EENG - Year 3

Semester 5

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Electrical Engineering 5

Electrical Engineering 5

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module MANNAH Marc Anthony
Type de module : Unité d'Enseignement	**Electrical Engineering 5** (LIIEEng05UElecEng5)		
Crédits (ECTS)	3		
Effectif maximum	250		
Durée totale : 40h00	Periode Semester 5	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Electrical Engineering 5
- AC Electrical Machines

AC Electrical Machines

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MANNAH Marc Anthony
Type d'EC : Cours	**AC Electrical Machines** (LIIEEng05EACElecMach)			
TD : 8h00 TP : 4h00 Cours : 8h00 Travail personnel : 20h00 Durée totale: 40h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this module, students will be able to:
1. Recognise the different types of 3 phase AC machines and interpret their construction, theory, and operation
2. Develop the equivalent circuits of induction and synchronous machines
3. Compare the modes of operation of generators and motors.
4. Evaluate the starting process, speed control, torque, power, and applications of three-phase AC machines

Contenu

This course provides engineering students with in-depth knowledge of electrical machines theories. It teaches the students the necessary techniques of solving problems. The principle of rotating magnetic field and AC machinery are underlined. AC machines including three-phase Synchronous machines and three-phase induction machines are explained. Analysis and calculations to find the voltage regulation and efficiency of a machine at a certain load are included. The different applications of each machine are studied as well.

o Principle of Rotating Magnetic Field: Rotating Magnetic Field, Electrical & Mechanical Quantities, Magnetomotive Force and Flux Distribution, Induced Voltage & Torque in AC Machines, Winding Insulation & AC Machine Losses, Voltage Regulation & Speed Regulation
o Synchronous Machines: Synchronous Generator Model, Synchronous Generator Operating Alone, Parallel Operation of Synchronous Generators, Control of Parallel Generators, Synchronous Motor Model, Synchronous Motor: Load and Field Effects, Starting Synchronous Motors
o Induction Machines: Induction Motor Construction, Induction Motor Concepts & Model, IM Torque Speed Characteristic, IM Rotor Design, IM Starting, Induction Generator

Prérequis

Prerequisites:
- Electrical Networks
- Electrostatics and Magnetostatics
- DC Electrical Machines

Bibliographie

Essential Resources:
Chapman, S., (2011), Electric Machinery Fundamentals, 4th Edn., McGraw Hill

Recommended Resources:
Sen, P., (1996), Principles of Electric Machines and Power Electronics, 2nd Edition, ISBN: [0-471-02295-0], Wiley
Sahdev, S., (2018), Electric Machines, Cambridge Press
El Hawary, M., (2002), Principles of Electric Machines with Power Electronic Applications, 2nd Edn., John Wiley & Sons

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	1. Recognise the different types of 3 phase AC machines and interpret their construction, theory, and operation 2. Develop the equivalent circuits of induction and synchronous machines 3. Compare the modes of operation of generators and motors. 4. Evaluate the starting process, speed control, torque, power, and applications of three-phase AC machines	0,7	Students will be evaluated on the following abilities (2 hours Final written exam): Validating technical skills on the calculation of a rotating field in an AC machine. Validating technical skills on synchronous and induction machines operation, performance and controlability
2	4. Evaluate the starting process, speed control, torque, power, and applications of three-phase AC machines	0,3	Students will be evaluated on the following abilities during one 4-hour experimental session: Demonstrate practical skills in working with induction motors. Test and characterize induction motors. Analyze the effect of load on machine performance. Evaluate the effect of changes in the input voltage on machine performance. Assessment will be based on both the written laboratory report and the student's ongoing performance during the laboratory session.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Electrical Engineering 5
- DC Electrical Machines

DC Electrical Machines

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MANNAH Marc Anthony
Type d'EC : Cours	**DC Electrical Machines** (LIIEEng05EDCElecMach)			
TD : 6h00 TP : 4h00 Cours : 6h00 Travail personnel : 16h00 Durée totale: 32h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this module, students will be able to:
1. Identify the magnetic field principle and rules.
2. Recognize the different type of DC motors and interpret their construction
3. Analyze the DC machine's torque speed characteristic and performance

Contenu

This course provides engineering students with in-depth knowledge of electrical machines theories. It teaches the students the necessary techniques of solving problems. The concept of magnetic field and the principle of operation of DC machines are covered. Their construction, operation's principles and equivalent models are studied in depth.

o Introduction to Machinery Principles: Rotational Notions, The Magnetic Field, Magnetic Circuit, Voltage & Torque Equations, Magnetic Losses
o DC Machines Construction : Simplest DC Machine (1 loop), Armature Construction, Commutation in a 4 Loop DC Machine, Lap & Wave Windings, Problems & Solutions in Real DC Machines, Voltage & Torque Equations, Losses in DC Machines
o DC Motors: Separately Excited & Shunt (Parallel) DC Motor, Series DC Motor & Compounded DC Motor, DC Motors Starting, DC Motors Applications & Test Procedures, DC Generators

Prérequis

Prerequisites:
- Electrical Networks
- Electrostatics and Magnetostatics

Bibliographie

Essential Resources:
Chapman, S., (2011), Electric Machinery Fundamentals, 4th Edn., McGraw Hill

Bibliographie

Recommended Resources:
Sen, P., (1996), Principles of Electric Machines and Power Electronics, 2nd Edition, ISBN: [0-471-02295-0], Wiley
Sahdev, S., (2018), Electric Machines, Cambridge Press

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	1. Identify the magnetic field principle and rules. 2. Recognize the different type of DC motors and interpret their construction 3. Analyze the DC machine's torque speed characteristic and performance	0,7	Students will be evaluated on the following abilities (1.5 hour midterm written exam): Understanding the magnetic field and its related calculations Validateing technical skills related to DC motors construction, operation and controlability
2	3. Analyze the DC machine's torque speed characteristic and performance	0,3	Students will be evaluated on the following abilities during one 4-hour experimental session: Demonstrate practical skills in working with DC machines. Test and characterize DC machines. Analyze the effect of load on machine performance. Evaluate the effect of changes in the input voltage and excitation on machine performance. Assessment will be based on both the written laboratory report and the student's ongoing performance during the laboratory session.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Industrial Organisation 5

Industrial Organisation 5

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module MORALES Jean
Type de module : Unité d'Enseignement	**Industrial Organisation 5** (LIIEEng05UIndusOrga5)		
Crédits (ECTS)	6		
Effectif maximum	250		
Durée totale : 55h00	Periode Semester 5	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Industrial Organisation 5
- Industrial Organisation

Industrial Organisation

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : COUROUGE Olivier,MORALES Jean
Type d'EC : Cours	**Industrial Organisation** (LIIEEng05EIndOrg)			
TD : 16h00 Cours : 16h00 Travail personnel : 44h00 Durée totale: 78h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

• Name the manufacturing strategies, flows and processes and associate them to the right products
• Explain the importance of managing & control flows in industries
• Classify industrial data
• Calculate direct product cost
• Calculate the OOE (Overall Operations Effectiveness) and the OEE (Overall Equipment Effectiveness)
• Explain the different levels of Industrial Planning and generate production plan, MPS (Master Production Schedule) and MRP (Material requirements Planning)
• Compare the production plan to the capacity of a production line
• Analyze inventory and categorize it in order to optimize your inventory management
• Apply the problem solving methodology in order to solve a problem and propose the most appropriate solution
• Acquire the philosophy of Lean Management and apply the right Lean tool to the right situation
• Recognise workshop layout principles
• Conduct a FMECA (Failure Mode Effects and Critically Analysis)
• Analyze the impacts of product specifications on product cost, on quality and on customer satisfaction
• Idendify the new technologies in industries and propose the most relevant
• Explain what is a "Supply Chain“
• Build a VSM (Value Stream Mapping)

Contenu

• Problem solving methololgy and related tools (PDCA, 5W2H, Pareto, Ishikawa, risks analysis, 5 Whys & Action Plan)
• Industrial Planning management
• Manufacturing flows and technical data (Bill of Materials, routing sheet)
• Plant implementation and workstation study
• Calculation of direct product costs
• The MRP2 system with its 3 levels: S&OP (Sales & Operations Planning), determination of the MPS (Master Production Schedule), load calculations and introduction to MRP (Materials Requirements Planning). Link with capacity planning.
• Lean Management
• TPM: OEE, OOE, 6 major losses
• Basics of inventory management
• VSM
• FMECA

Prérequis

None

Bibliographie

S. N. Chapman, J. R. Tony Arnold, A. K. Gatewood, and L. M. Clive, « Introduction to Materials Management », 8th edition, 2017
G. Baglin, O. Bruel, L. Kerbache, J. Nehme, and C. van Delft, “Management Industriel et Logistique - Concevoir et piloter la Supply Chain - 6ème édition”, 2013
APICS Dictionary, 3rd edition, 2008
S. N. Chapman, J. R. Tony Arnold, A. K. Gatewood, and L. M. Clive, « Introduction to Materials Management », 8th edition, 2017
R. Le Moigne, "Supply Chain Management - Achat, production, logistique, transport, vente", 2nd edition, 2017
J. Womack, D. Jones, "Système Lean - Penser l'entreprise au plus juste", 2nd edition, 2009
M. Pillet, C. Martin-Bonnefous, P. Bonnefous, A. Courtoire, "Gestion de Production - Les fondamentaux et les Bonnes Pratiques", 5th edition, 2011

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	The student should demonstrate ones ability to synthetise the most important notions of the lectures and to apply them to industrial cases.	40	Midterm
2		20	Continuous Assessment
3	The student should demonstrate ones ability to synthetise the most important notions of the lectures and to apply them to industrial cases.	40	Final

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Industrial Organisation 5
- Industrial Methods

Industrial Methods

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MORALES Jean
Type d'EC : Cours	**Industrial Methods** (LIIEEng05EInduMeth)			
TD : 10h00 Cours : 8h00 Travail personnel : 18h00 Durée totale: 38h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

From a production specification, the student must be able to:
• Analyze the definition drawing of a part to be manufactured, carry out fixture, elaborate the machining process planning.
• Choose the process(es) for obtaining raw materials.
• Make out the different assembly techniques, the different types of plant
• Apply on an industrial example with the design of an assembly line

Contenu

• Processes for the transformation and processing of metallic and plastics materials.
• Introduction to unconventional and CNC (Computer Numerical Control) Manufacturing processes.
• Study of workpiece fixturing and development of machining process planning for mechanical parts.

Prérequis

To have successfully validated the following modules: fundamentals of mechanics and manufacturing processes

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written or oral exam	100	Final

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Mathematics for Engineering 5

Mathematics for Engineering 5

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module BARILLON Cristelle
Type de module : Unité d'Enseignement	**Mathematics for Engineering 5** (LIIEEng05UMathEng5)		
Crédits (ECTS)	8		
Effectif maximum	250		
Durée totale : 100h00	Periode Semester 5	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Mathematics for Engineering 5
- Mathematics for Engineers 5

Mathematics for Engineers 5

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BARILLON Cristelle
Type d'EC : Cours	**Mathematics for Engineers 5** (LIIEEng05EMathEng5)			
TD : 30h00 Cours : 30h00 Travail personnel : 60h00 Durée totale: 120h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

This module is dedicated to the study of mathematical tools that are commonly used in applications (Fourier Series and Transform, Laplace Transform, classic examples of Partial Differential Equations, Distribution and/or optimization.)

