

PRJ402 - TECHNOLOGICAL PROJECT

🎓 Class attendance system 🎓



Aim of the project

- Hardware and Software development ;
- Address several technical areas ;
- Per teams of 3 ;

- Design a technological project following :
 - **Conception step**
 - Functional analysis and technical requirements
 - Proteus **simulation**
 - Labdeck **prototype**
 - PCB layout on DesignSpark PCB
 - **Fabrication step**
 - Fabrication of the PCB
 - Drilling and soldering
 - Unit **tests**
 - Functional validation

Project description

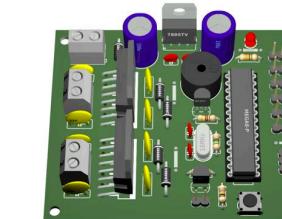
CLASS ATTENDANCE SYSTEM



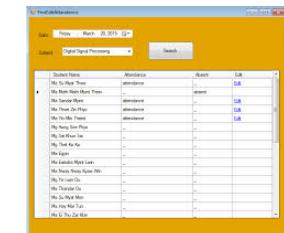
RFID receptor



LCD screen



Your own PCB



Java GUI

- an ATMEGA328P based **PCB** including :
 - a RC522 RFID module to read student IDs ;
 - a LCD screen to display read students' UIDs and name ;
 - a buzzer and a green LED to show the user that the card has been read ;
 - a USB connector to send the UID to a computer based interface.

- a processing based **interface** that :
 - recover the UID through USB ;
 - Display the list of class's students and display if they are attending class ;
 - An database that stores the nb of still allowed non-attendance credits and send this number to the board to display it on two 7-SEG displays.

List of material (per team of 3)

project	lab	designation	number
X		Sheet of tracing paper	1
X		Microcontrôleur ATMEGA328P Bootloader UNO	1
X		Module RFID RC522	1
X		écran LCD – HD44780	1
X		Potentiomètre 10k	1
X		condensateur 22pF	2
X		Régulateur 3,3 V	1
X		Quartz 16 MHz	1
X		Résistance 1MOhm 2W	1
X		condensateur 100nF	4
X		condensateur 10uF	1
X		Adaptateur USB TTL	1
X		Embase à broche 36 pôles 1 rangée	2
X		buzzer électromagnétique	1
X		LED RVB	1
X		plaqué cuivre epoxy présensibilisée 160 x 100 mm	1
X		embase femelle 20 contacts traversant	2
X		Female PCB spacer M3, 5mm	4
X		Male/Female PCB spacer M3, 12mm	4
X	X	Résistance 100R	5
X	X	Plaquette de montage rapide	1
X	X	Câbles Dupont M/M 20cm	10
X		AOP MCP6281 8PDIP	1
X		Photorésistance	1
X		LED blanche	1
X		Résistance 10K	3
X		Optocoupleur K1010	1

Key dates

FEBRUARY

MARCH

APRIL

week of Feb. 10th

Project Kick off

Lecture on the conception
of electronic boards

week of Mar. 30th

Project session 2

Fabrication

week of Feb. 17th

3 h Lab on the conception
of electronic boards

week of Apr. 6th

Project session 3
GUI interface and tests

week of Feb. 24th

Project session 1
Simulation
and prototyping

week of Apr. 13rd

Project defense

Key dates

Planning du cours de projet technologique

SEMAINE		TP	PRJ	EXAMEN
7	10/2	CI 1 : présentation du module et du projet TP 1 : conception d'une carte électronique [1 / 2]		
8	17/2	TP 1 : conception d'une carte électronique [2 / 2]		
9	24/2		PRJ1 : Prototypage	
10	2/3	PERIODE EN ENTREPRISE		
11	9/3			
12	16/3			
13	23/3			
14	30/3		PRJ2 : Fabrication de la carte	
15	6/4		PRJ3 : Tests et GUI	
16	13/4			SOUTENANCE

Remark about the fabrication step

- For the purpose of this course, we have course in E2-P345 and you have access to the fablab each time we have "Technological project" class.
- You are supposed to perform all the fabrications steps involving fablab machines (PCB fabrication) during these courses and not outside of these time slots.
- Welding stations and drills are in free access in room P345.

