Project Learning for better Esatblishment on Labor market

STUDENT PROJECT ASSIGNMENTS

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Project:Attendance system with RFID

Countries:	Czech Republic	Hungary
Suitable for grade:	3-4	3-4
Specialization:	IT	IT
Responsible teacher:	Petr Madecki	Tamás Kósa

Project description:

ARDUINO with RFID sensor must be programmed and visualized. The model and other I/O are determined by the Hungarian partner (red and green sign posts, lists). You need to purchase ARDUINO with sensors and outputs (LCD, etc.).

Project tasks:

Student #1 (CZ):

- To build a provisional system
- To programme ARDUINO
- To perform simulation tests
- To write documentation both in English and Czech language

Student #2 (H):

- To Make the final model
- To Assemble sensor and actuator
- To programme HW tests on ARDUINO
- To write documentation in both English and Hungarian language

Success criteria:

ARDUINO responds to the RFID card and gives access to people.

Developed hard skills:

Analysis of real problems, usage of different sources of information, programming in C language, software configuration, improvements in English language, equipment selection, trouble shooting, complex problem solving

Developed soft skills:

Communication skills, problem solving skills, creativity, team work capability

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Project name: Parking robot

Countries:	Czech Republic	Hungary
Suitable for grade:	3-4	3-4
Specialization:	IT, Automatic systems	IT
Responsible teacher:	Pavel Urban	Tamás Kósa

Project description:
A Robocar kit with ARDUINO must be programmed for parking in the designated place. The model of the car parking and the car will be made by the Hungarian partner.
The robot car steps up to the entrance of the car park with manual management. The microcomputer drives the car into the car park changing to automatic management then it searches the first free parking place. If it finds it, it makes the car parked. After little waiting, manually, the controller turns the car off the car park and directs to the exit, where it stops and hands over the control to the manual control.

Project tasks:
Student #1 (CZ):
- To build a provisionalsystem
- To programme ARDUINO
- To build a finalcar
- To write the documentation both in English and Czech language

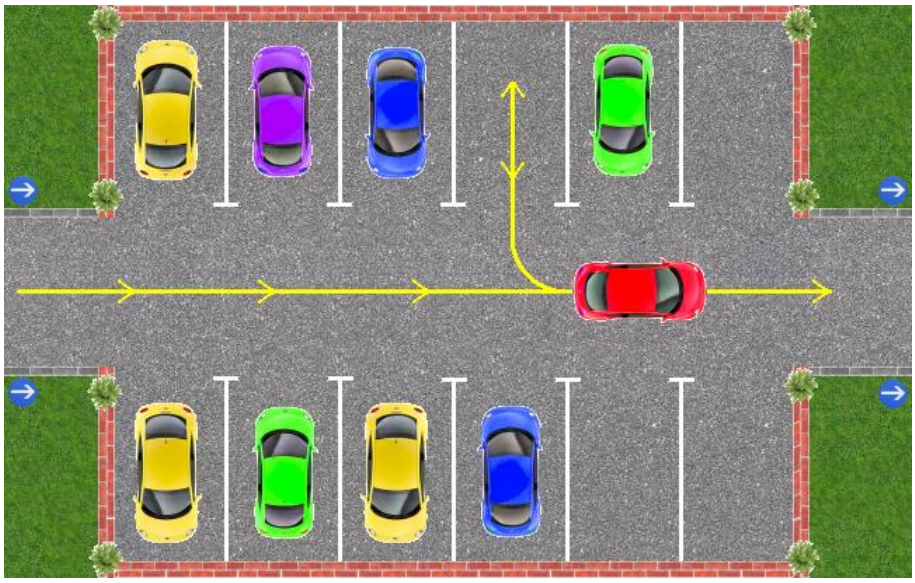
Student #2 (H):
- To Make the final model parking place
- To Assemble sensor and actuator
- To programme HW tests on ARDUINO
- To write documentation in both English and Hungarian language

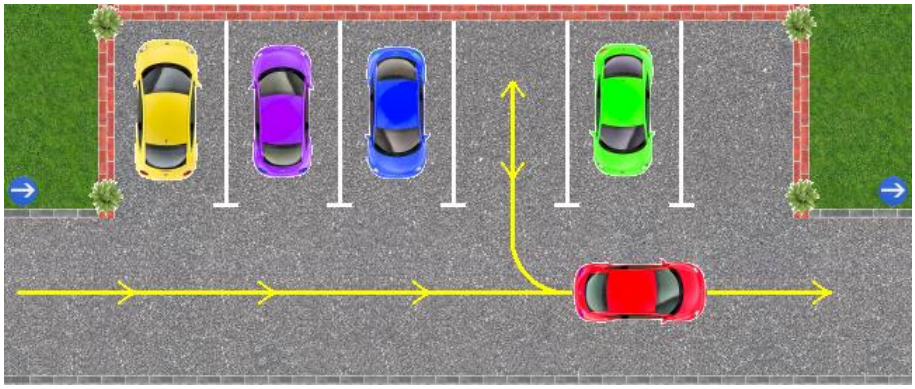
Implementation of the project:
We suggest two formats for execution.
Both are based on a parking lot, enclosed park yard which is surrounded by a parapet wall, it is one-way, and it has at least 10-12 parking places. The difference comes from the different versions: what kind of parking technique it is necessary to use.
The project can be implemented with or without additional accessories.
For extra additions, we make the following suggestions:
- automatic barrier at the entrance and the exit
- parking-counter and display at the entrance.

Construction proposal:

1. *Parking in a perpendicular reverse direction*

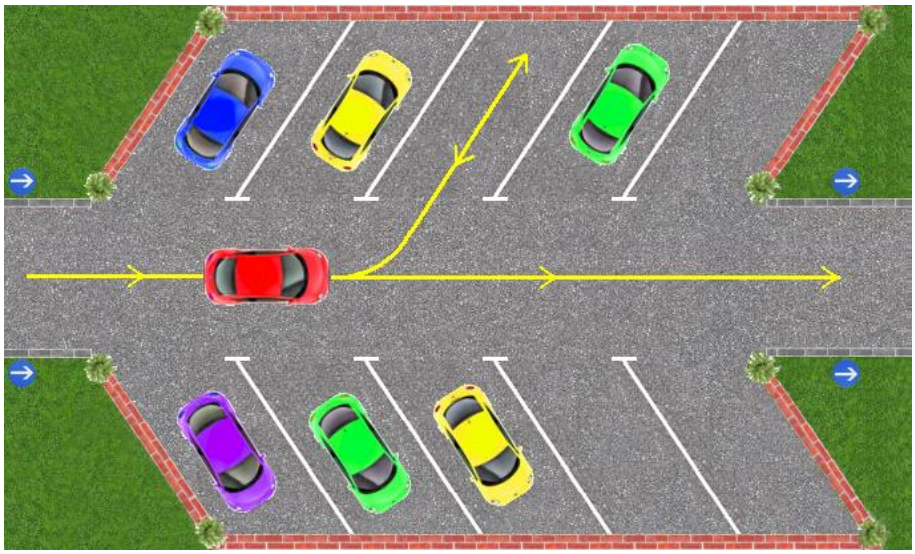
The construction of it is possible in one- or two-side parking forms.
The car searches the first free park place, passes it and parks in reverse. The car leaves the parking place and the park yard in forward direction.

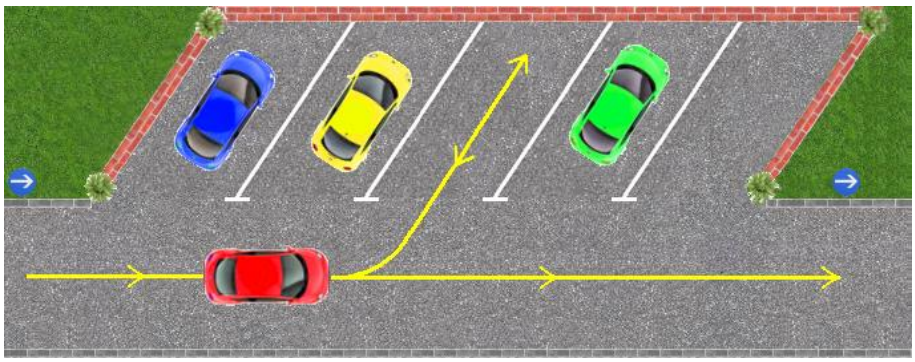




2. *Forward parking with lopsided direction*

Its form can be carried out with one-side or two-side parking lots. The car searches the first free parking place and parks in forward direction. The car drives out in reverse and then it drives out forward from the car park.





