Multidisciplinary Projects 3

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		Responsable(s) Module
Type de module : Unité d'Enseignement	**Multidisciplinary Projects 3** (LIIEEng03UMultiProjects3)		
Crédits (ECTS)	4		
Effectif maximum	250		
Durée totale : 64h00	Periode Semester 3	Langue d'enseignement : English	

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 2
- Semester 3
- Multidisciplinary Projects 3
- Multidisciplinary Project 1

Multidisciplinary Project 1

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**
Type d'EC : Projet	**Multidisciplinary Project 1** (LIIEEng03EMultiPro1)

TD : 10h00 Cours : 2h00 Projet : 4h00 Travail personnel : 6h00 Durée totale: 22h00	Statut	Periode Semester 3	Langue d'enseignement : English

Acquis d'apprentissage

By the end of the MDP1, the students should be capable of the development and the design of a weather station system including two main parts : the mechanical and the electronic parts
The project is realized in a group of two or three students, thanks to this opportunity the students should have gained an experience of project managment

Contenu

Project Based Learning:
Mechanical Design:
- using the CREO CAD software, create the parts starting from the real & sectioned prototype by measuring dimensions using adapted measurement tools (metrology)
- Create the subassemblies
- Create the final assembly using the necessary dynamic joints.
- Create the assembly drawing draft with nomenclature. Represent at least one section to allow the visualization of the mechanism.
- Represent in the assembly drawing two main necessary fittings and the functional conditions required in the mechanism.
- Using CREO mechanism: run the simulation using the calculated data

Electronics:
- Realization of the electronic circuit (practically+ using tinkercad) that will be used in order to realize some measurment regarding three aspects (The direction of the wind, the speed of the wind and the strength of the wind
- Development of arduino scripts in order to respond to the electronic specifications of the project

Prérequis

Mechanical Design 1 & 2
Electronic principles and technology (S2)
Electronic systems and circuits

Bibliographie

ECAM Biblio
Arduino related source of information.

Évaluation(s)			
N°	**Nature**	**Coefficient**	**Objectifs**
1	Project	0,5	Written report on: * Project Development Phases and Project Mgmt. * Deliverables in different technology fields.
2	Oral report	0,5	* Be able to present clearly the deliverables. * Demonstrations might apply.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 2
- Semester 3
- Multidisciplinary Projects 3
- Sustainable Comsumption & Production 1

Sustainable Comsumption & Production 1

Données Générales			
Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**		
Type d'EC : Cours	**Sustainable Comsumption & Production 1** (LIIEEng03ESustComProd1)		
Cours : 2h00 Projet : 6h00 Travail personnel : 8h00 Durée totale: 16h00	Statut	Periode Semester 3	Langue d'enseignement : English

Acquis d'apprentissage

Students must develop their capacity to analyse some concrete issues and to tale part to concrete actions that must be beneficial either for the environment or for the society.

Contenu

This course reinforces the general knowledge on Sustainable Development (SD) acquired in the 1st year and proposes the students to develop some concrete actions towards Sustainable Development in their projects.
During S5, students identify a concrete issue in their surrounding environment, and provide a diagnosis of the situation. They also develop an action plan to implement some concrete actions that could improve the problem situation. During S6, students must implement their solution : implementation can take different forms, and results must be ideally measured. Students must adopt a critical viewpoint on their results and present / demonstrate them during the European Sustainable Development week (May).

Prérequis

Introduction to Sustainable Development 1 & 2.

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Continuous Assessment	0,10	MCQ General knowledge about Sustainable development notions
2	Written exam	0,90	Report of 4 pages about a specific issue of ODD12 (Sustainable Consumption and Production). Situation analysis with quantified datas and bibliographic references. With an introduction to an awareness raising game

Évaluation(s)			
			proposal linked to the sepcific issue.

- ECAM LaSalle Mechanical and Electrical Engineering Programme
- EENG - Year 2
- Semester 3
- Multidisciplinary Projects 3
- Pathway Discovery Workshops / Winter Schools

Pathway Discovery Workshops / Winter Schools

Données Générales

Programme Académique	**ECAM LaSalle Mechanical and Electrical Engineering Programme**
Type d'EC : Projet	**Pathway Discovery Workshops / Winter Schools** (LIIEEng03TechWorkshopsWinterSchools)

TP : 40h00 Travail personnel : 28h00 Durée totale: 68h00	Statut	Periode Semester 3	Langue d'enseignement : English

Acquis d'apprentissage

Workshops aim at providing a general overview of the different pathways offered in the Ecam Engineering program.
There are 2 workshop sessions during Year 2, one in Semester 3 and one in Semester 4.
Each session lasts two weeks.
During each week, students participate to one practical workshop (20 H) related to one pathway.
Students are then exposed to the four pathways over the whole Year 2
The goal is to prepare the students to the different types of activities they will meet in the various pathways but also to guide their decision-making by offering an overview of the related professions and job opportunities in each area.
In addition, workshops can be replaced by some Winter / Summer schools offered by our institutional partners abroad. These Schools are optional since inscription fees are applied, but they are a real opportunity for the students to deepen the pathway topic in a multicultural environment.

