

# Open Thesis / Project: Electronics & Firmware for a Theft-Resistant Bicycle Light

## Motivation & Summary

Bicycle lights are everyday safety devices – yet they are frequently stolen or inconvenient to remove and re-mount. KEEP.IT develops an innovative, theft-resistant bicycle light that combines a robust mechanical concept with smart electronics. The product already exists as a prototype; mechanical components are available and the focus of this thesis is entirely on electronics and embedded software. The goal is to design an energy-efficient, robust, and series-ready electronic platform (PCB) including firmware for a rechargeable bicycle light: bright, reliable, and secure. The thesis is a paid company project with flexible working location and close technical exchange with the startup founder and university supervisors.

## Recommended Prior Knowledge

- Embedded programming in C/C++
- PCB design basics (e.g., KiCad)
- Power electronics fundamentals
- Basics of NFC/RFID and secure actuator control

## Thesis Type

- Bachelor's Thesis

## Student Target Groups

- Computer Science (CS)
- Information and Computer Engineering (ICE)
- Electrical Engineering (EE)

## Goals & Tasks

- Define the electronic architecture for a battery-powered bicycle light.
- Design the power subsystem: Li-Ion battery, BMS/protection, USB-C charging, etc.
- Implement LED power stage and light control: high-power LED (~600 lm), multiple modes, temperature monitoring.
- Develop the unlocking logic: solenoid/locking actuator control and NFC authentication (card/smartphone).
- Prototype, test, and iterate: PCB bring-up, firmware validation, robustness and low-power evaluation.



## Contact & Information

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