Extra supplements:

The car park can be carried out according to the claim. It can be perpendicular on one-side, and lopsided on the other side with parking places. And it can be equipped with the following extras:

- automatic barrier
- parking-counter and displayer.

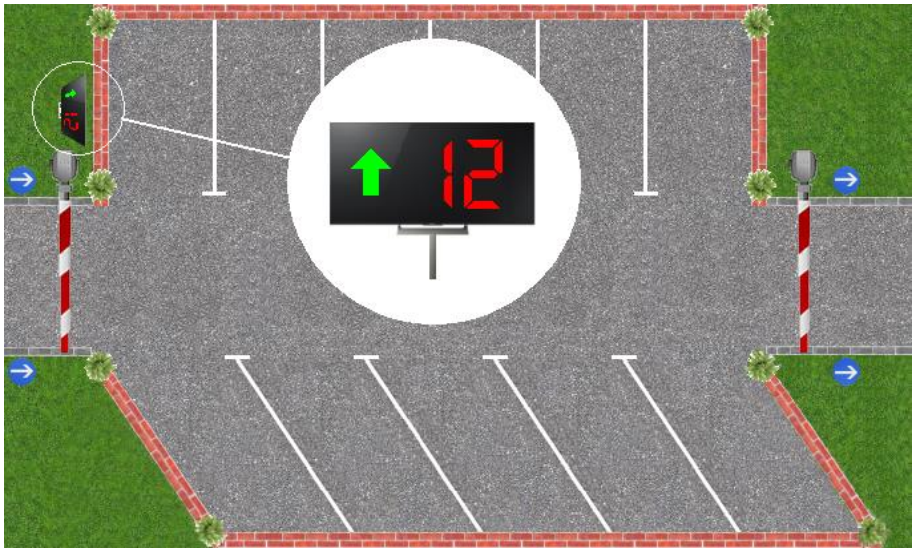
Both additions are independent from the robot car; it claims the forming of a control, which can be handled as the part of the parking lot.

1. *Automatic barrier*

It can be placed at the entrance and the exit of the parking lot. Its operation is automatic, the arriving of the car is detected by a sensor and to the sign of it, and the controller raises the pike.

2. *Parking place counter*

A display can be placed at the entrance of the parking lot, which displays the number of the free parking places. If there is any free place in the car park, the barrier will be raised. If there is no free place, the barrier will not open. The number of the free parking places reduces by 1 when a car parks in; and increases by 1 when the car parks out. Sensors are needed to the implementation at the entrance and the exit.



Success criteria:

The car parks automatically in the free parking space.

Developed hard skills:

Analysis of real problems, usage of different sources of information, programming in C language, software configuration, improvements in English language, equipment selection, trouble shooting, complex problem solving

Developed soft skills:

Communication skills, problem solving skills, creativity, team work capability

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Weather forecast station with Arduino

Countries:	Czech Republic	Hungary
Suitable for grade:	3	3-4
Specialization:	IT	IT
Responsible teacher:	Zuzana Paučková	Tamás Kósa

Project description:
Data from weather station sensors (temperature, humidity, pressure, direction) collects ARDUINO. Visualize on a local character LCD eventually www page. The partner produces the hardware part of the project and programs HW tests on ARDUINO.
Weather station for measuring and displaying indoor and outdoor climate conditions.
The task of the weather station is to measure and display the outside and indoor climatic factors of a building. The station measures the ambient temperature, the air pressure and the humidity outside the building, as well as the room temperature and the humidity inside the room. The measure values are displayed on a single graphical interface on a monitor screen. In addition, it stores the sampled values at specified times, based on it prepares retrospective change graphs and weather forecasts.

Project tasks:
Student #1 (CZ):

- To consult sensors with the partner
- To build a provisional system
- To programme ARDUINO
- To perform simulation tests
- To write documentation bothin English and Czech language

Student #2 (H):

- To Make the final model
- To Assemble sensor and actuator
- To programme HW tests on ARDUINO
- To co-moderate weather forecasting algorithms
- To perform final tests
- To write documentation in both English and Hungarian language

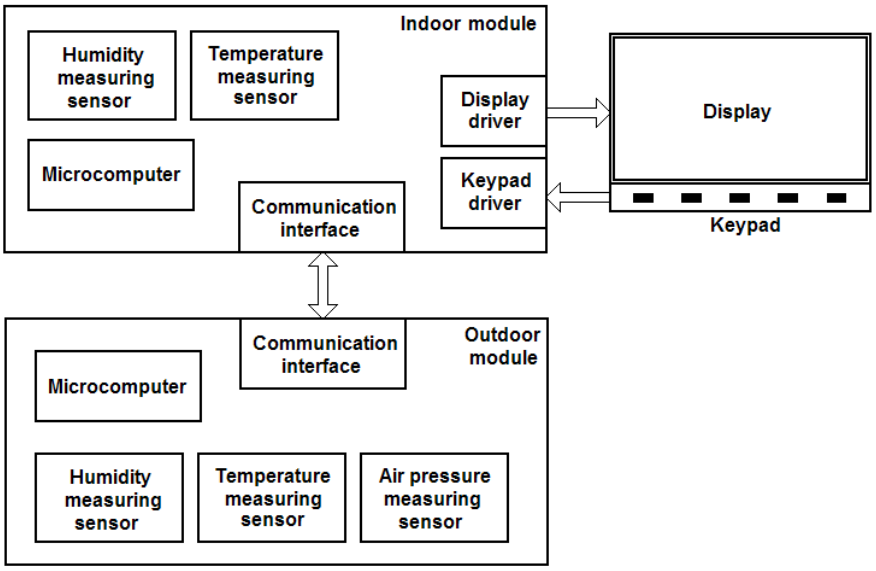
The implementation of the project:

We suggest two formats for execution.

Both are based on a microcomputer-supported, external and internal meeting unit, which is equipped with a display device and a control panel (the latter ones can be conveniently integrated). The proposed embodiment and the internal units according to the next chapter. The embodiment of the system is illustrated in the following figure.

Design proposals

The following diagram illustrates the possible of the system.

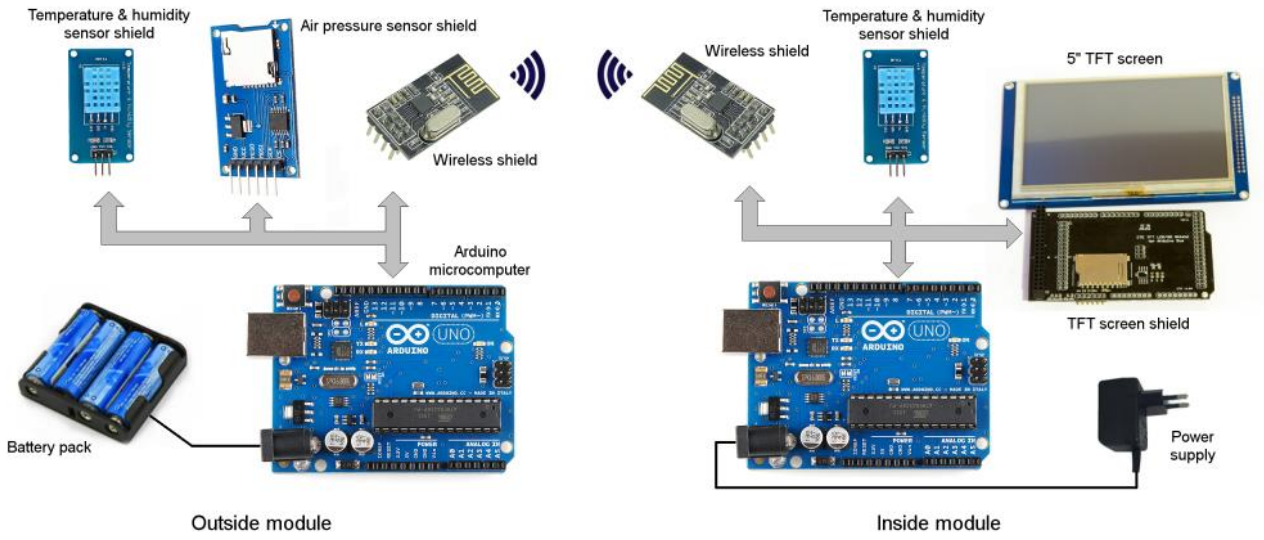


The external unit, situated outside the building, measures climatic data using sensors with the help of microcomputer. The data is transmitted through an interface to the internal unit, situated inside the building. The internal unit processes and displays the received data together with the climatic data, measured by itself. The display mode can be modofied by the help of pushbuttons. We suggest two solutions to the communication through the interface:
- with a wireless connection: in this case the external unit must have a microcomputer control
- with a wired connection: in this case the external unit doesn't need to have a microcomputer control.