General objectives (learning outcomes : LO) :
* LO1 to develop abstract reasonning skills (e.g. being able to comprehend the extension of analysis and algebra studied during the first two years to Hilbert spaces / Lebesgue integration / Generalized functions)
* LO2 to understand the foundations of common tools like Fourier Series, Fourier Transform, Laplace Transform
* LO3 to be able to analyze a problem (for instance a PDE problem, optimization problem) and find the appropriate method to solve it (Fourier, Laplace,...)
* LO3 to develop rigorous problem solving approaches

Contenu

* Lebesgue integration and Hilbert Spaces - Parameter dependant integrals.
* Fourier Series
* Fourier Transform
* Laplace Transform
* Some Classical examples in Partial Differential Equations
* optimization: non linear optimization (unconstrained and constrained optimisation for functions of several variables) linear optimisation (simplex method)

Prérequis

Calculus and algebra Year 1 and Year 2, Improper Integrals, Infinite Series, Vector Spaces,

Bibliographie

Essential Textbooks:
James, G. & Dyke, P. (2018) Advanced Modern Engineering Mathematics, 5th Edn., Pearson

Bibliographie

Recommended textbooks:
Croft, A. et al. (2017) Engineering Mathematics, 5th Edn., Pearson Education
Stroud, K.A. (2020) Advanced Engineering Mathematics, 6th Edn., Red Globe Press
Kreyszig, E. (2011) Advanced Engineering Mathematics, 10th Edn., John Wiley & Sons

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	LO1 and LO2	0,30	mid-term
2	LO3	0,25	*labs*
3	Written exam	0,45	Final Exam for the course - 2h written exam - Students need to be able to write clear and complete solution for given problem with a clear reasoning.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Mathematics for Engineering 5
- Networks and Security

Networks and Security

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BARILLON Cristelle
Type d'EC : Cours	**Networks and Security** (LIIEEng05EnetworkSecu)			
TD : 6h00 TP : 8h00 Cours : 20h00 Travail personnel : 34h00 Durée totale: 68h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

Date of Update : 01/02/2024

This module covers the fundamentals of computer networks, including the historical context and various use cases. It also explores the client/server model of communication, network components, and infrastructure. The module introduces communication protocols and their specifications, along with TCP/IP and OSI models for communication.

Addressing schemes at the layer 2 (MAC Address) and layer 3 (IP Address) are also discussed, as well as frames and packet processing and the role of end devices and intermediary devices in network communication. The module explores communication on local and remote networks, including an in-depth discussion of the Address Resolution Protocol (ARP).

Security of information systems is a critical aspect, and this module provides an understanding of internal and external threats to information systems. It also introduces cryptographic schemes to encrypt and decrypt data, as well as the Information Systems Security Policy (ISSP).

Lastly, the module delves into the General Data Protection Regulation (GDPR), which is a regulation in EU law on data protection and privacy for all individuals within the European Union (EU) and the European Economic Area (EEA).

Contenu

1 - Understand the fundamentals of computer networks, including their historical context and various use cases.

2 - Learn about the client/server model of communication, network components, and infrastructure.

3 - Gain knowledge of communication protocols and their specifications, as well as TCP/IP and OSI models for communication.

4 - Understand addressing schemes at layer 2 (MAC Address) and layer 3 (IP Address), frames and packet processing, and the role of end devices and intermediary devices in network communication.

5 - Gain an in-depth understanding of communication on local and remote networks, including the Address Resolution Protocol (ARP).

6 - Understand the critical aspect of information system security and learn about internal and external threats to information systems.

7 - Learn about cryptographic schemes to encrypt and decrypt data, as well as the Information Systems Security Policy (ISSP).

8 - Gain knowledge of the General Data Protection Regulation (GDPR) and its impact on data protection and privacy for individuals in the EU and EEA.

Prérequis

None

Bibliographie

Essential Guide to Home Networking Technologies : Gerard O'Driscoll
Cybersecurity for Everyone: Securing your home or small business network : Terence L Sadler
Skillsforall.com
Cisco Networking Academy

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Lab	20	This grade, which represents 20% of your final mark, includes : 1 - The results of the Quiz 2 - Class participation 3 - The results of the two practical Lab.
2	Written exam	80	This grade, which represents 80% of your final mark, is the mark associated with the final written exam.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Mechanical Engineering 5

Mechanical Engineering 5

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module ANKOUNI Mouhamad
Type de module : Unité d'Enseignement	**Mechanical Engineering 5** (LIIEEng05UMechaEng5)		
Crédits (ECTS)	7		
Effectif maximum	250		
Durée totale : 97h00	Periode Semester 5	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Mechanical Engineering 5
- Introduction to Heat Transfer

Introduction to Heat Transfer

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : ANKOUNI Mouhamad
Type d'EC : Cours	**Introduction to Heat Transfer** (LIIEEng05EIntroHeatTransf)			
TD : 12h00 TP : 8h00 Cours : 12h00 Travail personnel : 24h00 Durée totale: 56h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

1. Identify the different modes of heat transfer (conduction, convection, radiation) taking place in a thermal system.
2. Apply the physical laws governing the heat transfer in a multi-mode heat transfer system.
3. Solve the heat conduction equation for steady state and transient problems.
4. Use steady state conduction existing solution to study realistic engineering problems.
5. Use empirical relations to study thermal/fluid systems.
6. Identify the specific nature of thermal radiation and the radiative interactions at a real surface.

Contenu

• General introduction : fundamentals of heat transfer, heat transfer mechanisms, relationship to thermodynamics.
• Fundamentals of conduction : Heat conduction equation, Fourier's law, one-dimensional heat conduction equation solutions with/without heat generation, variable thermal conductivity, boundary and initial conditions.
• Steady heat conduction : heat conduction in plane walls, cylinder wall and spherical shell, thermal resistance concept, generalized thermal resistance network, thermal contact, critical radius of insulation, heat transfer from finned surfaces.
• Fundamentals of convection : physical mechanisms, hydrodynamic/thermal boundary layer equations, Nusselt and Prandtl numbers, boundary layer similarity, Reynolds analogy.
• External forced convection : laminar and turbulent flow, heat transfer correlations for the parallel flow over flat plates and the flow over cylinders and spheres, flow across tube banks.
• Internal forced convection : laminar and turbulent flow in tube, thermal entry length, general thermal analysis, log mean temperature difference, heat transfer correlations for circular/non-circular tubes.
• Introduction to radiation: spectral and directional distribution, solid angle, blackbody radiation, Stefan-Boltzmann law, emission from real surfaces, radiative properties (emissivity, absorptivity, transmittivity, reflectivity), Kirchoff's laws.

Prérequis

Thermodynamics, Fluid Mechanics

Bibliographie

Çengel, Y et al. (2019), “Heat and Mass Transfer: Fundamentals and Applications”, 6th Edn., McGraw Hill Higher Education.
Incropera, F.P. et al. (2017), “Incropera's Principles of Heat and Transfer”, Global Edn., John Wiley & Sons.

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	1, 2, 4, 5	25	Laboratory work: Practical insight through lab benchwork applications (linear heat conduction, forced convection over a flat plate, heat transfer from a fin)
2	1 - 4	30	Midterm exam of 90 mins: Fundamentals of heat transfer, heat conduction equation, steady heat conduction (thermal resistance network), heat tranfer from finned surfaces
3	1 - 6	45	Final exam of 2 hours: Heat tranfer from finned surfaces, fundamentals of convection, external and internal forced convection, radiation properties and processes
4		Written exam	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Mechanical Engineering 5
- Materials 2

Materials 2

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : SAYILAN Aslihan
Type d'EC : Cours	**Materials 2** (LIIEEng05EMaterials2)			
TD : 6h00 TP : 12h00 Cours : 6h00 Travail personnel : 20h00 Durée totale: 44h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

Upon completion of this course, the students are expected to:
1. Interpret the diffusion phenomenon .
2. Sketch a simple microstructure of an alloy.
3. Distinguish the differences between equilibrium and non-equilibrium cooling.
4. Analyze the cooling and heating curves.
5. Analyza the binary eutectic systems.

Contenu

1. Diffusion
• Mechanisms of Diffusion
• Diffusion Flux
• Factors of Diffusion
2. Phase Diagrams I
• Microstructure
• Equilibrium and Non-Equilibrium Cooling
3. Phase Diagrams II
• Binary Eutectic Systems
• Hypoeutectic and Hypereutectic
• Relative Amounts in the Micro-constituents
• Equilibrium and Non-Equilibrium Cooling of Binary Systems

Prérequis

Materials 1

Bibliographie

Essential textbooks:
Callister, W.D. (2020) Callister's Materials Science and Engineering, 10th Edn., John Wiley & Sons

Recommended textbooks:
Shackelford, J.F. (2022) Introduction to Materials Science for Engineers, 9th Edn., Pearson
Smith, W.F. & Hashemi, J. (2018) Foundations of Materials Science and Engineering, 6th Edn., McGraw Hill
Ashby, M.F. (2016) Materials Selection in Mechanical Design, 5th Edn., Butterworth-Heinemann

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	The final exam tests the students' understanding of the entire course, which includes: - Diffusion process - Phase Diagrams of metals - Microstructure of metals - Equilibrium and Non-Equilibrium Cooling - Binary Eutectic Systems	60	At the end of the course, there will be a final exam about all the concepts covered in the course. The exam consists of short questions as well as thorough analysis problems.
2	The students should learn how to: - measure the modulus of elasticity of polymers - measure the resilience of polymers - plot ana analyze the heating and cooling curves	30	The students will perform in the first part of the LAB work an impact and tensile test on different types of polymers in order to determine the mechanical properties of the materials (Practical work based on Materials 1 course). In the second part, students will heat an alloy in order to determine experimentally its heating and cooling curves. They will analyze the phase diagram of the alloy and represents its microstructure at different compositions. Students will be evaluated according to their LAB work as well as their comprehension and analysis.
3	Continuous Assessment	10	The students should expect a drop quiz in each session about the previous lesson.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Mechanical Engineering 5
- Strength of Materials

Strength of Materials

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : SAYILAN Aslihan
Type d'EC : Cours	**Strength of Materials** (LIIEEng05EStrengthMat)			
TD : 12h00 TP : 8h00 Cours : 12h00 Travail personnel : 24h00 Durée totale: 56h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

At the end of this module, students should be able to:
- Analyze structural systems to determine stresses, strains and stress concentration for axial, torsional and bending loads
- Build shear and moment diagrams for simple structures in 2 dimensions.
- Estimate the influence of internal forces on the deformation and analyze statically undeterminate systems
- Utilize a numerical simulation software for stress analysis (Ansys Structural)

Contenu

- Introduction: review of Statics and Solid Mechanics (stress and strain)

- Axial loads: stress concentrations, stresses due to temperature change, solutions of hyperstatic systems

- Torsional loads: torsion of shafts due to applied torques, design of transmission shafts, stress concentrations

- Analysis of beams under later loads: shear and moment diagrams

- Pure bending of beams: normal stresses, properties of cross-sections

- Deflection of beams: elastic curve equation, resolution of hyperstatic systems

Prérequis

Solid Mechanics
General Mechanics

Bibliographie

Essential textbooks:
Hibbeler, R. (2018) Mechanics of Materials, 10th Edn., Pearson Education
BeerF. et al. (2020) Mechanics of Materials, 8th Edn., McGraw Hill

Bibliographie

Recommended Textbooks:
Anand, L. et al. (2022) Introduction to Mechanics of Solid Materials, OUP Oxford
Raymond Parnes, "Solid Mechanics in Engineering",

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	0,3	1 mid-term at the mid-course about the topics covered in the first half of the course: Review of statics, axial loads, torsion, shear and moment diagrams
2	Written exam	0,45	Final exam about all the concepts covered in the course. The exam consists of short questions as well as thorough analysis problems.
3	Practical work	0,15	Use of commercial FEM software: Axial, bending and torsional loads.
4	Continuous Assessment	0,1	Quizzes, general behavior in class

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Multidisciplinary Project 5

Multidisciplinary Project 5

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module BRAILLY Elsa
Type de module : Unité d'Enseignement	**Multidisciplinary Project 5** (LIIEEng05UMultiProj5)		
Crédits (ECTS)	3		
Effectif maximum	250		
Durée totale : 32h00	Periode Semester 5	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Multidisciplinary Project 5
- Ecodesign Project Part 1 - Environment

Ecodesign Project Part 1 - Environment

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : TOURET Thomas
Type d'EC : Cours	**Ecodesign Project Part 1 - Environment** (LIIEEng05EEcoDesi1Envi)			
TD : 10h00 Cours : 5h00 Projet : 4h00 Travail personnel : 13h00 Durée totale: 32h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

The project is decomposed into 2 main phases:
- Semester 5: Technical and environmental analysis (Life Cycle Assessment - LCA) of an existing small household appliance
- Semester 6: On the basis of the results of the analysis, develop ecodesign proposals for the product, at 3 different levels

The 2 phases can be attended independently by the students even if it would be preferable to attend both.

