EECE5001 Senior Design **Autumn, 2020-09-04**

Great Opportunity for Electrical Engineering student in Senior Design

Need 2 domestic EE students and 2 JCI students for this cross continental project.

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INNOVATIVE BIKE PARKING SOLUTIONS

General Context : The bicycle is a more and more popular way to get to academic institutions. This means of transportation is particularly fast in the city, compatible with a student budget, and is part of a clear approach to preserving the environment and air quality. Nevertheless, current infrastructures do not always allow the growing number of bicycles to be parked in good conditions, while ensuring the safety of bicycles and users. Thus, the University of Lorraine ambitions to propose new solutions for secure bicycle storage, and ENSEM's mission is to respond to this ambition by offering innovative solutions. A prototype of one or different solutions can be tested on the ENSEM forecourt, as shown in the example below.

total budget = 10k€ including construction costs

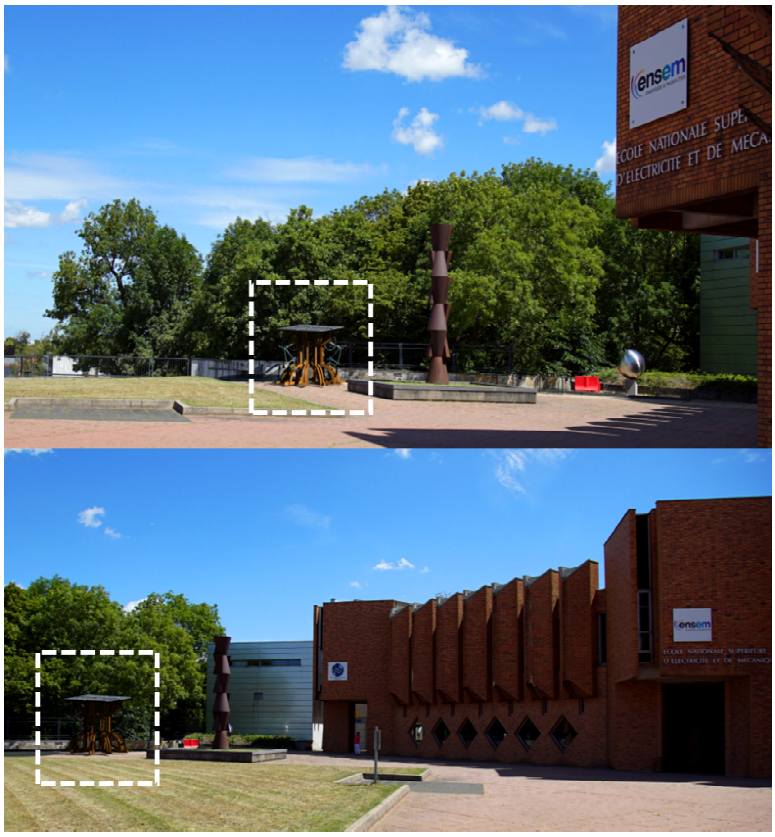

Figure 1: Example of innovative bike shelters on ENSEM's forecourt (photomontage).

Complete and detailed specifications can be defined after discussing with the central services of the University of Lorraine, in particular the departments of real estate and internal logistics. These specifications will include the following aspects:

- **storage security**: reliable and anti-theft system

- user safety (in particular: taking into account aggression issues that may be associated with closed premises)

- storage access via **UL card**

- **modularity**: possibility to easily increase the capacity of the bike shelter

- **Autonomy:** the power supply of the actuators (card reader, light and possibly an automated attachment system) will be done via photovoltaic panels.

- **Compactness**: the shelter should accommodate a maximum number of bicycles for a minimum footprint.

- **feasibility & cost:** the first prototype will have to be manufactured in ENSEM's workshops, minimizing the associated costs (total budget allocated = 10k€ including construction costs)

- **environmental footprint** related to the choice of materials and processes

PROJECT TOPICS

Market research / project management / design/ implementation (Bachelor -senior students)

A group of students will be in charge :

- to take stock of the existing solutions with regard to the above specifications

- to identify relevant solutions with regard to the existing situation

- to propose innovative solutions (structure, power supply, safety, mobile apps etc..)

- to dialogue with the UL authorities involved in the project for the implementation

- manage the budget and monitor the manufacturing of the selected solution

- identify partners capable of mass producing the selected solution

- to carry out a market study regarding the marketing of the chosen solution

Mechanical Design project (master level)

Strutural design and dimensioning

A pair of students, specialized in solid and structure mechanics, will be in charge :

- to find innovative solutions that differ from existing ones

- design different structures in response to the specifications and compare them

- to dimension the structure in relation to existing standards

- prepare the manufacturing of the chosen solution in the mechanical workshop

Electrical Engineering / Digital Sciences project

Autonomy of the bicycle garage

A pair of students , specialized in electrical engineering and/or information sciences, will be in charge of :

- sizing and selecting the photovoltaic power supply for the bicycle shelter

- dimensioning and selecting lighting and actuators in response to the selected system

- carrying out the purchases and the electrical assembly

- Working with UL's Digital Division on badge access to the bike storage area

- Imagining smart solutions to maximize safety (sensors, apps etc.)