1. *Weather station with wireless connection*

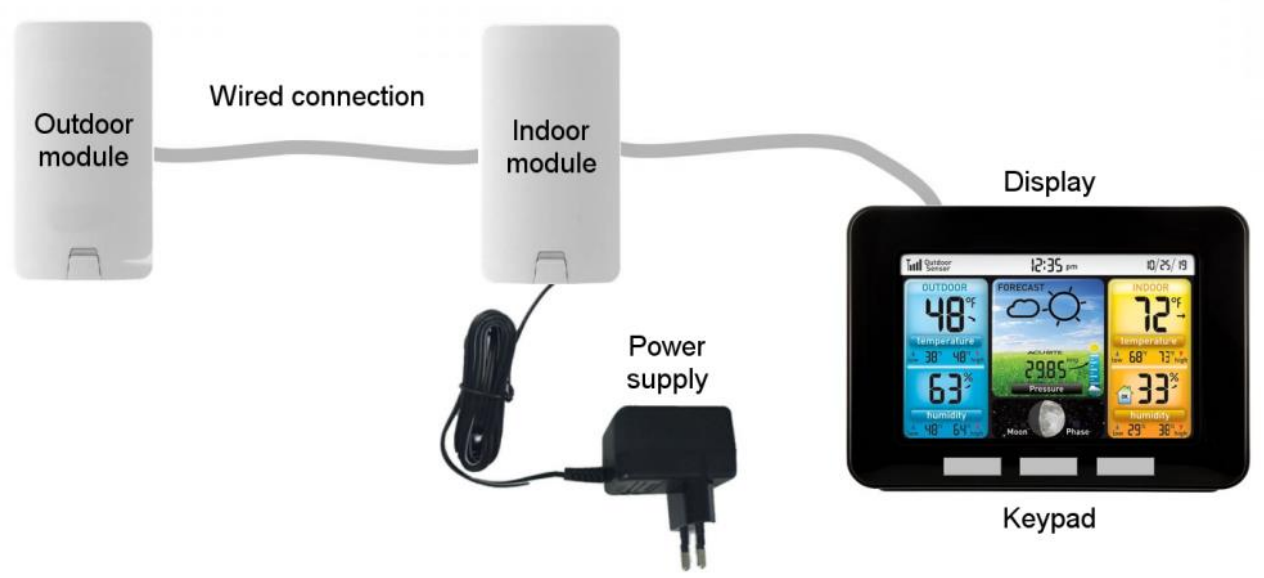
In this case, the communication interface can be based on any easy-to-use wireless technology such as WiFi, Bluetooth, ZigBee, Xbee, Wireless SPI, or any other short-range RF technology. The basic structure is illustrared in the following figure.

We propose to implement the concrete design using a measuring system based on Arduino microcomputers, as shown below.

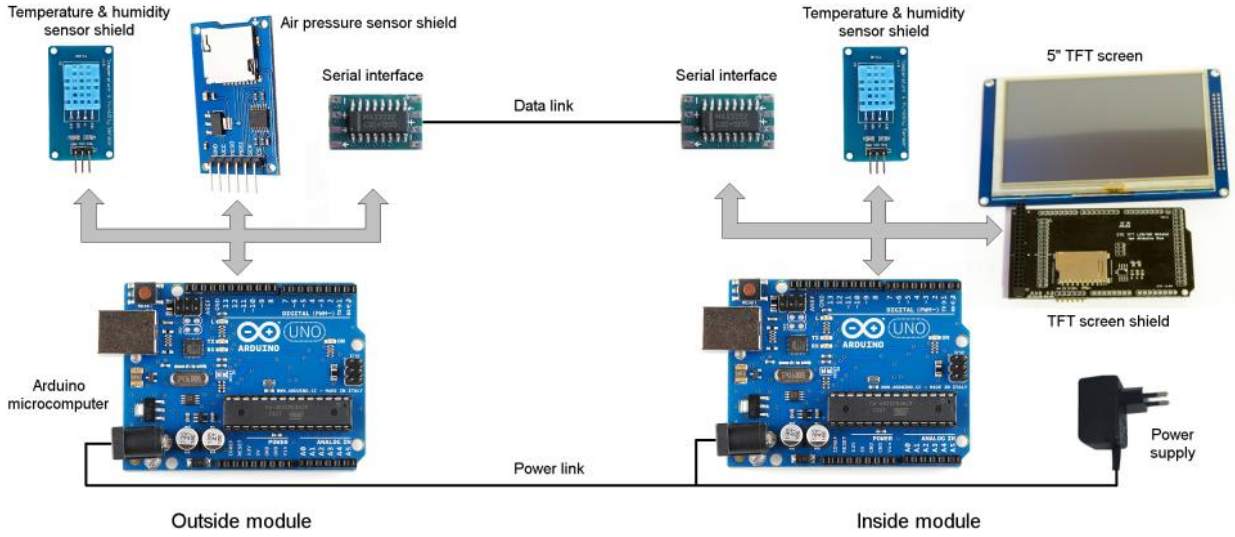


2. *<u>Weather station with wired connection</u>*

In this case, the communication interface can be based on any serial, SPI data transmission technology. The basic structure is illustrated in the following figure.



We propose to implement the concrete design using a measuring system based on Arduino microcomputers, as shown below.



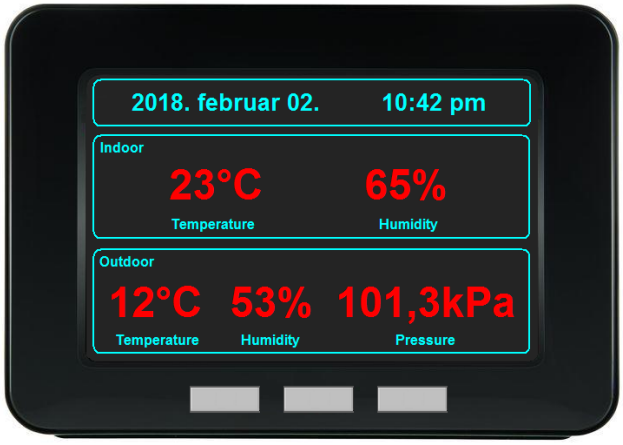
The extra supplements of the project:

<u>The proposed software supplements:</u>

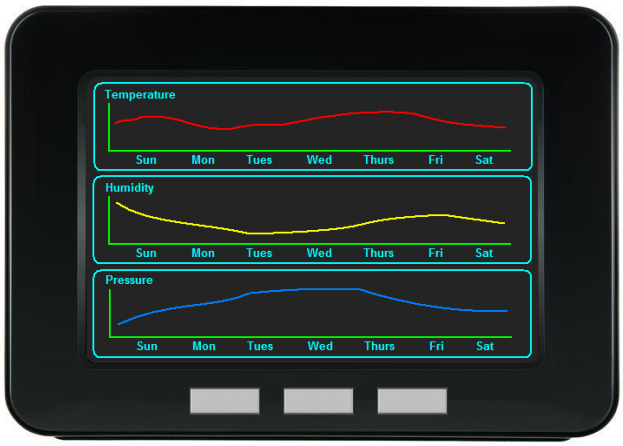
- Display the measured, external and internal temperature in °C, and °F, from a control panel which can be chosen by pushbuttons.
- display the external and internal pressure at kPa and bar with index-numbers, it can be selected from the control panel by pushbuttons
- display the measured storage data and the change tendencies after statistical analysis on graphs (weather forecast), which can be selected with pushbuttons on the control panel
- the keypad can be configured independently from the monitor or it can integrated with it, in touch-screen format
- the language of the displayed text can be changed (English, Czech, Hungarian, Slovak, Slovanian).