Learning outcomes for S5:
1. Basic skills in LCA:
- Software modelling (Simapro): choice of data & methods
- Capacity to interpret LCA results
2. Generic knowledge on the environment and on evaluations of impacts
3. Practical skills (project): measurement of energy consumption, product dismantling, Bill of Materials building, bibliography & research to define the product life cycle scenario.

Learning outcomes for S6:
1. Capacity to switch from analysis to synthesis: define ecodesign strategies on the basis of the analysis (main environmental hot spots)
2. Capacity to develop 3 ecodesigned solutions that are technically viable

Contenu

The project contains 3 expected content types: courses & tutorials, project sessions (labs), and personal work.
Content of Semester 5: 1. Courses & tutorials: basics of environmental evaluation & LCA. - Courses topics: global environmental issues, impacts and indicators, life cycle thinking, environmental evaluation using LCA - Tutorials on Simapro 2. Project sessions (labs) supervised by the teacher. - Energy measurements: data acquisition using a data logger - Dismantling (tools available) and BoM definition - Life cycle modelling on Simapro 3. Personal work: information search, interpretation of LCA results.

Prérequis

To do Ecodesign Project Part 1 – Technical, and preferably but not mandatory, to do Ecodesign Project Part 2 – Environment, Ecodesign Project Part 2 – Technical (s6)

Bibliographie

Standards:
• ISO 14040-44 Environmental Management - Life cycle assessment. 2006.
• ISO/TR 14062 Environmental Management. 2002
• ISO 14020-25. Environmental labels and declarations. 2000
Online tools:
• Bilan Produit tool: http://www.base-impacts.ademe.fr/bilan-produit
• Ecodesign Pilot tool: http://pilot.ecodesign.at/pilot/ONLINE/ENGLISH/PDS/INDEX.HTM
Books and reports:
• IPCC. Climate Change 2007, Fourth Assessment report. 2007
• IPCC. Climate Change 2014, Fifth Assessment report, 2014
• Ashby, F. « Matériaux et environnement », Dunod, 2011
Online resources :
• http://www.mineralinfo.fr/page/matieres-premieres-critiques
• Online resources and publication from Jean-Marc Jancovici: https://jancovici.com/en/
• Online free MOOC on Waste management and Critical Raw Materials: https://www.edx.org/course/waste-management-and-critical-raw-materials

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written Report	15	Deliverable 1, evaluate the group on : - The use scenario definition - The uses drifts proposals -The elements regarding the tests procedures (evaluated in the technical part) -The elements regarding the Average Energy consumption (evaluated in the technical part)
2	Continuous Assessment	10	The continuous Assessment evaluate INDIVIDUALLY: -The presence in the differents modules -The involvement/commitment in the tutored sessions
3	Written Report	75	Deliverable 2, evaluate the group on the ability to make a LCA on their electronic device : - Definition of the functional unit and reference flow - Clear definition of the scope of the study - Life cycle inventory elaboration - results analysis and critical overview

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Multidisciplinary Project 5
- Ecodesign Project Part 1 - Technical

Ecodesign Project Part 1 - Technical

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : TOURET Thomas
Type d'EC : Cours	**Ecodesign Project Part 1 - Technical** (LIIEEng05EEcoDesi1Tech)			
Cours : 3h00 Projet : 10h00 Travail personnel : 11h00 Durée totale: 24h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

The project consists of 2 main phases:
- Semester 5: Technical and environmental analysis (Life Cycle Assessment - LCA) of an existing small household appliance
- Semester 6: On the basis of the results of the analysis, develop ecodesign proposals for the product, at 3 different levels

The 2 phases can be attended independently by the students even if it would be preferable to attend both.

Learning outcomes for S5:
1. Basic skills in LCA:
- Software modelling (Simapro): choice of data & methods
- Capacity to interpret LCA results
2. Generic knowledge on the environment and on evaluations of impacts
3. Practical skills (project): measurement of energy consumption, product dismantling, Bill of Materials building, bibliography & research to define the product life cycle scenario.

Learning outcomes for S6:
1. Capacity to switch from analysis to synthesis: define ecodesign strategies on the basis of the analysis (main environmental hot spots)
2. Capacity to develop 3 ecodesigned solutions that are technically viable

Contenu

The project contains 3 expected content types: courses & tutorials, project sessions (labs), and personal work.
For each semester, this projects represents ~40h of work on-site + 20h-30h of personal work. The total workload for each semester is estimated to 60- 70h/student.

Content of Semester 5:
1. Courses & tutorials: basics of environmental evaluation & LCA.
- Courses topics: global environmental issues, impacts and indicators, life cycle thinking, environmental evaluation using LCA
- Tutorials on Simapro
2. Project sessions (labs) supervised by the teacher.
- Energy measurements: data acquisition using a data logger
- Dismantling (tools available) and BoM definition
- Life cycle modelling on Simapro
3. Personal work: information search, interpretation of LCA results.

Prérequis

Preferably (not mandatory):
- Workshops Y1
- Introduction to project management (Y2)
- Multidisciplinary project (Y2)
- Introduction to Sustainable Development Y1 & Y2

Bibliographie

Standards:
• ISO 14040-44 Environmental Management - Life cycle assessment. 2006.
• ISO/TR 14062 Environmental Management. 2002
• ISO 14020-25. Environmental labels and declarations. 2000
Online tools:
• Bilan Produit tool: http://www.base-impacts.ademe.fr/bilan-produit
• Ecodesign Pilot tool: http://pilot.ecodesign.at/pilot/ONLINE/ENGLISH/PDS/INDEX.HTM
Books and reports:
• IPCC. Climate Change 2007, Fourth Assessment report. 2007
• IPCC. Climate Change 2014, Fifth Assessment report, 2014
• Ashby, F. « Matériaux et environnement », Dunod, 2011
Online resources :
• http://www.mineralinfo.fr/page/matieres-premieres-critiques
• Online resources and publication from Jean-Marc Jancovici: https://jancovici.com/en/
• Online free MOOC on Waste management and Critical Raw Materials: https://www.edx.org/course/waste-management-and-critical-raw-materials

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written Report	40	Deliverable 1 evaluate the GROUP on : -The elements regarding the Use scenarios (evaluated in the Environmental part) -The elements regarding the tests procedures -The elements regarding the Average Energy consumption
2	Written Report	50	Deliverable 2 evaluation the GROUP on : -The elements regarding system behavior analysis -The elements regarding the thechnical formalism of the behavior analysis (technological diagram) -The elemenst regarding the establishment of the bill of material of the studied product.
3	Continuous Assessment	10	The continuous Assessment evaluate INDIVIDUALLY: -The presence in the differents modules -The involvement/commitment in the tutored sessions

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Society, Management and Entrepreneurship 5

Society, Management and Entrepreneurship 5

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module MONAGHAN Erin
Type de module : Unité d'Enseignement	**Society, Management and Entrepreneurship 5** (LIIEEng05USociManaEntr5)		
Crédits (ECTS)	3		
Effectif maximum	250		
Durée totale : 56h00	Periode Semester 5	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Society, Management and Entrepreneurship 5
- Lv2 Mutualisée 1Er Semestre

Lv2 Mutualisée 1Er Semestre

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module :
Type d'EC : Cours	**Lv2 Mutualisée 1Er Semestre** (LIIAem-EEng01ELV2)			
Durée totale: 0h00	Statut	Periode Semester 5	Langue d'enseignement :	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Society, Management and Entrepreneurship 5
- Advanced English Skills 5

Advanced English Skills 5

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BLACK Claire
Type d'EC : Cours	**Advanced English Skills 5** (LIIEEng05EAdvEngSkills5)			
TP : 14h00 Travail personnel : 14h00 Durée totale: 28h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

Students will
Deepen their understanding of each element of the IELTS exam: Listening, Reading, Writing, Speaking.
Study exam techniques through example answers illustrating a bandscore 7 plus.
Gain a deeper understanding of the bandscore descriptors and their role in grading.
Recognise and implement IELTS targeted expressions
Recognise and implement IELTS-targeted vocabulary
Complete practice papers with teacher feedback
Complete an entire mock IELTS paper with teacher feedback
By the end of the module students should be aware of what each element of the IELTS test involves and which areas they need to work on further to reach the required bandscore 7.

Contenu

Introduction to test.
Mock Listening paper and feedback.
Mock Reading paper and feedback.
Introduction to Writing Tasks 1 and 2.
Sample papers
Full mock IELTS paper
Individual mock speaking tests (by student request).

Prérequis

B2 level of English

Bibliographie

Raymond Murphy - English Grammar in Use.
Official Cambridge Guide to the IELTS test - Cambridge English.
Official IELTS practice materials 1 - Cambridge ESOL.

Bibliographie

Official IELTS practice materials 2 - Cambridge ESOL.
Common mistakes at IELTS Advanced - Cambridge English.
www.ieltsliz.com

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Mock IELTS test Past papers	100	Class participation. Completion of classroom exam activities including submission of Task 1 and Task 2 writing papers. Mock IELTS test.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Society, Management and Entrepreneurship 5
- Engineering Ethics

Engineering Ethics

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MONAGHAN Erin
Type d'EC : Cours	**Engineering Ethics** (LIIEEng05EEngEthics)			
TD : 8h00 Cours : 4h00 Travail personnel : 4h00 Durée totale: 16h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

- Explain the obligations by engineers to society, to their clients, and to the profession.
- Distinguish the professional ethics required in specific sectors or job types.
- Apply theoretical concepts to case studies.

Contenu

The course will examine the development of Ethics as a social science and prepare students to approach decision making using coherent ethical frameworks. It helps students understand various moral principles and theories that guide human behavior. By encouraging critical thinking about complex moral issues and dilemmas, it provides tools for making ethical decisions in both personal and professional contexts. Additionally, it fosters awareness of different cultural perspectives on ethics, promoting personal growth by encouraging students to reflect on their own values and beliefs. Overall, the aim is to equip students with the knowledge and skills to navigate ethical challenges thoughtfully and responsibly.

Prérequis

none

Bibliographie

The Fundamentals of Ethics by Russ Shafer-Landau

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	1	• Explain the obligations by engineers to society, to their clients, and to the profession.

Évaluation(s)			
			• Distinguish the professional ethics required in specific sectors or job types. • Apply theoretical concepts to case studies.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Society, Management and Entrepreneurship 5
- French as a Foreign Language

French as a Foreign Language

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BLACK Claire,MARTIN Stephen
Type d'EC : Cours	**French as a Foreign Language** (LIIEEng05EFrenchForeignLang)			
TP : 21h00 Travail personnel : 18h00 Durée totale: 39h00	Statut	Periode Semester 5	Langue d'enseignement : French	

Acquis d'apprentissage

*Groups are organised by a placement test score so content and objectives vary according to students' different levels

Strengthen vocabulary
Acquire grammatical accuracy
Improve listening and reading comprehension skills
Improve oral expression and fluency
Introduction to culture, geopolitics or science and technology
Introduction to academic and working environment

Contenu

6 hour lessons every week : 4h face-to-face +2h guided autonomy
Expanded vocabulary
Introduction of grammar points
Improvement of phonological control

A1
Can establish basic social contact by using the simplest everyday polite forms of: greetings and farewells; introductions; saying please, thank you, sorry etc.

