Harvard Business Press.

· Matière Conduite de projet

· UE Radar et Systèmes

· Matière Signal Radar

· Matière Equipement Radar

· Matière Réseaux communicants

Responsable(s)
TAO JUNWU

· UE Physique Appliquée 1

· Matière Modèles Multiphysiques - COMSOL

Responsable(s)

TAO JUNWU

· **Matière CEM**

· **Matière Antennes réseaux**

· **Matière Théorie de la diffraction**

· **Matière Propagation réelle**

· **M2 ESECA Signal and Image Processing Semestre 9**

· **UE UE Modélisation et Représentation des signaux**

· **Matière Représentation et Analyse des Signaux II**

Responsable(s)
OBERLIN THOMAS

· **Matière Représentation et Analyse des Signaux**

· **Matière Codage de source, Application à l'audio**

· **Matière Estimation - Détection**

· **Matière Classification et Reconnaissance des Formes**

· **UE UE Traitement des signaux numériques**

· **Matière Traitement Numérique du Signal 2**

· **Matière Processeurs de Traitement du Signal**

· **UE UE Technique avancée du traitement du signal**

· **Matière Traitement d'antennes**

· **Matière Traitement adaptatif**

- **Matière Problèmes inverses**
- **Matière Projet de traitement avancé**

- **UE UE Télémédecine et Télédetection**
  - **Matière Imagerie médicale**
  - **Matière Télédétection**
  - **Matière Signal Radar**
  - **Matière Projet d'imagerie biomédicale**
  - **Matière Projet de télédétection**

- **UE Sciences Humaines et Sociales**
  - **Matière Soutenance de stage**
  - **Matière Langue M2 ESECA (option ICES et SIP) semestre 9**
  - **Matière Relations entreprises**
  - **Matière Métiers et fonctions de l'Ingénieur dans l'industrie**

Composante

École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

MASTER ELECTRONIC SYSTEMS FOR EMBEDDED AND COMMUNICATING APPLICATIONS M2

PLUS D'INFOS

Crédits ECTS : 60

Organisation de la formation

- **M2 Electronic Systems for Embedded & Communicating Appli.**
  - **M2 ESECA Semestre 9**
    - **UE UE Social Science & Culture sem 9**
      - **Matière French (FLE) sem 9**
      - **Matière English sem 9**
      - **Matière Internship presentation**
      - **Matière Research project**
      - **Matière Conferences on aeronautics sem 9**
      - **Matière Relation with enterprises**
    - **UE UE Embedded Systems**
      - **Matière Synthèse numérique**

        Responsable(s)
        BONY FRANCIS
        REBOLLO TONY
      - **Matière System on Chip**
      - **Matière Projet ASIC, Traitement du Signal**

· Matière Equipement RF

· Matière Dimensionnement Charge Utile

· Matière Architectures, interfacing and reliability of ES

· Matière Mobile autonomous platform project

· UE UE Power Management

· Matière Convertisseur d'Energie DC/DC

Pré-requis nécessaires

Knowledge of the basic concepts related to Kirchhoff laws and the MOSFET transistor (static and dynamic characteristics, Spice model level 1).

Objectifs

At the end of the first part of the training dedicated to the analysis of the SMPS topology analysis, the students will be able to master correctly all the equations and the main notions attached to the study of a DC/DC converter by showing that they are able to analyze the state-variable waveforms in steady-state to determine the performances of the system.

After the second part dedicated to the study of the voltage and current control loops, the students will be able to determine the type of controller required to regulate the state-variables of the system by showing that they are able to compute the pole and zero of the open-loop transfer function when it is necessary to insure the stability of a SMPS-type DC/DC converter.

Compétences visées

- understand the principles of lossless energy transfer using SMPS topologies,

- know the different architectures used to provides an output voltage higher or lower than the input voltage : Buck converter, Boost converter, Buck-boost converter, SEPIC converter.

- be able to find the analytical expression of each characteristic of the converter using a waveform analysis method,

- understand the different method used to regulate the output voltage value for any type of load or any value of input voltage,

- be able to compute the poles and zeros of the controller in order to implement an unconditional stable control loop for the output voltage regulation.

- be able to understand the datasheet of an SMPS.