The graphical user interface

The following diagrams show a possible appearance of the monitor display. Switching between the modes can be controlled from the keypad.



Measuring mode



Forecast mode

Success criteria:

Actual data from the sensors and weather forecast are displayed on the LCD or www page

Developed hard skills:

Analysis of real problems, usage of different sources of information, programming in C language, software configuration, improvements in English language, equipment selection, trouble shooting, complex problem solving

Developed soft skills:

Communication skills, problem solving skills, creativity, team work capability

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RFID lock

Countries:	Czech Republic	Republic of Poland
Suitable for grade:	3 - 4	2 - 3
Specialization:	IT	IT, mechatronics
Responsible teacher:	Petr Madecki	Opoka Artur

Project description:

The door lock is controlled by the ARDUINO module, which must be supplemented with an RFID sensor. Character LCD will identify the person, connect the door output to the relay. The list of the identified people issent by a serialline or stored on a SD memory card. The partner produces the model, installs the sensor, connects the relay, makes a special registration ring.

Project tasks:
Student #1 (CZ):

- To select sensors and modules used by the partner
- To build a provisional system
- To programme ARDUINO
- To work with a partner on management algorithms
- To perform simulation tests
- To write documentation bothin English and Czech language

Student #2 (PL):

- To Make the final model
- To Assemble sensors
- To make a special registration ring
- To programme HW tests on ARDUINO (in cooperation with a Czech student)
- To perform final tests
- To write documentation in both English and Polish language

Success criteria:
The lock opens the door and registers the incoming people.

Developed hard skills:
Analysis of real problems, use different sources of information, programming in C langure, software configuration, improvements in English, equipment selection, troubleshooting, complex problem solving.

Developed soft skills:
Communication skills, problem solving skills, creativity, teamwork capability.

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Temperature regulation

Countries:	Czech Republic	Republic of Poland
Suitable for grade:	3 - 4	2 - 3
Specialization:	IT, Automatic systems	IT, mechatronics
Responsible teacher:	Božena Ralbovská	Olsza Marek

Project description:

The temperature in the small chamber is controlled by the ARDUINO module, which must be connected to thetemperature sensor, keyboard, actuator and graphic LCD, SD memorycard. To programmetwo-point, proportional and PI control. To show timedependencies of controlled quantities. The partner produces a small chamber to demonstrate a temperature control in the class. Adding a temperature sensor and a heating element, possibly a fan. Maximum temperature at 100% heatingpoweris 70 deg. Celsius, control accuracy 0.1 deg. Celsius. The system is heated to 50 degrees within 5 minutes.

Project tasks:

Student #1 (CZ):

- Sensors and actuators consultation with the partner
- To design the circuit diagram for electrical circuits and consult with the partner
- To build a provisional system
- To work with a partner on control algorithms
- To perform simulation tests
- To write documentation bothin English and Czech language

Student #2 (PL):

- To Make the final model
- To Assemble sensors
- To programme HW tests on ARDUINO (in cooperation with a Czech student)
- To perform final tests
- To write documentation in both English and Polish language

Success criteria:

We will show how different types of temperature regulators work with various parameters.

Developed hard skills:

Analysis of real problems, use different sources of information, programming in C langure, software configuration, improvements in English, equipment selection, troubleshooting, complex problem solving.

Developed soft skills:

Communication skills, problem solving skills, creativity, teamwork capability.

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Weather station

Countries:	Czech Republic	Republic of Poland
Suitable for grade:	3 - 4	2 - 3
Specialization:	IT	IT, mechatronics
Responsible teacher:	Ladislav Opiol	Opoka Artur

Project description:

ARDUINO collects the data from the weather station sensors (temperature, humidity, pressure, direction and wind force). Visualization on a localcharacter LCD and wwwpage. The partner produces a direction and windsensor, prints a box and otherparts on a 3D printer.

Project tasks:
Student #1 (CZ):

- To select sensors and modules used by the partner
- To build a provisional system
- To programme ARDUINO
- To work with a partner on management algorithms
- To perform simulation tests
- To write documentation bothin English and Czech language

Student #2 (PL):

- To Make the final model
- To Assemble sensors - direction and wind force
- To programme HW tests on ARDUINO (in cooperation with a Czech student)
- To perform final tests
- To write documentation in both English and Polish language

Success criteria:
The actual data from the sensors are displayed on the LCD or web page.

Developed hard skills:
Analysis of real problems, use different sources of information, programming in C langure, software configuration, improvements in English, equipment selection, troubleshooting, complex problem solving.

Developed soft skills:
Communication skills, problem solving skills, creativity, teamwork capability.

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Project name: Crossroad

Countries:	Czech Republic	Republic of Slovenia
Suitable for grade:	3	3
Specialization:	IT, Automatic systems	IT
Responsible teacher:	Milada Bajtková	Rajko Palatin

Project description:

The crossroad is controlled by traffic lights. ARDUINO with sensors and LEDs must be programmed. The Slovenian partner will make the model of the crossroad, the electronics end on the connector.

Project tasks:

Student #1 (CZ):

- To select sensors and modules used by the partner
- To build a provisional system
- To programme ARDUINO
- To work with a partner on management algorithms
- To perform simulation tests
- To write documentation both in English and Czech language

Student #2 (SLO):

- To Make the final model
- To Assemble sensors
- To programme HW tests on ARDUINO
- To perform final tests
- To write documentation in both English and Slovenian language

Success criteria:

- The model works just like a real crossroad

Developed hard skills:

Analysis of real problems, usage of different sources of information, programming in C language, software configuration, improvements in English language, equipment selection, trouble shooting, complex problem solving

Developed soft skills:

Communication skills, problem solving skills, creativity, team work capability

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Project name: Greenhouse

Countries:	Czech Republic	Republic of Slovenia
Suitable for grade:	3-4	3
Specialization:	IT, Automatic systems	IT
Responsible teacher:	Václav Sedlák	Darko Oskomič

Project description:

The greenhouse is controlled by ARDUINO with temperature, humidity, window opening etc. The actuators switch on heating, water, alarm. Perform a visualization of values on the LCD screen, possibly on the WWW. Set the required values on the keyboard. The greenhouse model is produced by a partner, installed by sensors and actuators, the electronics end on the connector.

Project tasks:

Student #1 (CZ):

- To select sensors and modules used by the partner
- To build a provisional system
- To programme ARDUINO
- To work with a partner on management algorithms
- To perform simulation tests
- To write documentation both in English and Czech language

Student #2 (SLO):

- To Make the final model
- To Assemble sensors
- To programme HW tests on ARDUINO
- To perform final tests
- To write documentation in both English and Slovenian language

Success criteria:

We will produce a functional model of the greenhouse

Developed hard skills:

analysis of real problems, use different sources of information, programming in C langure, software configuration, improvements in English, equipment selection, troubleshooting, complex problem solving

Developed soft skills:

communication skills, problem solving skills, creativity, teamwork capability

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Project name: Smart bin

Countries:	Czech Republic	Republic of Slovenia
Suitable for grade:	3	
Specialization:	IT, Automatic systems	
Responsible teacher:	Pavel Urban	Simon Horvat

Project description:

ARDUINO with modules for GSM, GPS and sensor communication must be programmed for reporting abnormal states. The bin model is realized by the partner.

Project tasks:

Student #1 (CZ):

- To select sensors and modules with the partner
- To build a provisional system
- To programme ARDUINO
- To perform simulation tests
- To write documentation both in English and Czech language

Student #2 (SLO):

- To Make the final model
- To Assemble sensors
- To programme HW tests on ARDUINO
- To perform final tests
- To write documentation in both English and Slovenian language

Success criteria:

Thesmart bin can send a message when it is full or displaced

Developed hard skills:

Analysis of real problems, usage of different sources of information, programming in C language, software configuration, improvements in English language, equipment selection, trouble shooting, complex problem solving

Developed soft skills:

Communication skills, problem solving skills, creativity, team work capability

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Lego Automatic Parking System

Countries:	Hungary	Poland
Suitable for grade:	1 - 2	2 - 3
Specialization:	IT	IT
Responsible teacher:	Csaba Deák	Dariusz Jędrzejek

Project description:

The task consists of two stages:
- The first stage is to agree with the other project teams ("Lego Line Follower" and "Lego Robot following the exit labyrinth") the design of the robot - this construction will be the same to each team. Particular emphasis should be placed on the selection of the drive structure, the location of the sensors and the dimensions of the structure.