Prérequis

None

Bibliographie

*Teachers use extracts from textbooks and authentic documents such as online articles or videos

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	Continuous Assessment	100	*Objectives according to different CEFR level groups Minimum 2 skills of 4 are tested each semester

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Society, Management and Entrepreneurship 5
- Optional Foreign Language

Optional Foreign Language

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BLACK Claire,MARTIN Stephen
Type d'EC : Cours	**Optional Foreign Language** (LIIEEng05EOptionLanguage)			
TP : 21h00 Travail personnel : 18h00 Durée totale: 39h00	Statut	Periode Semester 5	Langue d'enseignement : German, Spanish, Italian	

Acquis d'apprentissage

*Groups are organised by level, so content and objectives vary according to students' different levels
Arabic, Chinese, French, Portuguese, German, Italian Russian, French Sign Language, Spanish

Strengthen vocabulary
Acquire grammatical accuracy
Improve listening and reading comprehension skills
Improve oral expression and fluency
Introduction to culture, geopolitics or science and technology
Introduction to academic and working environment

Language skills according to different level groups

Contenu

1.5 hour lessons every week.
Expanded vocabulary
Revision of grammar points
Improvement of phonological control

Prérequis

Groups are organised by level

Bibliographie

*Teachers use extracts from textbooks and authentic documents such as online articles or videos

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1		100	Continuous Assessment

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 5
- Society, Management and Entrepreneurship 5
- Professional Engineering Project

Professional Engineering Project

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MAGGIORE Manuel
Type d'EC : Cours	**Professional Engineering Project** (LIIEEng05EProEngProj)			
TD : 5h00 Durée totale: 5h00	Statut	Periode Semester 5	Langue d'enseignement : English	

Acquis d'apprentissage

Demonstrate understanding the professional environment through discussions about companies, their sectors of activity, and the professions of engineers.

Contenu

After a general presentation of the functioning of a company and the different professions that make it up, a presentation of the sectors of activity open to engineers will be discussed. The internship search techniques will then be presented (from the definition of your project to preparation for the interview). Students will thus be encouraged to develop their employability and understand the challenges of recruitment, and be able, as future managers, to recruit new employees.

Prérequis

None

Bibliographie

Getting a Job Abroad: The International Jobseekers' Directory by Roger Jones

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	1	Demonstrate understanding the professional environment through discussions about companies, their sectors of activity, and the professions of engineers.

Semester 6

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Control Engineering 6

Control Engineering 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module GHRAB Sonia
Type de module : Unité d'Enseignement	**Control Engineering 6** (LIIEEng06UContEng6)		
Crédits (ECTS)	6		
Effectif maximum	250		
Durée totale : 62h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Control Engineering 6
- Introduction to Control Theory

Introduction to Control Theory

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : GHRAB Sonia
Type d'EC : Cours	**Introduction to Control Theory** (LIIEEng06EContrTheo)			
TD : 10h00 TP : 8h00 Cours : 14h00 Travail personnel : 24h00 Durée totale: 56h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this module, students will be able to :
1. Determine the mathematical model of an LTI system : Mainly the use of differential equations and the application of the Laplace transform to find the transfer function
2. Apply the reduction block diagram rules to find the transfer function of a given LTI system
3. Describe and analyze the response of a first and a second order system
4. Evaluate the performances of a first and second order system
5. Identify the difference between Proportional, Integral , Derivative controllers or any combinaison of these three basic controllers
6. Understand the use of the aformentioned controllers, implement them (with respect to some specifications) on some real systems and interpret the obtained results

Contenu

1. Introduction to continuous Linear Time-Invariant (LTI) systems
2. Mathematical models of LTI systems
3. Block diagram and the reduction rules
4. Time-domain analysis of a first order system
5. Time domain analysis of a second order system
6. PID controllers for TLI systems

Prérequis

Electronic principles and technology (S2) : Kirshoff's circuit laws
Mathematics for engineers 1 and 2 (S1 & S2) : Partial fraction decomposition

Bibliographie

Ogata, K. (2010) Modern control engineering .Prentice Hall

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	Written exam	0,2	This written exam stands for a Midterm. The contents of the midterm will be defined according to the progress of the lectures and tutorials
2	Practical work	0,3	There are two lab sessions. Each Lab lasts 4 hours. The students will be evaluated on their effort during the lab and on the report they provide for each session
3	Written exam	0,5	The Final exam will take into account all the parts the student had seen during lectures, tutorials and labs

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Control Engineering 6
- Power Electronics

Power Electronics

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : GHRAB Sonia,MANNAH Marc Anthony
Type d'EC : Cours	**Power Electronics** (LIIEEng06EPowElect)			
TP : 8h00 Cours : 16h00 Travail personnel : 24h00 Durée totale: 48h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this module, students will be able to:
1. Identify the characteristics of power semiconductor diodes and be able to interpret their circuits.
2. Identify the characteristics of power transistors and thyristors.
3. Illustrate the operation of ac-dc diodes and controllable rectifiers
4. Recognise the filtering and PWM techniques.
5. Outline the characteristics and operation of DC-DC converters, DC-AC inverters and AC-AC controllers.
6. Describe the essence of operation of power converters: Switching techniques, various configurations, Performance analysis, and Load effect.
7. Describe the converter's behaviour in terms of frequency and harmonical content.
8. Demonstrate a high familiarity with the various configurations of inverters and their applications.
9. Design and Develop power electronics models

Contenu

This course introduces a comprehensive overview of different power electronics components and applications. It presents the basics of devices, their characteristics, their principle of operation, and their range of applications as well. The course also underlines the principle of operation of converters used in DC drives (diodes rectifiers, controlled rectifiers and choppers). It discusses the principle of harmonics, performance parameters and filtering techniques. Furthermore, upon completion of this course, the student will be able to outline the characteristics and operation principle of power AC drives (inverters and AC-AC controllers). Mainly full bridge and three phase circuits are highlighted. The effect of inductive loads and protection schemes are discussed as well. The student will understand and be able to describe switching techniques and conduct both performance and harmonical studies. The student will be able to demonstrate a certain familiarity with the various configurations and applications and to develop models and simulations.

o Introduction & Basics in Power Electronics: Purpose, History &Application, Devices & Circuits Characteristics, Ideal and Practical device, Semi-conductors basics
o Conversion Basics & Diodes Rectifiers : Conversion Circuits Types, Switching Sequence & Methodology, Protection, Performance Parameters, FW SP Diode Rectifier, FW 3P Diode Rectifier
o Controlled Rectifiers & DC/DC converters: FW SP Controlled Rectifier, FW 3P Controlled Rectifier,
o Introduction to DC-DC drives: Buck Converter, Boost Converter, Buck Regulator, Other topologies
o DC/AC Conversion: Introduction to AC Drives, SP Full Bridge Inverter, 3P Full Bridge Inverter

Prérequis

Prerequisites:
- Electronics 2
- Electrical Network
- Electric Machines

Bibliographie

Essential Resources:
Rashid, M., (2013), Power Electronics: circuits, devices and applications, 4th edition, [9780273769088], Pearson

Recommended Resources:
Mohan, N., Undeland, T., Robbins, W., (2002), Power Electronics: Converters, Applications, and Design, 3rd edition, [978-0-471-22693-2], Wiley
Chappell, P., (2014), Introduction to Power Electronics (Power Engineering), 1st Edition, [978-1608077199], AHP
Erickson, R., (2020), Fundamentals of Power Electronics, 3rd Edition, [978-3030438791], Springer
Pollefliet, J., (2017), Power Electronics: Switches and Converters, 1st Edition, [9780128146439], Academic Press

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	1. Identify the characteristics of power semiconductor diodes and be able to interpret their circuits. 2. Identify the characteristics of power transistors and thyristors. 3. Illustrate the operation of ac-dc diodes and controllable rectifiers 4. Recognise the filtering and PWM techniques. 5. Outline the characteristics and operation of DC-DC converters, DC-AC inverters and AC-AC controllers. 6. Describe the essence of operation of power converters: Switching techniques, various configurations, Performance analysis, and Load effect. 7. Describe the converter's behaviour in terms of frequency and harmonical content. 8. Demonstrate a high familiarity with the various	0,7	Students will be evaluated on the following abilities (in a 2 hours Final written exam): Understanding the operation of semi conductor devices, analyzing the operation of power electronics converters, evaluating their efficiency and the quality of the output signals, understanding the inductrial context and the various applications
2	3. Illustrate the operation of ac-dc diodes and controllable rectifiers 4. Recognise the filtering and PWM techniques. 5. Outline the characteristics and operation of DC-DC converters, DC-AC inverters and AC-AC controllers. 6. Describe the essence of operation of power converters: Switching techniques, various configurations, Performance analysis, and Load effect. 7. Describe the converter's behaviour in terms of frequency and harmonical content. 8. Demonstrate a high familiarity with the various configurations of inverters and their applications. 9. Design and Develop power electronics models	0,3	Students will be evaluated based on two hands on sessions (each of 4 hours, evaluated on spot and via report), where they will be exposed to different simulation software. In the first part of each session they will be introduced to the software and the circuits, whereas in the second part, they will be working on their own. The overall purpose is for students to be able to design and simulate power electronics circuits, analyze the time and the frequency domains and evaluate the effectiveness of the energy conversion

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Industrial Engineering and Supply Chain Management 6

Industrial Engineering and Supply Chain Management 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module MARCONNET Bertrand
Type de module : Unité d'Enseignement	**Industrial Engineering and Supply Chain Management 6** (LIIEEng06UInduEngSuppChainMngt6)		
Crédits (ECTS)	8		
Effectif maximum	250		
Durée totale : 88h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Industrial Engineering and Supply Chain Management 6
- Industrial Engineering and Project Management

Industrial Engineering and Project Management

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MARCONNET Bertrand
Type d'EC : Cours	**Industrial Engineering and Project Management** (LIIEEng06EIndEngProjMgmnt)			
TD : 22h00 Cours : 8h00 Projet : 10h00 Travail personnel : 12h00 Durée totale: 52h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

- Define the specifications to implement a factory
- Define and design a production line
- Identify the structure of a product and redesign it
- Determine the interest and challenges of managing documents within a company
- Explain the structure of a document
- Manage versions and validations flow of documents within a team
- Recognise the different assembly techniques, the different types of plant
- Apply an industrial example with the design of an assembly line
- Work by team and build a prototype
- Make out the challenges of maintenance - Deepening the TPM (Total Productive Maintenance)
- Remind and explain the functional specifications
- Create a routing sheet and communicate with the production team
- Raising awareness of the impact of digital technology with the Digital Collage

Contenu

- To study process flows before implementation of a manufacturing plant
- Workstation analysis, determination and optimization of times
- Design, methods and tools for industrialization
- Exploring the challenges facing Total Productive Maintenance
- Total Productive Maintenance - TPM :

Reliability functions, probability density functions. Serie and Parallele systems Failure rate, MTTF (Mean Time To Failure), MTBF (Mean Time Between Failure), MTTR (Mean Time To Repair)

- Analysis & specifications of product
- (Re)Designing a product with Creo Parametric
- Being able to define standard documents
- To understand the types and levels of maintenance
- Establish a simple version of the maintenance plan
- Flow simulation with FLEXSIM

Bibliographie

S. N. Chapman, J. R. Tony Arnold, A. K. Gatewood, and L. M. Clive, « Introduction to Materials Management », 8th edition, 2017.
G. Baglin, O. Bruel, L. Kerbache, J. Nehme, and C. van Delft, “Management Industriel et Logistique - Concevoir et piloter la Supply Chain - 6ème

Bibliographie

édition", 2013.
A. Perrot, P. Villemus, "La boite à outils de la Supply Chain", 2019.
A. Marchal et al., "Supply Chain Management – Logistique Globale", 2ème edition, 2018.
APICS dictionary, 3rd edition, 2008.
A. Rushton, P. Croucher, and P. Beker, "The Handbook of Logistics and Distribution Management", 5th edition, 2014.
C. A. Ptak, CFPIM, CIRM, and C. J. Smith., "Orlicky's Material Requirements Planning", 3rd edition
K. E. Kurbel, « Enterprise Resource Planning and Supply Chain Management – Functions, Business Processes and Software for Manufacturing Companies », 2013

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1		20	Continuous Assessment
2		50	Written exam
3		30	Oral exam
4		Written exam	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Industrial Engineering and Supply Chain Management 6
- Introduction to Supply Chain Management

Introduction to Supply Chain Management

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MARCONNET Bertrand
Type d'EC : Cours	**Introduction to Supply Chain Management** (LIIEEng06EIntroIndSupplyProjManag)			
TD : 12h00 Cours : 12h00 Projet : 4h00 Travail personnel : 12h00 Durée totale: 40h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

The student will be able to manage an industrial project and to learn how to identify problems and know how to solve them

Contenu

- Ergonomy, Health and Security at work
- Inventory Management: Define and manage the economic quantity, the safety stock and the stock classification
- Approach of Inventory Management
- Knowledge in Financial Management in industries