Description

The course is divided into 3 distinct parts :

- 1) the study of the Buck converter topology (waveform analysis, CCM vs DCM, basic voltage control loop),

- 2) the study of the Boost converter topology (waveform analysis, CCM vs DCM, basic voltage control loop including a peak-current detection method)

- 3) the small-signal analysis of a Sample-Mode-Power-Supply: introduction to the state-variable analysis method, transfer function identification, design of the controller to insure the stability of the regulated system.

Practical work session using Cadence-Pspice simulator helps to illustrate the different concepts discussed in the course, namely: understand the shape of the several waveforms observed with the Buck converter, be able to design of a simple voltage control loop and measure the phase margin.

Volume horaire
8.75 HC + 10.5 HBE

Responsable(s)
COUSINEAU Marc
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Méthode d'enseignement
En présence

Langue d'enseignement
Anglais

Bibliographie

D.M. Mitchell, “DC-DC Switching Regulator Analysis”, McGraw-Hill Companies.

Enseignants ENSEEIHT Génie Electrique, “Méthodes d’Étude des Convertisseurs Statiques”, Mentor Sciences.

Unitrode Application Notes U-97, U-93, U-111, U-140 and DN-62.

· Matière Drivers et Intégr. - Transf. Intégrés

Pré-requis nécessaires

Knowledge of the basic concepts related to the power transistor main characteristics (parameters, technology, MOSFET / IGBT) as well as the basics about Switch Mode Power Supply.

Objectifs

At the end of the first part of the training dedicated to the analysis of the power transistor switching mechanisms, the students will be able to determine correctly the dynamic performance of a complete eletrical system involving the Driver circuit in its environment by showing that they are able to analyze waveforms when it is necessary to determine the overall losses associated with the switchings.

After the second part dedicated to the study of the disturbances due to the presence of parasitic components, the students will be able to read a data sheet and make relevant choices by showing that they master the concepts related to Driver circuits and its EMC issues when it is necessary to implement the switching-cells of a SMPS-type converter.

Compétences visées

- Know how to read the datasheet of a Driver circuit, to estimate the losses related to the control circuit,

- Have a depth knowledge of the switching-cell behavior,

- Be able to make the right choices for the components in the design of a power board,

- Obtain a good understanding of the design rules related to the PCB drawing to minimize EMI issues due to the switchings.

Description

The course is divided into 3 distinct parts:

- 1) the behavior of a MOSFET or IGBT transistor during a turn-on event is analysed in detail (gate-to-source V_{gs} vs gate charges Q_g, behavior of the capacitors C_{gs}, C_{gd}, C_{ds}, the Miller plateau, dI_d/dt and dV_{ds}/dt equations),

 Toutes les informations données sur cette page sont indicatives et n'ont pas de valeur contractuelle

- 2) the peripheral functions of the driver: bootstrap circuitry, charge pump, isolated power supplies, transmission of isolated control signal and immunity to dv/dt, synchronous rectification, dead-time notion, influence of parasitic components (inductive and capacitive) during a switching event,

- 3) the physical implementation of the Driver circuit (IC level) and study of the resonant topologies (principle and efficiency analysis).

Practical work session using Cadence-Pspice simulator helps to illustrate through waveform analysis the several concepts covered in the course, namely: the turn-on and turn-off events, the design of a charge-pump circuit, the behavior of a resonant driver topology.

Volume horaire
5.25 HC + 7 HBE

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Méthode d'enseignement
En présence

Langue d'enseignement
Anglais

Bibliographie

A. D. Pathak, « MOSFET/IGBT Drivers Theory And Applications » - IXYS Colorado.

B. Multon, S. Lefebvre, « MOSFET et IGBT : circuits de commande », TI, D3 233.

Yuhui Chen and all,« A resonant MOSFET gate driver with efficient energy recovery », IEEE Trans. on Power Electronics, Vol. 19, No. 2, March 2004.

· Matière EMC of Integrated Circuits

· UE UE Radar and remote sensing

· Matière Signal Radar

· Matière Remote sensing project

· Matière RADAR equipment

· UE RF/OPTO

· Matière Composants et Circuits optoélectroniques en HF

Responsable(s)
PERCHOUX JULIEN

· Matière Project Embedded optical links

· Matière Signal for telecommunication

· Matière Space telecoms

· M2 ESECA Semestre 10

· UE UE Soutenance PFE semestre 10

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