- The second stage - in this part, a scale model with a parking space and a programme controlling the robot "Lego Automatic Parking System" should be created in the first place. The programme should be able to detect and automatically “park” the robot in a free parking space.

Project tasks:
Student #1 (PL):

- cooperation with the "Lego Line Follower" and "Lego Robot following the labyrinth exit" teams
- cooperation in the design of the robot (dimensions, power transmission system, sensors’ type and their location, etc.)
- cooperation in the determination of the Lego Mindstorm hardware configuration
- cooperation in the determination of the scale model’s shape and dimensions
- the design of the instruction for the model construction
- construction of the model at students’ home school
- writing the control programme and programming the robot by a PL student
- carrying out a test run
- both students – the development of an algorithm, which will complete the task in a most efficient way

Student #2 (HU):

- cooperation with the "Lego Line Follower" and "Lego Robot following the labyrinth exit" teams
- cooperation in the design of the robot (dimensions, power transmission system, sensors’ type and their location, etc.)
- cooperation in the determination of the Lego Mindstorm hardware configuration
- cooperation in the determination of the scale model’s shape and dimensions
- the design of the instruction for the model construction
- construction of the model at students’ home school
- writing the control programme and programming the robot by a HU student

- carrying out a test run - both students – the development of an algorithm, which will complete the task in a most efficient way
Success criteria: Building a working robot that will perform a designed task - parking the robot in a free parking space on the scale model.
Developed hard skills: Designing the construction of the robot, writing the control programmes, algorithm programming and testing, making changes to improve the robot's efficiency.
Developed soft skills: Communication with other team members, technical and programming problem solving, planning the project work, keeping deadlines

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Lego Line Follower

Countries:	Hungary	Poland
Suitable for grade:	1 - 2	2 - 3
Specialization:	IT	IT
Project teacher:	Csaba Deák	Dariusz Jędrzejek

Project description:

The task consists of two stages:
- The first stage is to agree with the other project teams ("Lego Automatic Parking System" and "Lego Robot following the exit labyrinth") the design of the robot - this construction will be the same to each team. Particular emphasis should be placed on the selection of the drive structure, the location of the sensors and the dimensions of the structure.

- The second stage - in this part, the design of the tracks and a programme controlling the robot "Lego Line Follower" should be created in the first place. The programme should be able to ride along the line in the quickest possible time.

Project tasks:
Student #1 (PL):

- cooperation with the "Lego Automatic Parking System" and "Lego Robot following the labyrinth exit" teams
- cooperation in the design of the robot (dimensions, power transmission system, sensors' type and their location, etc.)
- cooperation in the determination of the Lego Mindstorm hardware configuration
- cooperation in the determination of the track's form and shape
- the design of the instruction for the model construction
- construction of the model at students' home school
- writing the control programme and programming the robot by a PL student
- the ride of the Line Follower along the track
- both students – the development of an algorithm, which will ride along the tracks in the most efficient way

Student #2 (HU):

cooperation with the "Lego Automatic Parking System" and "Lego Robot following the labyrinth exit" teams
- cooperation in the design of the robot (dimensions, power transmission system, sensors' type and their location, etc.)
- cooperation in the determination of the Lego Mindstorm hardware configuration
- cooperation in the determination of the track's form and shape
- the design of the instruction for the model construction
- construction of the model at students' home school

- writing the control programme and programming the robot by a HU student - the ride of the Line Follower along the track - both students – the development of an algorithm, which will ride along the tracks in the most efficient way
Success criteria: Building a working robot that will complete the designed task – riding through the whole track in the quickest time possible (in relation to the algorithms developed by HU and PL students)
Developed hard skills: Designing the construction of the robot, writing the control programmes, algorithm programming and testing, making changes to improve the robot's efficiency.
Developed soft skills: Communication with other team members, technical and programming problem solving, planning the project work, keeping deadlines

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Lego Robot following the labyrinth exit

Countries:	Hungary	Poland
Suitable for grade:	1 - 2	2 - 3
Specialization:	IT	IT
Responsible teacher:	Csaba Deák	Dariusz Jędrzejek

Project description:

The task consists of two stages:
- The first stage is to agree with the other project teams the design of the robot ("Lego Automatic Parking System" and "Lego Line Follower") - this construction will be the same to each team. Particular emphasis should be placed on the selection of the drive structure, the location of the sensors and the dimensions of the structure.

- The second stage - in this part, the design of the labyrinth scale model and a programme controlling the robot „Lego Automatic Robot following the labyrinth exit" should be created in the first place. The programme should be able to lead the robot to the labyrinth exit.

Project tasks:
Student #1 (PL):

- cooperation with the "Lego Line Follower" and "Lego Automatic Parking System" teams
- cooperation in the design of the robot (dimensions, power transmission system, sensors' type and their location, etc.)
- cooperation in the determination of the Lego Mindstorm hardware configuration
- cooperation in the determination of the scale model's shape and dimensions
- the design of the instruction for the model construction
- construction of the model at students' home school
- writing the control programme and programming the robot by a PL student
- carrying out a test run
- both students – the development of an algorithm, which will complete the task in a most efficient way

Student #2 (HU):

- cooperation with the "Lego Line Follower" and "Lego Automatic Parking System" teams
- cooperation in the design of the robot (dimensions, power transmission system, sensors' type and their location, etc.)
- cooperation in the determination of the Lego Mindstorm hardware configuration
- cooperation in the determination of the scale model's shape and dimensions
- the design of the instruction for the model construction
- construction of the model at students' home school
- writing the control programme and programming the robot by a HU student

- carrying out a test run - both students – the development of an algorithm, which will complete the task in a most efficient way
Success criteria: Building a working robot that will complete the designed task – finding the labyrinth exit in the quickest time possible (in relation to the algorithms developed by HU and PL students)
Developed hard skills: Designing the construction of the robot, writing the control programmes, algorithm programming and testing, making changes to improve the robot's efficiency.
Developed soft skills: Communication with other team members, technical and programming problem solving, planning the project work, keeping deadlines

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Electronic price tag

Countries:	Slovenia	Hungary
Suitable for grade:	3-4	3 - 4
Specialization:	Electrotechnics	Electrotechnics
Responsible teacher:	Rajko Palatin	Sándor Péter

Project description:
Goal is to build a smart parking house with a display which is counting the free spaces in the parking lot and showing where the free spaces are and where they are taken. For the project we needed a base and some electronic components which were: 8 IR sensors (6 of them for the actual parking spaces and 2 of them for the gate), 2 servo motors for the gate, wires to connect all the components, 3D printed parts for the small house and the gates.

Project tasks:
Student #1 (SI):

- Design the base and the 3D printed parts.
- Design the wireing tunnels to run all the connections
- Connect all the wires to the sensors, servos, display and the Arduino microcontroller
- Test the functionality of system

Student #2 (HU):

- Design communication protocol and data format for the microcontroller
- Program the display to show the spaces
- Program the counter for letting in and out cars

Success criteria:
Project will be successful after it assembled and programed to show all the free and all the taken places in the parking lot. Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills:
Programming, debugging, working with 3D printed parts, working with datasheets, soldering, drilling, cutting the base

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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Tesla coil

Countries:	Slovenia	Hungary
Suitable for grade:	3 - 4	3 - 4
Specialization:	Elektrotechnical	Electrotechnical
Responsible teacher:	Darko Oskomič	Peter Sandor

Project description:
Goal is to build a Tesla coil. A Tesla coil is a device which converts a lower voltage in to a higher voltage. It does that by first converting the DC voltage in to an alternating voltage. This is done by using a circuit. The alternating voltage is then applied to the primary which creates magnetic flux. The magnetic flux then induces a voltage in the secondary. Because of the difference in the amount of turns the voltage on the secondary side is much bigger then the primary.

Project tasks:
Student #1 (HU):

- Build the phisycal model of the Tesla coil(primary winding, secondary winding and the toroid)

Student #2 (SI):

- Do the calculations which are involved in making of a Tesla coil

Success criteria:
Project will be successful after construction of a working Tesla coil. The Tesla coil is functional when it emits high voltage. We can test that by powering up the Tesla coil and putting near the output a incondesant light bulb. If the light bulb lights up, without being directly connected to the output, that means we have a working Tesla coil.