Bibliographie

S. N. Chapman, J. R. Tony Arnold, A. K. Gatewood, and L. M. Clive, « Introduction to Materials Management », 8th edition, 2017.
G. Baglin, O. Bruel, L. Kerbache, J. Nehme, and C. van Delft, “Management Industriel et Logistique - Concevoir et piloter la Supply Chain - 6ème édition”, 2013.
A. Perrot, P. Villemus, “La boite à outils de la Supply Chain”, 2019.
A. Marchal et al., “Supply Chain Management – Logistique Globale”, 2ème edition, 2018.
APICS dictionary, 3rd edition, 2008.
A. Rushton, P. Croucher, and P. Beker, “The Handbook of Logistics and Distribution Management”, 5th edition, 2014.
C. A. Ptak, CFPIM, CIRM, and C. J. Smith., “Orlicky’s Material Requirements Planning”, 3rd edition
K. E. Kurbel, « Enterprise Resource Planning and Supply Chain Management – Functions, Business Processes and Software for Manufacturing Companies », 2013

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1		20	Continuous Assessment

Évaluation(s)			
2		40	Written Report
3		40	Oral Presentation

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Industrial Engineering and Supply Chain Management 6
- The Fresh Connection

The Fresh Connection

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : COUROUGE Olivier
Type d'EC : Cours	**The Fresh Connection** (LIIEEng06ETheFreshConnection)			
TD : 16h00 Cours : 4h00 Travail personnel : 16h00 Durée totale: 36h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

The student will be able to manage an industrial project and to learn how to identify problems and know how to solve them

Contenu

- The Fresh Connection: serious game in a web-based simulation

Bibliographie

S. N. Chapman, J. R. Tony Arnold, A. K. Gatewood, and L. M. Clive, « Introduction to Materials Management », 8th edition, 2017.
G. Baglin, O. Bruel, L. Kerbache, J. Nehme, and C. van Delft, “Management Industriel et Logistique - Concevoir et piloter la Supply Chain - 6ème édition”, 2013.
A. Perrot, P. Villemus, “La boite à outils de la Supply Chain”, 2019.
A. Marchal et al., “Supply Chain Management – Logistique Globale”, 2ème edition, 2018.
APICS dictionary, 3rd edition, 2008.
A. Rushton, P. Croucher, and P. Beker, “The Handbook of Logistics and Distribution Management”, 5th edition, 2014.
C. A. Ptak, CFPIM, CIRM, and C. J. Smith., “Orlicky’s Material Requirements Planning”, 3rd edition
K. E. Kurbel, « Enterprise Resource Planning and Supply Chain Management – Functions, Business Processes and Software for Manufacturing Companies », 2013

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1		100	Continuous Assessment
2			

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Mathematics for Engineering 6

Mathematics for Engineering 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module BITAR Diala
Type de module : Unité d'Enseignement	**Mathematics for Engineering 6** (LIIEEng06UMathEng6)		
Crédits (ECTS)	6		
Effectif maximum	250		
Durée totale : 66h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Mathematics for Engineering 6
- Object-Oriented Programming

Object-Oriented Programming

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**	Responsable(s) Module : BITAR Diala,NERON Francois
Type d'EC : Cours	**Object-Oriented Programming** (LIIEEng06EObjProg)	

TD : 4h00 TP : 12h00 Cours : 6h00 Projet : 8h00 Travail personnel : 18h00 Durée totale: 48h00	Statut	Periode Semester 6	Langue d'enseignement : English

Acquis d'apprentissage

Go beyond the basics of programming to understand object-oriented methodology, the approach to modular and reusable software systems.

Contenu

Basics of Java
Introduction to Object Oriented Programming
Classes and Methods
Inheritance
Standard Library of Java

Prérequis

Introduction To Algorithmic And Computer Programming
Computer Programming 2

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1		100	Project

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Mathematics for Engineering 6
- Probabilities and Inferential Statistics

Probabilities and Inferential Statistics

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : AUDREN Loïc,BITAR Diala,DAVAL Gauthier
Type d'EC : Cours	**Probabilities and Inferential Statistics** (LIIEEng06EProbaStat)			
TD : 16h00 Cours : 16h00 Travail personnel : 32h00 Durée totale: 64h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

- To be able to calculate and interpret descriptive statistics of samples and populations

- To demonstrate an understanding of random variables and their use applied to certain standard probability distributions (Binomial, Poisson and Normal)

- To demonstrate an understanding of the theory behind common statistical inference techniques and apply parametric hypothesis tests as appropriate

- To be able to implement on a professional software (MINITAB), a complete statistical analysis

Contenu

Introduction to statistics and probability - Graphical Tools to represent data
Meaningful Values
Probability Theory
Common Discrete and Continuous Probability Distributions
Convergence Theorems
Sampling
Estimations and Confidence intervals
Statistical Tests
Comparison of Normal Distributions
Normality Assumption checking
Homogeneity of a population: ANOVA
Chi-Square test
Correlation and linear regression

Prérequis

None

Bibliographie
Course Lecture Notes

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	Written exam	0,25	exam
2	Written Report	0,25	Reports
3	Written exam	0,50	exam

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Mechanical Engineering 6

Mechanical Engineering 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module ANKOUNI Mouhamad
Type de module : Unité d'Enseignement	**Mechanical Engineering 6** (LIIEEng06UMechaEng6)		
Crédits (ECTS)	8		
Effectif maximum	250		
Durée totale : 88h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Mechanical Engineering 6
- Advanced Heat Transfer

Advanced Heat Transfer

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : ANKOUNI Mouhamad
Type d'EC : Cours	**Advanced Heat Transfer** (LIIEEng06EAdvHeatTransfMecha)			
TD : 12h00 Cours : 12h00 Travail personnel : 24h00 Durée totale: 48h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

1) To extend the basic knowledge acquired in the introduction to heat transfer course and relate it to more advanced/practical application.
2) To identify the relevance of numerical methods in solving multidimensional and transient heat conduction problems.
3) To acquire a better insight into convection heat transfer mechanisms such as natural convection and boiling/condensation heat transfer.
4) To acquire essential knowledge for the design and sizing of a heat exchanger, which is one the most practical and interesting application of heat transfer.
5) To develop some understanding of radiation exchange between mulitple surfaces, which is a primary quantity of interest in most radiation problem.

Contenu

12 hours (lecture), 12 hours (tutorial)
- Steady Heat conduction : heat transfer in common configuration, conduction shape factors.
- Transient conduction : lumped system analysis, Biot number, transient heat conduction in large plane walls, long cylinders, and spheres with spatial effects, transient heat conduction in semi-infinite solids.
- Numerical methods in heat conduction : finite difference formulation of differential equations, two-dimensional steady heat conduction.
- Natural convection : physical mechanisms, equation of motion and the grashof number, natural convection over surfaces, natural convection inside enclosures, combined natural and forced convection.
- Boiling and condensation : boiling heat transfer, pool Boiling, flow boiling, condensation heat transfer, film condensation, dropwise condensation
- Heat exchangers : heat exchanger types, overall heat transfer coefficient, the log mean temperature difference, the effectiveness-NTU method, heat exchanger design and performance calculations.
- Radiation heat transfer : the view factor, view factor relations, black surfaces, diffuse and gray surfaces, radiation shields and the radiation effect.

Prérequis

Introduction to Heat Transfer

Bibliographie

Y. Çengel, “Heat and Mass Transfer, A practical approach”, 3nd Ed, McGraw Hill Higher Eduction.

Bibliographie

F.P. Incropera and D.P. DeWitt, “Fundamentals of Mass and Heat Transfer”, 6th/7th Ed, John Wiley.
J. P. Holman, “Heat Transfer”, 7th Ed., McGraw-Hill, 1990.

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	1, 2, 3	0,4	Mid-term exam: Multi-dimensional and Transient Conduction Free/Natural Convection
2	1, 3, 4, 5	0,6	Final exam: Free/Natural Convection Boiling and Condensation Heat Exchanger Radiation Exchange between Surfaces

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Mechanical Engineering 6
- Hydraulics

Hydraulics

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : ANKOUNI Mouhamad
Type d'EC : Cours	**Hydraulics** (LIIEEng06EHydrMecha)			
TD : 12h00 Cours : 12h00 Travail personnel : 20h00 Durée totale: 74h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

1.To compute minor and major head losses in piping systems/hydraulic network (system head).
2.To evaluate dynamic pumps performance using measured pump performance curves.
3.To match a pump characteristic to a hydraulic network characteristic.
4.To select an appropriate type and size of a dynamic pump for a specific application (use of specific speed).
5.To predict pump performance or to adapt pump operation using similarity rules.
6.To develop a fundamental and practical understanding of hydraulic power systems.
7.To evaluate the performance of positive displacement pumps.
8.To design a hydraulic circuit for a specific hydraulic power application.

Contenu

- Hydraulic networks: fundamentals of fluid flow in pipes, major and minor and head loss, system head, branches in parallel and series.
- Pumping systems: classification of pumps, operation of dynamic pumps, pump main parameters, pump performance curves, pumps combined in series and parallel, matching a pump to a piping system, cavitation and net positive-suction head, dimensionless pump performance, similarity rules, specific speed, adaptation of operating conditions.
- Hydraulic power systems: Fundamentals of Hydraulic Power Transmission, hydraulic power generation, positive displacement pumps (design and performance), hydraulic power distribution (hydraulic valves: types, design and function), hydraulic power deployment (hydraulic cylinders, hydraulic motors, hydrostatic transmission), hydraulic circuits.

Prérequis

Fluid Mechanics

Bibliographie

- Cengel, Y., & Cimbala, J. M. (2014), Fluid mechanics: Fundamentals and applications, 3th ed., McGraw-Hill Education.
- White F. (2016), Fluid Mechanics, 8th ed, McGraw- Hill.
- Zhang Q. (2018), Basics of Hydraulic Systems, 2nd ed., CRC Press.
- Esposito A. (2014), Fluid Power with Applications, 7th ed., Pearson Education Limited.

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	1, 2, 3	0,4	Midterm exam of 1h 30 mins: Hydraulic networks Pumping systems
2	1 to 8	0,6	Final exam: Hydraulic networks Pumping systems Hydraulic power systems

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Mechanical Engineering 6
- Materials 3

Materials 3

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : ANKOUNI Mouhamad,NKOU BOUALA Galy Ingrid
Type d'EC : Cours	**Materials 3** (LIIEEng06EMaterials3)			
TD : 10h00 TP : 16h00 Cours : 10h00 Travail personnel : 40h00 Durée totale: 76h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

Upon completion of this course, the students are expected to:
1. Apply heat treatment to steel and aluminum alloys.
2. Predict the microstructures and phases which occur in in steel and aluminum alloys during heat treatment.
3. Predict the forms of corrosion and decide how to prevent it.

Contenu

1. Introduction to Phase Transformation
• Processes and Types of Phase Transformation
• Types of Nucleation
• Phase Transformation Rate
2. Part 1: Heat Treatment
• Equilibrium and Non-equilibrium States
• Eutectoid, Hypereutectoid and Hypoeutectoid Points
• Martensite Transformation
3. Part 2: Heat Treatment
• Mechanical Properties of Martensite
• Tempering of Steel Alloys
• Continuous Cooling Transformation Diagrams
4. Structural Hardening of Aluminum
• Equilibrium Diagram of Aluminum Alloys
• Heat Treatments of Aluminum Alloys
5. Corrosion
• Redox Reactions
• Types of Corrosion
• Methods for Corrosion Prevention

Prérequis

Materials 2

Bibliographie

Essential resources:
Not required

Recommended resources:
Materials Science and Engineering, An Introduction, W.D. Callister.
Materials Selection in Mechanical Design, M.F. Ashby.