"Robotics & automation" workshop
By the end of this course, students will be able to:
1. Sense the multidisciplinarity of robotics
2. Discover computer vision
3. Face the difficulty of hardware programming
4. Program a simple robotic system composed of 2 stepper motors using an Arduino board and a shield

"Energy" workshop
The outcomes of this project are:
• To learn how to size a renewable energy system
• To use the disposing material and turn it into a useful and efficient design
• To assess energy system performances
• To optimize the design
• To carry out a technical Low-Cost project independently and with complete autonomy
• To practice Team building and efficiently manage the time
• Communicate on the project orally and in written format

"Mechanical engineering workshop
Discover the mechanical design process starting from the idea until the prototyping throughout numerical simulation and testing.
-Create Computer-aided design model using CREO software
-Perform FEM programing and compare analytical results with numerical simulations results.
-Control Dimensions, tolerances and adjustments.
-Numerical simulation to simulate the mechanical behavior.

Contenu

Workshops are mixing three types of activities:
- A practical work or experiment related to the pathway

Contenu

- Series of conferences or round tables with professionals
- Visits of industrial companies' sites

"Robotics & automation" workshop
The goal of the workshop is to build a robotic system called Polargraph: the system receives an image as input and draws its contour on a whiteboard as output.
First, the students study the mechanical structure of the system to define its specifications.
Second, they learn the basics of computer vision during a 4-hours session lab.
Third, they setup the system (electronic and mechanic) components, program the contour detection algorithm in Python, and the control algorithm on the Arduino board.
Finally, they test the limits of the system by manipulating several parameters (e.g. frame rate).

"Energy" workshop
i. Students will design the blades, and plan the performance: power vs. wind speed velocity. At this step, aerodynamics and optimization of the design are the two main bricks to focus on.
ii. then they will build the electric circuit, connect it to the DC generator and the Boost converter and verify and test the good operation of the circuit
iii. Students should finally, assemble all the parts (blades on axis, motor on support/tower)

"Mechanical engineering workshop
1- The students will design, using CREO, a mechanical crane that should be able tohold and transport an object in space. The model is sized based on the mechanical components given to the students at the beginning of the workshop (bearings, gears). The total weight of the crane and its volume should be minimized.

2- The CAD design of the crane arm will be then imported to the numerical simulation Ansys software where a FEM (Finite Element) analysis is performed to check the ability of the arm to withstand the maximum force acting upon it. A topology optimization is also performed and the design can be then improved accordingly
(A tutorial video about this simulation: https://www.youtube.com/watch?v=qLBpQVhfXIc).

3- Finite element programming of the basic equations with the help of MATLAB language should be realized to study the deformation of the crane arm. The FEM results of the arm using Ansys software should be compared with the analytical solution of finite element method. Please refer to annex for details

4- Once the design is finalized, the final CAD model is 3D-printed using PLS or ABS materials.

5- The prototype is run by servo motor controlled by Arduino to control the speed and the direction of the arm.

6- A test is performed to assess the ability of the prototype to carry the weight.

Prérequis

"Robotics & automation" workshop
-Mathematics for engineers 1
-Mathematics for engineers 2
-Mathematics for engineers 3
-General Mechanics 1
-Computer programming
-Electronics 1 – Components and technology
-Digital design and embedded software 1

"Energy" workshop
- Fluid mechanics
- Mechanical Design
- General Mechanics
- Electronics 1 – Components and technology
- Electronic Circuits & Systems

Prérequis

"Mechanical engineering workshop
Mechanical design 1
General mechanics
Arduino basics

Bibliographie

"Robotics & automation" workshop
http://adafruit.github.io/Adafruit_Motor_Shield_V2_Library/html/
https://www.youtube.com/watch?v=KsL9uxfWHoo

"Energy" workshop
[1] https://www.iea.org/reports/wind-power
[2] GWEC
GLOBAL WIND REPORT 2021
[3] R Camilla Thomson, Gareth P Harrison, 2015, Life Cycle Costs and Carbon Emissions of Onshore Wind Power. A ClimateXChange report, Scotland,
[4] Carbon footprint of wind turbine by life cycle assessment March 2015 Huanjing Kexue Xuebao / Acta Scientiae Circumstantial 35(3):927-934

Évaluation(s)

N°	Nature	Coefficient	Objectifs
1	Continuous Assessment	100	The practical work is evaluated differently according to the concentration, but three main criteria are taken into account: - The result / output of the workshop - A poster - A presentation / video - An oral pitch General behaviour, involvement and attendance can also affect the students' grade.