Developed hard skills:
Building a transformer with different materials(acrylic, PVC pipe, wood), building a circuit, wire forming, wire wrapping

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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LED cube

Countries:	Slovenia	Hungary
Suitable for grade:	3-4	3 - 4
Specialization:	Electrotechnics	Electrotechnics
Responsible teacher:	Darko Oskomič	Peter Sandor

Project description:
The goal is to create a colourful, programmable LED Cube (RGB LED CUBE), which is capable for visualizing of mathematical shapes, forms, letters, numbers and smaller animations. With the help of a microphone it can function as a 3D signal level measurer and a spectrum analyzer.
LED cube.

Project tasks:
Student #1: to build the hardware part with the use of LEDs (diameter: 5mm WS2812D_F5 type). The size of the cube is 8x8x8, which consists of 512 pieces of RGB LED, with which we can visualize letters, numbers, and forms in 3D.

Student #2: to take part in the programming of a micro-controller (ATMEGA328P) following the wiring plan of the LED Cube.

The source of LED: https://www.tme.eu/hu/details/ws2812d-f5/tht-led.diodak-5mm/worldsemi/

Success criteria:
Project will be successful after it is assembled and programed to show different animations in a 3D space and light in different colours according to the level of sound.

Developed hard skills:
Programming, debugging, CAD systems, design of PCB, soldering

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules, thinking in 3D space

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Intelligent mirror

Countries:	Slovenia	Poland
Suitable for grade:		2 - 3
Specialization:		Mechatronics
Project teacher:		Beata Organ

Project description:

The goal of the project is to build an intelligent mirror, which after detecting a person standing in front of it, will display information such as time, date, weather information, world news, etc. The construction should consist of a monitor placed behind the mirror (a Venetian mirror) and a Raspberry module that performs the function of a control module. The designed construction should be made carefully in accordance with WHS regulations.

Project tasks:

Student #1 (PL):
- cooperation with the SLO student (determining the size of the mirror, orientation – vertical / horizontal, the type and method of displayed information, the method of control - locally or remotely, etc.)
- choice of the LCD monitor and adapting it to the needs of the project
- preparation of a mirror with appropriate dimensions
- construction design with space for all elements (Raspberry Pi, power supply, etc.)
- assembly of a sensor detecting the presence of a person in front of the mirror
- model operations test
- preparation of a manual in Polish and English

Student #2 (SLO):
- cooperation with the PL student (determining the size of the mirror, orientation – vertical / horizontal, the type and method of displayed information
- assistance by the choice of LCD monitor
- selection of a sensor that reacts to the person in front of the mirror
- Raspberry Pi configuration for SSH communication
- software installation
- writing a program that displays information and responds to information from the sensor
- preparation of a manual in Slovenian and English

Success criteria:
The project will be successful when the model of the interactive mirror will perform the assumed functions: information will be displayed in accordance with the assumptions at the moment of detecting the person in front of the mirror.

Developed hard skills: Programming, soldering, drilling, mechanical treatment of materials, computer graphics, computer networks.
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules.

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LED cube

Countries:	Slovenia	Poland
Suitable for grade:		2 - 3
Specialization:		IT or mechatronics
Project teacher:		Beata Organ

Project description:

In this task, a system consisting of two parts must be designed, executed and started:
- a display consisting of LED diodes arranged in the shape of a cube,
- control system - a system based on a microprocessor that performs a display control function.
The effects presented on the LED matrix and the way of control will be determined by the students during the task implementation.

Project tasks:

Student #1 (PL):

- cooperation with the SLO student to determine the details of the task
- design and implementation of an auxiliary tool for cube-shaped LED diodes assembly
- execution of the LED matrix in accordance with the agreements
- preparation of the connector for the control board
- performing the LED cube test
- preparation of documentation in Polish and English

Student #2 (SLO):

- communication with the PL student to determine the details of the task
- designing the pattern and making a printed circuit
- implementation of the LED matrix control system
- programming the microprocessor microcircuit
- preparation of documentation in Slovenian and English

Success criteria:
The task would be completed when the designed patterns will display on the LED Cube. During the project evaluation, the design will take into account the diligence of implementation and the quality of the displayed effects.

Developed hard skills: Programming, debugging, soldering, drilling, PCB designing and making, electronics, working with vacuum components, electronic measurement, working with datasheets, mechanical treatment of materials, choosing materials, computer graphics, CAD systems.
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules.

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Solar sun tracker

Countries:	Slovenia	Poland
Suitable for grade:		2 - 3
Specialization:		Mechatronics
Project teacher:		Marek Olsza

Project description:

Construction of a model containing a solar panel mounted on a system that moves it in the vertical and horizontal axis, enabling optimal setting of the panel to the sunlight. The team's tasks is to design a light sensor which in combination with the microprocessor microcircuit controlling the engines, will automatically and precisely set the panel towards the sunlight. The control system can be executed in analogue, digital or microprocessor technology.

Project tasks:

Student #1 (PL):

- cooperation with the SLO student (determination of construction details – e.g. selection of engines)
- designing the mechanical elements of the model
- construction elements execution (technology: 3D / CNC printing)
- building the model together with the solar panel
- adjustment of the mechanism
- model operation test
- preparation of documentation in Polish and English

Student #2 (SLO):

- cooperation with the PL student (determination of construction details)
- design of the electronic circuit and the light sensor
- making a printed circuit
- control electronics activation
- model testing
- preparation of documentation in Polish and English

Success criteria:
Project will be successful after construction of working model. The model should respond to the angle of sunlight and adjust the mechanism so that the solar panel always founds in the optimal setting.

Developed hard skills: Programming, debugging, soldering, drilling, PCB designing and making, electronics, mechanical treatment of materials, choosing materials, computer graphics, CAD systems.
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules.

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Conveyor belt with possibility of sorting products

Countries:	Czech Republic	Slovakia
Suitable for grade:	3 - 4	3 - 4
Specialization:	Automatic systems	Technical lyceum, Electrotechnics
Responsible teacher:	Václav Sedlák	Jan Lechman

Project description:
The goal is to construct conveyor belt for transport material with possibility of sorting by different parameters. Product will be separated by parameters like metal detection, height detection, weight detection and reflection detection. Sorting starts using of START button on control panel depending on presence of product in initial position of conveyor belt. Sorting is possible to stop with STOP button in every moment of processing time. Full control of the device will be provided by controlling system of PLC AMiT.

Project tasks:
Student #1 (CZ):
- Create program for PLC AMiT, which will control whole process of separation
- Perform a diagnosis of created program and tune up possible problems
- Create interface for connecting to controlled part of conveyor belt device
- Depending on amount of outputs and inputs create connector for communication with controlled part of conveyor belt device
- Write documentation both - in English and Czech language

Student #2 (SK):
- Create construction of conveyor belt
- Place into construction in-built sensors for detection of relevant parameters
- Place into construction actuators for separation of products and signalization
- Depending on amount of outputs and inputs create connector for communication with PLC AMiT
- Prepare product models for each type of detection
- Test detections and actions for smooth implementation of PLC
- Write documentation both - in English and Slovak language

Success criteria:
Project will be successful after construction of working separation line based on conveyor belt, sensors and sorting actuator, that will be able to sort material differed by various properties (height, weight, material, …). Project should also have basic safety elements. All project parts should be cost efficient and controller program should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills: Programming, debugging, making connectors and connections, working with sensors and actuators, electronic measurement, working with datasheets, programming of PLC using ladder schemes or programming language, processing materials, manual work with metal or other materials
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following and applying safety and ergonomic rules

Co-funded by the Erasmus+ Programme of the European Union

Signal generator

Countries:	Czech Republic	Slovakia
Suitable for grade:	3 - 4	3 - 4
Specialization:	IT	Electrotechnics
Responsible teacher:	Ladislav Opiol	Peter Psota

Project description:
Goal of the project is to make signal generator for frequencies up to 5MHz with different shape of signal (sine wave, triangle, saw, …). Generator should have buttons/switch to change signal shape, keyboard to type frequency of signal, potentiometer to regulate signal amplitude and display to check selected values. Project will consist of two modules. First module will be circuit generating signal and second will be control and display.