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	In this midterm, the students will be evaluated in the following topics: - Phase Transformation - Heat Treatment of Metals - Martensite Transformation - Tempering of Steel Alloys	0,3	Students will have a mid-term at the mid-course about the topics covered in the first half of the course.
2	The final exam tests the students' understanding of the entire course, which includes: - Phase Transformation - Heat Treatment of Metals - Martensite Transformation - Tempering of Steel Alloys - Structural Hardening of Aluminum - Corrosion	0,45	At the end of the course, there will be a final exam about all the concepts covered in the course and the Laboratory sessions. The exam consists of short questions as well as thorough analysis problems.
3	The continuous assessment evaluates the students' understanding after each session, which determines whether the goals of education are being met.	0,15	Students will perform a heat treatment for steel and aluminum alloys. They will also test the impact and resilience of each alloy. They will observe their microstructure. Students will also perform a corrosion test on some materials. Students will be graded on their performance and analysis of the LAB work.
4	Continuous Assessment	0,1	The students should expect a drop quiz in each session about the previous lesson. The students will be assigned to read research articles about several tribological systems and then, present the state of art. Students will be graded on their ability to analyze the topic as well as to correlate what they learned in the course to the research.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Multidisciplinary Project 6

Multidisciplinary Project 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module BRAILLY Elsa
Type de module : Unité d'Enseignement	**Multidisciplinary Project 6** (LIIEEng06UMultiProj6)		
Crédits (ECTS)	3		
Effectif maximum	250		
Durée totale : 28h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Multidisciplinary Project 6
- Ecodesign Project Part 2 - Environment

Ecodesign Project Part 2 - Environment

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BRAILLY Elsa
Type d'EC : Cours	**Ecodesign Project Part 2 - Environment** (LIIEEng06EEcoDesign2Environment)			
TD : 4h00 Cours : 3h00 Projet : 8h00 Travail personnel : 8h00 Durée totale: 31h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

The project is decomposed into 2 main phases:
- Semester 5: Technical and environmental analysis (Life Cycle Assessment - LCA) of an existing small household appliance
- Semester 6: On the basis of the results of the analysis, develop ecodesign proposals for the product, at 3 different levels

The 2 phases can be attended independently by the students even if it would be preferable to attend both.

Learning outcomes for S5:
1. Basic skills in LCA:
- Software modelling (Simapro): choice of data & methods
- Capacity to interpret LCA results
2. Generic knowledge on the environment and on evaluations of impacts
3. Practical skills (project): measurement of energy consumption, product dismantling, Bill of Materials building, bibliography & research to define the product life cycle scenario.

Learning outcomes for S6:
1. Capacity to switch from analysis to synthesis: define ecodesign strategies on the basis of the analysis (main environmental hot spots)
2. Capacity to develop 3 ecodesigned solutions that are technically viable

Contenu

The project contains 3 expected content types: courses & tutorials, project sessions (labs), and personal work.
For each semester, this projects represents ~40h of work on-site + 20h-30h of personal work. The total workload for each semester is estimated to 60- 70h/student.

Content of semester 6:
1. Courses & tutorials: Ecodesign approaches and strategies.
- Courses topics: Ecodesign regulations & strategies, Materials & environment, Design for Sustainable behaviour, Thermal insulation & downsizing, Ecodesign of packaging, design for End-of-life, Innovation for ecodesign.
- Tutorials: CES EduPack (choice of materials), Simapro, CREO (CAD modelling)
2. Project sessions (labs) supervised by the teacher: Developing 3 levels of ecodesigned solutions
- Solutions developments: calculations, CAD modelling, LCA modelling of the 3 levels
3. Personal work: information search, interpretation of LCA results.

Prérequis

Preferably (not mandatory):
- PART 1 of the Ecodesign project
- Workshops Y1
- Introduction to project management (Y2)
- Multidisciplinary project (Y2)
- Introduction to Sustainable Development Y1 & Y2

Bibliographie

Standards:
• ISO 14040-44 Environmental Management - Life cycle assessment. 2006.
• ISO/TR 14062 Environmental Management. 2002
• ISO 14020-25. Environmental labels and declarations. 2000
Online tools:
• Bilan Produit tool: http://www.base-impacts.ademe.fr/bilan-produit
• Ecodesign Pilot tool: http://pilot.ecodesign.at/pilot/ONLINE/ENGLISH/PDS/INDEX.HTM
Books and reports:
• IPCC. Climate Change 2007, Fourth Assessment report. 2007
• IPCC. Climate Change 2014, Fifth Assessment report, 2014
• Ashby, F. « Matériaux et environnement », Dunod, 2011
Online resources :
• http://www.mineralinfo.fr/page/matieres-premieres-critiques
• Online resources and publication from Jean-Marc Jancovici: https://jancovici.com/en/
• Online free MOOC on Waste management and Critical Raw Materials: https://www.edx.org/course/waste-management-and-critical-raw-materials

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	0,90	Deliverables are common between technical and environmental parts, but they are both evaluated for 50% and 50%. Evaluation of S6 is decomposed as follows: - WRITTEN EVALUATION -WE (80% of Final Grade) - D1 (20% of WE): Level 1 of ecodesign - Changing materials and comparative LCA - D2 (30% of WE): Level 2 of ecodesign - Optimizing product performance and comparative LCA - D3 (50% of WE): Level 3 of ecodesign - Innovative and functional redesign and comparative LCA - ORAL EVALUATION (20% of Final Grade): Oral presentation (10 min + 10 min questions) - BONUS/MALUS: +/- 1 point on the Final grade: involvement, attendance, behaviour
2	Written exam	0,10	MCQ

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Multidisciplinary Project 6
- Ecodesign Project Part 2 - Technical

Ecodesign Project Part 2 - Technical

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BRAILLY Elsa,TOURET Thomas
Type d'EC : Cours	**Ecodesign Project Part 2 - Technical** (LIIEEng06EEcoDesign2Technical)			
TD : 2h00 Cours : 3h00 Projet : 8h00 Travail personnel : 4h00 Durée totale: 25h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

The project is decomposed into 2 main phases:
- Semester 5: Technical and environmental analysis (Life Cycle Assessment - LCA) of an existing small household appliance
- Semester 6: On the basis of the results of the analysis, develop ecodesign proposals for the product, at 3 different levels

The 2 phases can be attended independently by the students even if it would be preferable to attend both.

Learning outcomes for S5:
1. Basic skills in LCA:
- Software modelling (Simapro): choice of data & methods
- Capacity to interpret LCA results
2. Generic knowledge on the environment and on evaluations of impacts
3. Practical skills (project): measurement of energy consumption, product dismantling, Bill of Materials building, bibliography & research to define the product life cycle scenario.

Learning outcomes for S6:
1. Capacity to switch from analysis to synthesis: define ecodesign strategies on the basis of the analysis (main environmental hot spots)
2. Capacity to develop 3 ecodesigned solutions that are technically viable

Contenu

The project contains 3 expected content types: courses & tutorials, project sessions (labs), and personal work.
For each semester, this projects represents ~40h of work on-site + 20h-30h of personal work. The total workload for each semester is estimated to 60- 70h/student.

Content of semester 6:
1. Courses & tutorials: Ecodesign approaches and strategies.
- Courses topics: Ecodesign regulations & strategies, Materials & environment, Design for Sustainable behaviour, Thermal insulation & downsizing, Ecodesign of packaging, design for End-of-life, Innovation for ecodesign.
- Tutorials: CES EduPack (choice of materials), Simapro, CREO (CAD modelling)
2. Project sessions (labs) supervised by the teacher: Developing 3 levels of ecodesigned solutions
- Solutions developments: calculations, CAD modelling, LCA modelling of the 3 levels
3. Personal work: information search, interpretation of LCA results.

Prérequis

Preferably (not mandatory):
- PART 1 of the Ecodesign project
- Workshops Y1
- Introduction to project management (Y2)
- Multidisciplinary project (Y2)
- Introduction to Sustainable Development Y1 & Y2

Bibliographie

Standards:
• ISO 14040-44 Environmental Management - Life cycle assessment. 2006.
• ISO/TR 14062 Environmental Management. 2002
• ISO 14020-25. Environmental labels and declarations. 2000
Online tools:
• Bilan Produit tool: http://www.base-impacts.ademe.fr/bilan-produit
• Ecodesign Pilot tool: http://pilot.ecodesign.at/pilot/ONLINE/ENGLISH/PDS/INDEX.HTM
Books and reports:
• IPCC. Climate Change 2007, Fourth Assessment report. 2007
• IPCC. Climate Change 2014, Fifth Assessment report, 2014
• Ashby, F. « Matériaux et environnement », Dunod, 2011
Online resources :
• http://www.mineralinfo.fr/page/matieres-premieres-critiques
• Online resources and publication from Jean-Marc Jancovici: https://jancovici.com/en/
• Online free MOOC on Waste management and Critical Raw Materials: https://www.edx.org/course/waste-management-and-critical-raw-materials

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written Report	45	written Report 2 Deliverables are common between technical and environmental parts, but they are both evaluated for 50% and 50%. Evaluation of S6 is decomposed as follows: - WRITTEN EVALUATION -WE (80% of Final Grade) - D1 (20% of WE): Level 1 of ecodesign - Changing materials and comparative LCA - D2 (30% of WE): Level 2 of ecodesign - Optimizing product performance and comparative LCA - D3 (50% of WE): Level 3 of ecodesign - Innovative and functional redesign and comparative LCA - ORAL EVALUATION (20% of Final Grade): Oral presentation (10 min + 10 min questions) - BONUS/MALUS: +/- 1 point on the Final grade: involvement, attendance, behaviour
2	Written Report	15	Written Report 1
3		15	Continuous Assessment
4		25	Oral exam

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Robotics and Automation Engineering 6

Robotics and Automation Engineering 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module GIBERT Guillaume
Type de module : Unité d'Enseignement	**Robotics and Automation Engineering 6** (LIIEEng06URoboAutoEng6)		
Crédits (ECTS)	8		
Effectif maximum	250		
Durée totale : 88h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Robotics and Automation Engineering 6
- Introduction to Robotics

Introduction to Robotics

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : GIBERT Guillaume
Type d'EC : Cours	**Introduction to Robotics** (LIIEEng06EIntoRobotics)			
TD : 12h00 TP : 8h00 Cours : 12h00 Travail personnel : 22h00 Durée totale: 54h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this course, students will be able to:
1. Define robotics and its various fields
2. Face the difficulty of hardware programming
3. State a problem, read and write technical specifications
4. Compute Forward, Inverse and Differential Kinematics for simple robotic systems
5. Compute motion planning for mobile robots
6. Program mobile robot kinematics and autonomous behavior with sensors interactions
7. Program robot arm kinematics
8. Develop good programming practices (documentation, test, git/gitflow)

Contenu

-Introduction to robotic systems and controllers
-Robots in their contexts
-Mechanical structures: serial and parallel robots, mobile robots
-Forward, Inverse and Differential Kinematics for Robot Arm
-Differential Drive robots
-Motion planning for mobile robot (Dijkstra, A*)
-Practical introduction to robot programming (mBot, poppy)

Prérequis

-Mathematics for engineers 1
-Mathematics for engineers 2
-Mathematics for engineers 3
-Mathematics for engineers 4
-Mathematics for engineers 5
-Computer programming
-Object-oriented programming
-Simulation and numerical calculation 1

Prérequis

-Simulation and numerical calculation 2
-Electronics 1 – Components and technology
-Electronics 2 – Functions and applications
-Digital design and embedded software 1
-Digital design and embedded software 2

Bibliographie

Essential resources: None
Recommended resources:
Corke P. (2011) Robotics, Vision and Control. Springer Tracts in Advanced Robotics, vol 73. Springer, Berlin, Heidelberg.
https://doi.org/10.1007/978-3-642-20144-8_15

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	1, 2, 3, 4, 8	0,3	Observable objectives: mid-term exam in which students will be evaluated on their ability to analyze the kinematics of a simple robotic system.
2	6, 7, 8	0,3	Observable objectives: labs in which students will be evaluated on their ability to program robot arms and mobile robots using good coding practices.
3	Written exam	0,4	Observable objectives: final exam in which students will be evaluated on their ability to analyze the kinematics of a simple robotic system and on motion planning for simple mobile robots.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Robotics and Automation Engineering 6
- Sensing & Perception