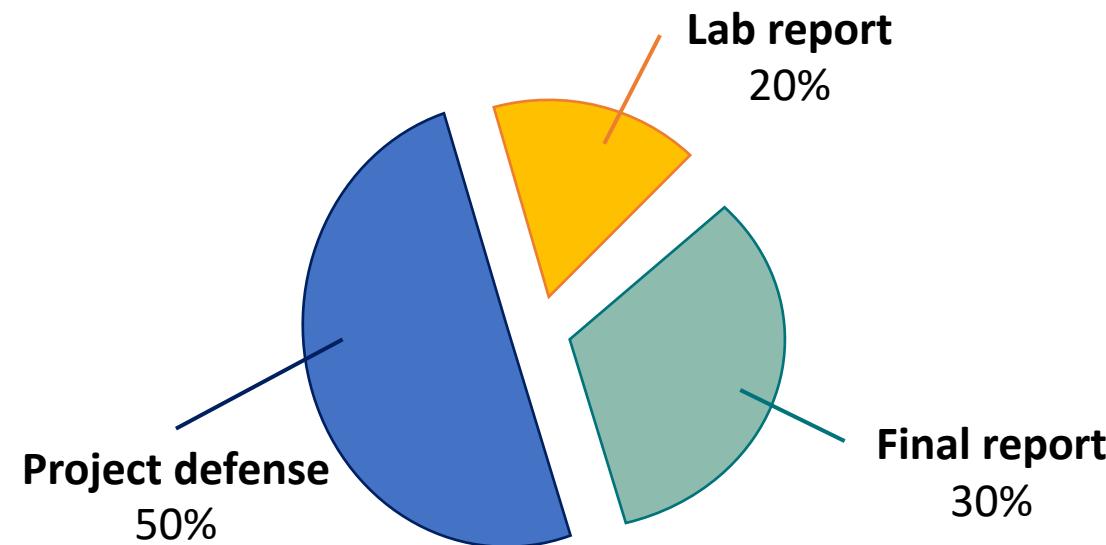
FABLAB

P345

➤ PCB fabrication

➤ Soldering and drilling

Evaluation process



Report requirements

- **Conception step**
 - Functional analysis
 - Functional diagram (SADT top-down diagram = "diagramme A0")
 - Table summarizing technical requirements
 - Expected results and test process
 - Hardware development
 - Presentation of the components
 - Unit simulations of main blocs (voltage regulator oscilloscope measurement, RFID - LCD screen test and light up of a LED controlled through processing at least)
 - Labdeck prototype
 - PCB layout : DesignSpark schematic and PCB layout
 - Software development
 - Microcontroller programming and program flowchart (commented code in Annexe, explanation of the code in the report)
 - Processing Interface programming and program flowchart
- **Fabrication step**
 - Manufacturing process steps
 - Unit tests and comparison with simulations (at least, verification of the connections of the tracks on the PCB)
 - Measurement of data transfer using an oscilloscope between the RFID module and the microcontroller + associated explanation
 - Pictures of the final product
 - functional validation in accordance with your requirements
- **Team management**
 - Team organization
 - Conclusion and perspectives

Defense requirements



- The **presentation** and the **demonstration [60% of the grade]** have to contain at least :
 - Context and problematic ;
 - Proteus simulations overview ;
 - Programs flow chart ;
 - Demonstration ;
 - Conclusion and perspectives.

- The **discussion [40% of the grade]** on your project :
 - The whole process of conception and fabrication of your project (*read the lecture slides...*)
 - Example : Why a capacitor there ? Why this value ? Why a THD and not a SMD ? Is it an electrolytic capacitor ?
 - Warning : if one team mate is not able to answer basic questions, it will affect the grade of the whole group !

Some advices

- If the circuit does not work, you can at least show simulations during the defense but if you still have time, start by doing unit test and verifying signals shape using an oscilloscope !
- Beware of the view (Top / bottom) and print the PCB layout once on regular A4 paper before printing it on tracing paper !
- Take care of your integrated circuits, especially of the external pins !
- Decoupling capacitors have to be the closest to the cured components !
- Think twice before soldering !
- Project report is 30% of the final grade !
 - don't forget to explain and comment all the figures



A SMOOTH SEA
NEVER MADE A SKILLED SAILOR.