Project tasks:
Student #1 (CZ):

- Design circuit for signal generator based on DDS chip from Analog Devices company
- Design and make PCB based on prepared circuit
- Prepare connectors for connecting outputs from microcontroller used for display values and read data from keyboard
- Solder parts on PCB and test circuit
- Compare precision of created signal generator to laboratory generators

Student #2 (SK):

- Prepare circuit for controlling generator by keyboard and displaying values on LCD display
- Design and make PCB for controlling module
- Prepare program for microcontroller to read data from keyboard and buttons/switches, send it to DDS chip and display current signal characteristics
- Connect controlling module to generator module

Success criteria:
Project will be successful after construction of working signal generator for max. 5GHz frequencies with various signal shape controlled by microcontroller. Generator should have its values set by keyboard and displayed on LCD display. Project should also follow safety rules according to working with voltage. All project parts should be cost efficient, software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills:
Making connectors and connections, electronic measurement, working with electronic parts, working with datasheets, programming in C, working with microcontroller, CAD systems, design of PCB, mounting, soldering, testing of circuits

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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Voltage meter with web output

Countries:	**Czech Republic**	**Slovakia**
Suitable for grade:	**3 - 4**	**3 - 4**
Specialization:	**IT**	**Technical lyceum, Electrotechnics**
Responsible teacher:	**Ladislav Opiol**	**Michal Copko**

Project description:
The goal is to construct at least four channels voltage meter for voltages 0-30V with possibility to send measured value through internet to the webserver. Voltage meter should have LCD display for local check of measured voltage and Arduino or other microcontroller with Ethernet module to send data through internet. Web application should have interface for starting new measurement, storing measured values and display them through web browser as table or graph (time based or XY-function).

Project tasks:
Student #1 (CZ):
- Design circuit for measuring of four different voltages in ranges 0-30V based on microcontroller
- Design PCB for microcontroller
- Prepare microcontroller program for sending measured values through internet to webserver and display measured values on LCD display
- Test the functionality of voltage meter and compare precision of constructed voltmeter with other voltage meteres with higher precision
- Write documentation bothin English and Czech language

Student #2 (SK):
- Prepare database for storing measurements and their values of four-channel voltage meter
- Prepare webserver and script for receiving data from voltage meter sent by internet
- Create web interface for management of measurements – create new measurement, display data, delete measurement
- Create script for display data in form of table or graph (time based or XY-function)
- Create script for recalculate values from volts (2-channels) to ampers if resistance value is known
- Write documentation bothin English and Slovak language

Success criteria:
Project will be successful after construction of working 4-channel voltage meter with desired precision based on microcontroller with local (LCD) and remote (web) output. Project should also follow safety rules according to working with voltage. All project parts should be cost efficient and software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills: Programming, debugging, making connectors and connections, electronic measurement, working with optoelectronic parts, working with datasheets, programming in C, programming with web languages, working with network protocols, computer graphics, computer networks, CAD systems, design of PCB, soldering
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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RFID system for borrowing keys from reception

Countries:	Hungary	Slovakia
Suitable for grade:	3 - 4	3 - 4
Specialization:	IT	Technical lyceum
Responsible teacher:	Roland Kiss	Michal Copko

Project description:
Goal is to create system based on microcontroller and web interface for borrowing keys of classrooms by teachers from school reception. System should have client station, which is microcontroller based circuit with reader of 125kHz RFID tags and Ethernet and/or WiFi module. Server part will be based on web technologies so it will be platform independent and it's role is to collect tag ID of borrowed key and save the name of teacher/employee, who has the borrowed key.
Optional feature: If time schedule is imported to server, it should suggest the name of borrowing person.

Project tasks:
Student #1 (HU):

- Suggest the process of borrowing keys with RFID system to have as little impact on current borrowing process as possible
- Design circuit for client part of borrowing system
- Design PCB for microcontroller with RFID reader and Ethernet/WiFi module
- Prepare microcontroller program for reading RFID and sending tag ID to server
- Test the functionality of system

Student #2 (SK):

- Suggest the process of borrowing keys with RFID system to have as little impact on current borrowing process as possible
- Prepare database for storing data of borrowed keys
- Prepare script for receiving tag ID of borrowed key and let the receptionist add name of borrowing person
- Prepare report of currently borrowed keys and historical reports based on chosen day
- Optional: Prepare script for importing current schedule (timetable) and suggest name of person borrowing key based on current time and day of week

Success criteria:
Project will be successful after construction of working system for borrowing keys that has attached RFID tags to them and prepare report of borrowing with current and recent borrowed keys. All project parts should be cost efficient and software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills: Programming, debugging, working with RFID technology, electronic measurement, working with datasheets, programming, computer networks and network protocols, working with microcontrollers, CAD systems, design of PCB, soldering
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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User programmable LED cube

Countries:	Hungary	Slovakia
Suitable for grade:	3 - 4	3 - 4
Specialization:	IT	Technical lyceum Electrotechnics
Responsible teacher:	Roland Kiss	Michal Copko

Project description:
Goal is to construct LED cube controlled by microcontroller with displayed pictures programmable by external user. Microcontroller should download displayable data from webserver, SD card or by serial line. Downloaded data will be generated through application that can be web based or local – console/graphical based. Web-based application will generate data through webserver, so LED cube must have Ethernet module to connect to the internet. If application will be local, it will generate text file that will be stored on SD card and readable by microcontroller. Second option of local application is to send generated data by serial line to microcontroller.

Project tasks:
Student #1:
- Design circuit for LED cube controlled by microcontroller with Ethernet module or SD card module
- Design PCB for LED cube
- Prepare microcontroller program for reading data to display on LED cube from internet or SD card or serial line and display them
- Test the functionality of LED cube

Student #2:
- Agree on data format for drawing pictures on LED cube with student #1
- Prepare application where user can draw 3D pictures that will be displayed on LED cube, application will have function to store and load prepared images
- Generate data for LED cube
- Test the functionality of LED cube

Success criteria:
Project will be successful after construction of working LED cube that will display image sent to it through application. All project parts should be cost efficient and software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills:
Programming, debugging, electronic measurement, working with optoelectronic parts, network protocols, working with datasheets, programming, computer graphics, CAD systems, design of PCB, soldering

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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Voltage meter with voice output

Countries:	**Hungary**	**Slovakia**
Suitable for grade:	**3 - 4**	**3 - 4**
Specialization:	**IT**	**Electrotechnics**
Responsible teacher:	**Roland Kiss**	**Peter Psota**

Project description:
The goal is to construct voltage meter for voltages 0-5V and 0-30V with voice output as a tool for visually impaired people. Voltage meter should have LCD display for local check of measured voltage and Arduino or other microcontroller with voice output. After connecting measuring probes to voltage, voltage meter will measure voltage based on selected range (5V/30V) and microcontroller should trigger voice output that will tell user measured voltage with precision of two decimal points. Voice output can be either robotic voice or recorded voice.

Project tasks:
Student #1 (SK):
- Design circuit for measuring voltages in ranges 0-5V and 0-30V based on microcontroller
- Design PCB for voltage meter
- Prepare microcontroller program for sending measured values to display and voice module
- Test the functionality of voltage meter and compare precision of constructed voltmeter with other voltage meteres with higher precision

Student #2 (HU):
- Design circuit for output module displaying measured value of voltage received from other microcontroller and say them in chosen language (SK/HU/EN)
- Design PCB for display and voice output module
- Prepare microcontroller program for displaying received value and tell it
- Test the functionality of output module

Success criteria:
Project will be successful after construction of working voltage meter for two voltage ranges with desired precision based on microcontroller with LCD and voice output. Project should also follow safety rules according to working with voltage. All project parts should be cost efficient and software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills:
Programming, debugging, making connectors and connections, electronic measurement, working with optoelectronic parts, working with datasheets, programming in C, working with audio electronic parts, CAD systems, design of PCB, soldering

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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Lixie Clock

	Poland	Slovakia
Suitable for grade:	**2 - 3**	**3 - 4**
Specialization:	**Mechatronics or IT**	**Electrotechnics**
Responsible teacher:	**Organ Beata**	**Ingrid Kolembusová**

Project description:
Goal of the project is to construct lixie clock that will display the time in the form of HH:MM. Clock will be driven by microcontroller. Whole project will be divided into two parts – display and control.