Sensing & Perception

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : GIBERT Guillaume
Type d'EC : Cours	**Sensing & Perception** (LIIEEng06ESensPerc)			
TD : 4h00 TP : 12h00 Cours : 8h00 Travail personnel : 12h00 Durée totale: 36h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this course, students will be able to:
1. Understand the physics and functioning of various sensors used in robotics
2. List all the elements of the Data Acquisition Chain and their features
3. Acquire the know-how for characterizing and calibrating sensors
4. Acquire the methodology to dimensioning sensors for specific applications
5. Apply knowledge in signal processing and statistics to robotic contexts
6. Create a Data Acquisition Chain from scratch
7. Program a microcontroller to sample data accurately
8. Learn the basics of image processing
9. Develop good programming practices (documentation, test, git/gitflow)

Contenu

-Inertial sensors, GPS and odometry / sonar sensing / vision, bio-inspired sensors, force sensors
-Transformation of information into electric properties and its implication
-Signal conditioning
-ADC: sampling, quantization, windowing
-MCU: Application of data acquisition, data analysis, data processing
-Introduction to image processing

Prérequis

-Metrology
-Computer programming
-Object-oriented programming
-Simulation and numerical calculation 1
-Simulation and numerical calculation 2
-Electronics 1 – Components and technology
-Electronics 2 – Functions and applications
-Digital design and embedded software 1
-Digital design and embedded software 2
-Signal processing

Bibliographie

Essential resources: None
Recommended resources:
Handbook of Modern Sensors, Fraden J., AIP Press, Springer
Corke P. (2011) Image Processing. In: Robotics, Vision and Control. Springer Tracts in Advanced Robotics, vol 73. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-20144-8_12

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	6, 7, 8, 9	0,3	Observable objectives: labs in which students will be evaluated on their ability to define and implement the components of a Data Acquisition Chain, to program a microcontroller and to program an image processing application using good coding practices.
2	1, 2, 3, 4, 5, 9	0,3	Observable objectives: mid-term exam in which students will be evaluated on their ability to analyze a Data Acquisition Chain and all its components from the physical quantity to processing performed on the MCU.
3	Written exam	0,4	Observable objectives: final exam in which students will be evaluated on their ability to analyze a Data Acquisition Chain and all its components and to apply image processing techniques to gray/color images.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Robotics and Automation Engineering 6
- Signal Processing + Wireless Communications

Signal Processing + Wireless Communications

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : GIBERT Guillaume
Type d'EC : Cours	**Signal Processing + Wireless Communications** (LIIEEng06ESigProcess)			
TD : 12h00 TP : 8h00 Cours : 12h00 Travail personnel : 24h00 Durée totale: 56h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this course, students will be able to:
1. Acquire the fundamentals features of signal
2. Perform a spectral analysis of a signal
3. Estimate the filter coefficients from filtering specifications
4. Analyze the stability of filters
5. Analyze random signals with temporal and spectral methods
6. Apply and analyse time-frequency to any signal
7. Learn image processing techniques and apply them
8. Develop good programming practices (documentation, test, git/gitflow)

Contenu

-Signals: general properties and transformations (convolution…)
-Spectral analysis (DFT, FFT…)
-Sampling
-Signals and systems (stability, causality…)
-Filters (FIR, IIR)
-Random signals (autocorrelation, intercorrelation…)
-Time-frequency analysis
-Image processing

Prérequis

-Mathematics for engineers 1
-Mathematics for engineers 2
-Mathematics for engineers 3
-Mathematics for engineers 4
-Mathematics for engineers 5
-Metrology
-Computer programming
-Object-oriented programming
-Simulation and numerical calculation 1

Prérequis

-Simulation and numerical calculation 2
-Electronics 1 – Components and technology
-Electronics 2 – Functions and applications
-Digital design and embedded software 1
-Digital design and embedded software 2

Bibliographie

Essential resources: None
Recommended resources:
Digital Processing of Signals: Theory and Practice, 3rd Edition

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	1, 2, 3, 4, 5, 6, 7	0,3	Observable objectives: mid-term exam in which students will be evaluated on their ability to analyze unknow signals and systems by applying temporal or spectral techniques.
2	1, 2, 3, 4, 5, 6, 7, 8	0,3	Observable objectives: labs in which students will be evaluated on their ability to define and implement signal/image processing techniques to analyze unknown signals using good coding practices.
3	Written exam	0,4	Observable objectives: final exam in which students will be evaluated on their ability to analyze unknow signals, images and systems by applying temporal or spectral techniques.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Society, Management and Entrepreneurship 6

Society, Management and Entrepreneurship 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module MONAGHAN Erin
Type de module : Unité d'Enseignement	**Society, Management and Entrepreneurship 6** (LIIEEng06USociManaEntr6)		
Crédits (ECTS)	4		
Effectif maximum	250		
Durée totale : 72h00	Periode Semester 6	Langue d'enseignement :	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Society, Management and Entrepreneurship 6
- Advanced English Skills 6

Advanced English Skills 6

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BLACK Claire,BUSSELL Frances,MURPHY Elizabeth
Type d'EC : Cours	**Advanced English Skills 6** (LIIEEng06EAdvEngSkills6)			
TP : 14h00 Travail personnel : 14h00 Durée totale: 28h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

Improve all English language skills within a professional and academic context.
Be aware of differences in formal and informal register.
Be able to communicate confidently and clearly on a range of subjects.

Contenu

The Advanced English Skills modules aim to have students develop their language skills across a wide range of topics.
Organisation and management of workshops on a pedagogical subject of their choice.
Research on specific topics and participation in debates.

Prérequis

B2 level of English:
Can express themselves clearly and without much sign of having to restrict what is said.
Has a sufficient range of language to be able to give clear descriptions, express viewpoints and develop arguments without much conspicuous searching for words, using some complex sentence forms to do so.
Has a sufficient range of language to describe unpredictable situations, explain the main points in an idea or problem with reasonable precision and express thoughts on abstract or cultural topics.

Bibliographie

Current articles from a range of high-level authentic sources to encourage students to expand their vocabulary to C1+ level

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	Continuous Assessment	100	Deliver a workshop on a topic of their choice. Students must adhere to evaluation guidelines.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Society, Management and Entrepreneurship 6
- French as a Foreign Language

French as a Foreign Language

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BLACK Claire,MARTIN Stephen
Type d'EC : Cours	**French as a Foreign Language** (LIIEEng06EFrenchForeignLang)			
TP : 21h00 Travail personnel : 18h00 Durée totale: 39h00	Statut	Periode Semester 6	Langue d'enseignement : French	

Acquis d'apprentissage

*Groups are organised by a placement test score so content and objectives vary according to students' different levels

Strengthen vocabulary
Acquire grammatical accuracy
Improve listening and reading comprehension skills
Improve oral expression and fluency
Introduction to culture, geopolitics or science and technology
Introduction to academic and working environment

Contenu

6 hour lessons every week : 4h face-to-face +2h guided autonomy
Expanded vocabulary
Introduction of grammar points
Improvement of phonological control

A1
Can establish basic social contact by using the simplest everyday polite forms of: greetings and farewells; introductions; saying please, thank you, sorry etc.

Prérequis

None

Bibliographie

*Teachers use extracts from textbooks and authentic documents such as online articles or videos

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	Continuous Assessment	100	*Objectives according to different CEFR level groups Minimum 2 skills of 4 are tested each semester

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Society, Management and Entrepreneurship 6
- Global Affairs

Global Affairs

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MONAGHAN Erin
Type d'EC : Cours	**Global Affairs** (LIIEEng06EGlobalAffairs)			
TD : 8h00 Cours : 6h00 Durée totale: 14h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

- Demonstrate a base of knowledge about historical and present issues in international affairs
- Identify analytical approaches and concepts frequently used to analyze international affairs.
- Apply realism, liberalism & identity theory in order to understand why conflicts occur.

Contenu

The academic discipline of International Relations (also called Global Affairs) traditionally focuses on political relationships between sovereign nation-states and non-state actors. This module aims to understand our contemporary international system using three frameworks: realism, liberalism and identity theory. The module begins with a historical analysis, because we cannot understand our contemporary system, without understanding the events that have shaped it. We then will begin to analyze modern history beginning at the end of the Cold War. The module culminates in a project that will require you to analyze the most recent international affairs.

Prérequis

None

Bibliographie

Perspectives on International Relations: Power, Institutions and Ideas by Henry Nau. Additional readings on Moodle

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	1	• Demonstrate a base of knowledge about historical and present issues in international affairs • Identify analytical approaches and concepts

Évaluation(s)			
			frequently used to analyze international affairs. • Apply realism, liberalism & identity theory in order to understand why conflicts occur.
2	Oral Presentation	1	• Demonstrate a base of knowledge about historical and present issues in international affairs • Identify analytical approaches and concepts frequently used to analyze international affairs. • Apply realism, liberalism & identity theory in order to understand why conflicts occur.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Society, Management and Entrepreneurship 6
- Optional Foreign Language

Optional Foreign Language

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : BLACK Claire,MARTIN Stephen
Type d'EC : Cours	**Optional Foreign Language** (LIIEEng06EOptionLanguage)			
TP : 21h00 Travail personnel : 18h00 Durée totale: 39h00	Statut	Periode Semester 6	Langue d'enseignement : German, Spanish, Italian	

Acquis d'apprentissage

*Groups are organised by level, so content and objectives vary according to students' different levels
Arabic, Chinese, French, Portuguese, German, Italian Russian, French Sign Language, Spanish

Strengthen vocabulary
Acquire grammatical accuracy
Improve listening and reading comprehension skills
Improve oral expression and fluency
Introduction to culture, geopolitics or science and technology
Introduction to academic and working environment

Language skills according to different level groups

Contenu

1.5 hour lessons every week.
Expanded vocabulary
Revision of grammar points
Improvement of phonological control

Prérequis

None for beginners and other groups are organised by level

Bibliographie

*Teachers use extracts from textbooks and authentic documents such as online articles or videos:
Journaux: Süddeutsche Zeitung et Berliner Zeitung
Vidéos: ARTE (karambolage) et Deutsche Welle

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1		100	Continuous Assessment

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Society, Management and Entrepreneurship 6
- Principles of Marketing

Principles of Marketing

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MONAGHAN Erin
Type d'EC : Cours	**Principles of Marketing** (LIIEEng06EPrinciplesMkt)			
TD : 8h00 Cours : 6h00 Travail personnel : 14h00 Durée totale: 28h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

*Define Marketing, its role in a company's strategy and the different aspects it covers
*Describe the difference between strategic marketing and operational marketing
*Define and apply the Segmentation Positioning Targeting (SPC) process
*Define what Market watch/analysis is, the different components of Market Watch and its key and central role in a Marketing Strategy
*Define and apply the Marketing tactics

Contenu

As future engineers, Students need to understand the way a company works and how they shall collaborate with different functions.
Marketing is a key department in a company, interacting with almost all departments, especially with the R&D and Manufacturing functions.
This course is aiming at providing students with a global overview of what Marketing is and how Marketing function is interacting with other departments inside a company.

Students will discover the major definitions and tools taught in Marketing.
The course will be composed of Lectures and Tutorials.
Students will have the opportunity to review and check their understanding of the content as well as their level of knowledge
Students will have the opportunity to test and learn how to use Marketing tools during the Tutorials thanks to Group Work activities
Eventually they willbe able to implement these learning during the Innovation program that they will go throught during their 4th year

Prérequis

n/a

Bibliographie

Marketing Management, Kotler et al, 16th edition, Pearson

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	Explain and analyze concepts and vocabulary around Marketing	50	The project consists of a Group work. Each group will need to prepare a Marketing Plan for a specific product or service.
2	Define and understand concepts around Marketing	50	The Students will be individually evaluated thanks an exam enabling them to validate their Marketing knowledge, their understanding of the words and concepts introduced in class and experimented during the Group Work

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Society, Management and Entrepreneurship 6
- Professional Project

Professional Project

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MAGGIORE Manuel,MONAGHAN Erin
Type d'EC : Cours	**Professional Project** (LIIEEng06EProfesProject)			
TD : 5h00 Durée totale: 5h00	Statut	Periode Semester 6	Langue d'enseignement :	

Acquis d'apprentissage

- Imagine, build, and validate your professional project
- Update and validate your documents
- Refine the professional project through meetings with professionals

Contenu

The objective of the teaching is multifaceted: from the search for a professional project to obtaining their degree, the student is led to understand the challenges of recruitment, to define the favorable conditions for its achievement, and to open up to the external professional world.

Bibliographie

The Squiggly Career by Helen Tupper and Sarah Ellis

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Project	1	- Imagine, build, and validate your professional project - Update and validate your documents - Refine the professional project through meetings with professionals

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Sustainable Energy and Environmental Engineering 6

Sustainable Energy and Environmental Engineering 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module ANKOUNI Mouhamad
Type de module : Unité d'Enseignement	**Sustainable Energy and Environmental Engineering 6** (LIIEEng06USustEnerEnviEng6)		
Crédits (ECTS)	8		
Effectif maximum	250		
Durée totale : 97h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Sustainable Energy and Environmental Engineering 6
- Advanced Heat Transfer

Advanced Heat Transfer

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : ANKOUNI Mouhamad,BEN HAJ SLAMA Rafika
Type d'EC : Cours	**Advanced Heat Transfer** (LIIEEng06EAdvHeatTransf)			
TD : 12h00 TP : 8h00 Cours : 12h00 Travail personnel : 24h00 Durée totale: 56h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

Upon completion of the course, the student will be able to
1. Extend the basic knowledge acquired in the introduction to heat transfer course and relate it to more advanced/practical application.
2. Use existing solution to solve transient and multi-dimensional heat conduction problems.
3. Compute heat exchange rates in problems including natural convection and boiling/condensation heat transfer.
4. Perform an analysis of the performance and the sizing of a heat exchanger.
5. Solve problems on radiation exchange between mulitple surfaces, which is a primary quantity of interest in most radiation problem.

Contenu

-Steady Heat conduction : heat transfer in common configuration, conduction shape factors.
- Transient conduction : lumped system analysis, Biot number, transient heat conduction in large plane walls, long cylinders, and spheres with spatial effects, transient heat conduction in semi-infinite solids.
- Numerical methods in heat conduction : finite difference formulation of differential equations, two-dimensional steady heat conduction.
- Natural convection : physical mechanisms, equation of motion and the grashof number, natural convection over surfaces, natural convection inside enclosures, combined natural and forced convection.
- Boiling and condensation : boiling heat transfer, pool Boiling, flow boiling, condensation heat transfer, film condensation, dropwise condensation
- Heat exchangers : heat exchanger types, overall heat transfer coefficient, the log mean temperature difference, the effectiveness-NTU method, heat exchanger design and performance calculations.
- Radiation heat transfer : the view factor, view factor relations, black surfaces, diffuse and gray surfaces, radiation shields and the radiation effect.

Prérequis

Introduction to Heat Transfer

Bibliographie

Recommended ressources :
Çengel, Y (2007), “Heat and Mass Transfer, A practical approach”, 3rd ed, McGraw Hill Higher Eduction.

Bibliographie

Incropera, F.P. and DeWitt, D.P. (2011), “Fundamentals of Mass and Heat Transfer”, 7th Ed, John Wiley.

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	3, 4	0,25	Laboratory work: Practical insight through lab benchwork applications (Natural convection over a flat plate/ finned surface, study of a Heat Exchanger, Boiling and condensation - Two phase Heat Exchanger)
2	1, 2 , 3	0,3	Mid-term exam: Multi-dimensional and Transient Conduction Free/Natural Convection
3	1, 3, 4, 5	0,45	Final exam: Free/Natural Convection Boiling and Condensation Heat Exchanger Radiation Exchange between Surfaces

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Sustainable Energy and Environmental Engineering 6
- Heating Ventilation & Air Conditioning HVAC

Heating Ventilation & Air Conditioning HVAC

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : ANKOUNI Mouhamad,BEN HAJ SLAMA Rafika
Type d'EC : Cours	**Heating Ventilation & Air Conditioning HVAC** (LIIEEng06EHeatRefAirCond)			
TD : 10h00 TP : 12h00 Cours : 10h00 Travail personnel : 20h00 Durée totale: 73h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

By the end of this course, students will be able:
1-To identify key concepts related to the subject such as cold chain management, thermal comfort, energy efficiency and environmental impacts as well as their specific constraints.
2- To carry out HVAC main processes namely Heat, Ventilation, Air Conditioning and Refrigeration (HVAC&R) technologies for industrial applications and buildings.
3- To Analyze HVAC system’s operating, and to assess their performance
4- To size/predesign/optimize HVAC systems for a specific purpose.
- To appropriate HVAC main processes namely Heat, Ventilation, Air Conditioning and Refrigeration (HVAC&R) technologies.
- To Analyze HVAC system’s operating, and to assess their performance
- To size/predesign/optimize HVAC systems for a specific purpose.

Contenu

The purpose of this course is to deeply understand Heat, Ventilation and Air Conditioning technologies and their importance in the building and industry sectors (buildings energy consumption, thermal comfort, ...) and to manage to size and optimize and HVAC system. The course addresses also the future of the HVAC&R industry (EU F-Gas regulation, use of new refrigerant fluids, improvement of energy efficiencies, etc.).
course content (10h of lectures + 10h of tutorials)
• Introduction to HVAC (Importance of HVAC processes in our current society, cold production, cold chain management, energy consumption, environmental consequences) and classic mechanical refrigeration
• Different Refrigeration technologies, and their performance (specificities and comparison)
• Heat pumps specificities and performance (different heating technologies)
• Humid air: Psychrometrics and thermodynamics of moist air.
• Air Handling Units for air conditioning (components and technology evolution)
Labs: (12h)
Study of a volumetric compressor of a refrigerating machine
Study of a refrigeration machine with a water secondary circuit
Study of an Air Handling Unit with a recycling option

Prérequis

Thermodynamics S2,
Fluid Mechanics S3,
Heat transfer S5.

Bibliographie

Recommended:
• Recknagel, H., Sprenger, E., & Schramek, E. R. (2013). Génie climatique-5e éd. Dunod.
• Owen, M., & Handbook-Fundamentals, A. (2001). American Society of Heating. Refrigerating and Air-Conditioning Engineers, 6-2.
• Stanfield, C. and Skaves, D., Fundamentals of HVACR, 2nd ed., Air-Conditioning, Heating and Refrigeration Institute, 2013.
• Nielsen, P. V., & Awbi, H. B. (2008). Air distribution: system design. Ventilation systems design and performance.

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	0,60	Analysis of an existing or future HVAC&R system, with the design of some of these components and assessments of its performance. No formula sheet is allowed for the assessments: all the complex formulas needed will be provided on the subject paper.
2		0,40	Practical work
3		1	Project

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Sustainable Energy and Environmental Engineering 6
- Hydraulics

Hydraulics

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : ANKOUNI Mouhamad,BEN HAJ SLAMA Rafika
Type d'EC : Cours	**Hydraulics** (LIIEEng06EHydr)			
TD : 12h00 Cours : 12h00 Travail personnel : 20h00 Durée totale: 74h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

1.To compute minor and major head losses in piping systems/hydraulic network (system head).
2.To evaluate dynamic pumps performance using measured pump performance curves.
3.To match a pump characteristic to a hydraulic network characteristic.
4.To select an appropriate type and size of a dynamic pump for a specific application (use of specific speed).
5.To predict pump performance or to adapt pump operation using similarity rules.
6.To develop a fundamental and practical understanding of hydraulic power systems.
7.To evaluate the performance of positive displacement pumps.
8.To design a hydraulic circuit for a specific hydraulic power application.

Contenu

- Hydraulic networks: fundamentals of fluid flow in pipes, major and minor and head loss, system head, branches in parallel and series.
- Pumping systems: classification of pumps, operation of dynamic pumps, pump main parameters, pump performance curves, pumps combined in series and parallel, matching a pump to a piping system, cavitation and net positive-suction head, dimensionless pump performance, similarity rules, specific speed, adaptation of operating conditions.
- Hydraulic power systems: Fundamentals of Hydraulic Power Transmission, hydraulic power generation, positive displacement pumps (design and performance), hydraulic power distribution (hydraulic valves: types, design and function), hydraulic power deployment (hydraulic cylinders, hydraulic motors, hydrostatic transmission), hydraulic circuits.

Prérequis

Fluid Mechanics

Bibliographie

- Cengel, Y., & Cimbala, J. M. (2014), Fluid mechanics: Fundamentals and applications, 3th ed., McGraw-Hill Education.
- White F. (2016), Fluid Mechanics, 8th ed, McGraw- Hill.
- Zhang Q. (2018), Basics of Hydraulic Systems, 2nd ed., CRC Press.
- Esposito A. (2014), Fluid Power with Applications, 7th ed., Pearson Education Limited.

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	1, 2, 3	40	Midterm exam of 1h 30 mins: Hydraulic networks Pumping systems
2	1 to 8	60	Final exam: Hydraulic networks Pumping systems Hydraulic power systems

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Systems Engineering 6

Systems Engineering 6

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module MAJDOUB Fida
Type de module : Unité d'Enseignement	**Systems Engineering 6** (LIIEEng06USystEng6)		
Crédits (ECTS)	3		
Effectif maximum	250		
Durée totale : 42h00	Periode Semester 6	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Systems Engineering 6
- Quality

Quality

Données Générales				
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : COUROUGE Olivier,MAJDOUB Fida
Type d'EC : Cours	**Quality** (LIIEEng06EQuality)			
TD : 10h00 Cours : 8h00 Travail personnel : 18h00 Durée totale: 51h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

Being an actor of a quality management system and to integrate a quality dimension in all the services of a company
Understand how to put in place the necessary actions to give the appropriate confidence that a product or service will meet the given quality requirements.
To be able to actively participate in a corporate strategy that aims at zero defects and that should prevent errors rather than finding them after the fact.

Contenu

Introduction to Quality, its history and evolution.
Learn about quality management with the main tools related to it.
Analysis and understanding of the ISO 9001 standard, its purpose, context and stakes.
Audit: Preparing and conducting an Audit.
QRQC : Operational method of quality management and problem solving. Discovery and appropriation of A3 and Kanban communication tools.
Experience plan: Initiation to the PEX tool, mathematical approach and method.

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	100	Final exam. General Knowledge and ability to use the quality tools

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 3
- Semester 6
- Systems Engineering 6
- Vibrations

Vibrations

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**			Responsable(s) Module : MAJDOUB Fida
Type d'EC : Cours	**Vibrations** (LIIEEng06EVibrat)			
TD : 4h00 TP : 4h00 Cours : 12h00 Travail personnel : 16h00 Durée totale: 51h00	Statut	Periode Semester 6	Langue d'enseignement : English	

Acquis d'apprentissage

- Recall the method of modal analysis for multi-body systems
- Apply modal analysis for one or two degrees of freedom system
- Plot and understand a frequency response diagram for a mechanical system
- Combine analytical methods and a numerical approach to solve study the vibration of a system
- Check consistency of a vibration analysis applied to an industrial case

Contenu

The course resumes the basics of vibration analysis.
At first the vibration analysis and its matrix formalism is presented and applied at two degrees of freedom systems.
Then, damping and vibration isolation is presented.
Exercises are done after each notion to put into practice formula and method introduced in the course.

Prérequis

Before taking this course, students should be able to
- Derive a polynomial function of degree n, trigonometric functions and composite functions
- Integrate a polynomial function of degree n, trigonometric functions and composite functions
- Calculate a scalar and vector product in three dimensions
- Project a three-dimensional vector
- Apply Newton’s law of motion for a rigid body and a system of rigid bodies
- Invert a matrix of dimension 2 or higher
- Multiply matrices of dimension 2 or higher

Bibliographie

- Pierre Agati, Yves Brémont et Gérard Delville (2003). Mécanique du Solide - Application industrielle 2° éditions : Dunod 302 p.
- Serge Viala (2021) Expertise vibratoire – Course material – ECAM LaSalle.
- Renaud Bertoni (2022) Vibrations – Course material – ECAM LaSalle.
- Luc Gaudiller (2013) Dynamique des solides indéformables - Cours et exercices. INSA Lyon

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Written exam	65	Student must reuse all the concepts seen in class in a final exam.
2		35	Written Report