Project tasks:
Student #1 (PL):

- Prepare program for microcontroller to:
  - realize a 12 or 24-hour clock
  - switches of control
  - control 1 of 10 each digit
  - RTC operation on the battery in the absence of power
- Prepare circuit to send output to display module made by student #2
- Design and make PCB based on circuit
- Test displaying time
- To write documentation in both English and Polish language

Student #2 (SK):

- Design and make display
- Design and make PCB for connecting lights to power source
- Test displaying
- Prepare the circuit to receive data from the display control module made by the student #1
- Interconnect lights PCB with outputs of microcontroller
- To write documentation in both English and Slovak language

Success criteria:
Project will be successful after construction of working lixie clock with displayed. All project parts should be cost efficient and computer code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills: Programming, debugging, soldering, drilling, designing and making PCB, electronics, electronic measurement, working with datasheets, mechanical treatment of materials, choosing materials, computer graphics, CAD systems
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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Robot for painting easter eggs

Countries:	Poland	Slovakia
Suitable for grade:	2 - 3	3 - 4
Specialization:	Mechatronics or IT	Technical lyceum Electrotechnics
Responsible teacher:	Opoka Artur	Jozef Gmiter

Project description:
Goal of the project is to build robot for painting easter eggs based on microcontroller (can be found on internet as EggBot). Whole robot should be similar to CNC turning machine. Robot should have rotation part to which egg will be stucked by its longer axis. Rotation part will rotate the egg in 360°. Other part of robot will hold the marker and can move in horizontal axis (circular motion) with pressing or releasing pen to egg. Robot will be made of two modules – controlling software and mechanical.

Project tasks:
Student #1 (PL):
- Design mechanical part of robot
- Design propulsion system for:
  - Rotate egg around its longer axis of 360°
  - Move pen in semicircle horizontal movement with pressing and releasing
- Test fixing the egg in to rotational part and function of all motors

Student #2 (SK):
- Prepare application for processing graphical file (e.g. SVG) into commands file for robot
- Prepare application for microcontroller for sending signal based on graphical commands to motor drivers
- Prepare testing patterns for painting easter eggs
- Test painting algorithm on robot

Success criteria:
Project will be successful after construction of working robot that will paint custom patterns on egg without damaging it. All project parts should be cost efficient and computer code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills:
Programming, debugging, soldering, drilling, designing and making PCB, electronics, mechanical treatment of materials, choosing materials, computer graphics, CAD systems.

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules.

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Word Clock

Countries:	Poland	Slovakia
Suitable for grade:	2 - 3	3 - 4
Specialization:	Mechatronics or IT	Technical lyceum Electrotechnics
Responsible teacher:	Olsza Marek	Michal Copko

Project description:
Goal of the project is to construct word clock (you can find picture on the internet) that will display the time as words in two languages – one side Polish and another side Slovak. Clock will be driven by microcontroller and synchronized with internet through NTP protocol. Clock should have RTC module to store the time if internet synchronization is not available and also serial (or web) interface to set up initial time, timezone and NTP time server. Whole project will be divided into two parts – display and control.

Project tasks:
Student #1 (PL):
- Design and make case (panel) of word clock for two languages – Polish and Slovak (SK in cooperation with a Slovak student)
- Prepare circuit for switching LED stripe/LEDs/bulbs under the words
- Design and make PCB for connecting lights to power source
- Test displaying time in two languages
- Interconnect lights PCB with outputs of microcontroller

Student #2 (SK):
- Prepare program for microcontroller to:
  - get data from NTP server and synchronize time with local RTC module
  - set time through serial line or internet
- Prepare circuit to send output to display module made by student #1
- Design and make PCB based on circuit
- Test displaying time

Success criteria:
Project will be successful after construction of working two-languages word clock that will display time in word form (e.g. quarter to six p.m.) synchronized by internet or locally set. All project parts should be cost efficient and computer code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills:
Programming, debugging, soldering, drilling, designing and making PCB, electronics, mechanical treatment of materials, computer graphics, computer networks, CAD systems.

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules.

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Electronic price tag

Countries:	Slovenia	Slovakia
Suitable for grade:	3 - 4	3 - 4
Specialization:	IT, Electronics	Technical lyceum Electrotechnics
Responsible teacher:	Igor Kutoš	Michal Copko

Project description:
Goal is to build electronic price tag that will display name and price of goods in the shop. Price tag should be energy efficient, small and updatable by NFC, Bluetooth or WiFi. One part of project is to build display controlled by microcontroller with LCD, OLED or eInk display that have NFC, Bluetooth or WiFi module to update information displayed on tag. Second part is system for preparation of information that will be displayed on tag (name, price, tax, …) and upload of these information to tag.

Project tasks:
Student #1 (SK):

- Design circuit for display part of tag controlled by microcontroller with NFC, Bluetooth or WiFi module
- Design PCB for microcontroller with connected display and communication module
- Prepare microcontroller program for reading data from application through NFC, Bluetooth or WiFi and showing them on display
- Test the functionality of system

Student #2 (SI):

- Design communication protocol and data format for sending into price tag
- Prepare application for sending data to price tag through NFC, Bluetooth or send it to server, from which can price tag download information through WiFi
- Application can be programmed for smartphone or webserver
- Test the functionality of system

Success criteria:
Project will be successful after construction of working electronic price tag that will display price and name of article in shop with possibility to display other information (category, expiration …) in which information will be provided wirelessly. Project should also follow safety rules according to possibility of placement in moist area (near vegetables or fridges). All project parts should be cost efficient and software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills:
Programming, debugging, working with wireless technology, electronic measurement, working with optoelectronic parts, working with datasheets, programming, working with network protocols, computer graphics, computer networks, CAD systems, design of PCB, soldering

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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Programmable robot for kids

Countries:	Slovenia	Slovakia
Suitable for grade:	3 - 4	3 - 4
Specialization:	IT, Electronics	Technical lyceum Electrotechnics
Responsible teacher:	Dominik Letnar	Jozef Gmiter

Project description:
Goal of this project is to build simple robot for kids that can be programmable by kids. On the top of the robot will be programming area with holes. Kids can put objects/bricks (e.g. colored cubes, cards, sticks,…) in these holes and depending on inserted brick robot make its movement (forward, backward, turn left/right, beep, blink, …). Robot will be ran on batteries and it should be safe for kids (no very small parts, moderate movements,…). Similar robot can be found on youtube finding Cubetto.

Project tasks:
Student #1 (SI):

- Design mechanical part of robot (case, wheels, gears)
- Design propulsion of robot motors and motor drivers
- Assembly mechanical parts and motors
- Test robot movements

Student #2 (SK):

- Design bricks for programming robot
- Design PCB for microcontroller and circuits for reading brick properties
- Prepare application for microcontroller that will read brick properties and depending on program built of bricks make desirable movements
- Program should run in two modes – loop and one-time
- Connect microcontroller outputs to propulsion part of robot
- Test robot programming

Success criteria:
Project will be successful after construction of working robot following the commands created by bricks or another objects to follow some path or proceed simple tasks. Project should also follow safety rules according to its usage by small kids. All project parts should be cost efficient and software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed soft skills:
Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules

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System for feedback of school lunches

Countries:	Slovenia	Slovakia
Suitable for grade:	3 - 4	3 - 4
Specialization:	IT, Electronics	Technical lyceum Electrotechnics
Responsible teacher:	Rajko Palatin	Michal Copko

Project description:
Goal is to build system for feedback of school lunches, that will consists of two parts – voting terminal and server collecting and displaying data. Voting terminal should have buttons for feedback (positive, neutral, negative) and light for showing that vote was accepted. Server part will have database for collecting data and part for displaying results as table or graph. System should limit or avoid fake votes (e.g. if one student will vote multiple times).

Project tasks:
Student #1 (SI):

- Design circuit for voting part of feedback system
- Design PCB for microcontroller with connected buttons (or other input method) and Ethernet/WiFi module
- Prepare microcontroller program for reading student response, send it to server and show that vote was successfully accepted
- Test the functionality of system

Student #2 (SK):

- Prepare database for storing data of votes
- Prepare script for receiving vote, send it to the database and respond with successful or unsuccessful writing to the database
- Prepare website for displaying results of votes for this day and days in past

Optional:

- Voting terminal can have display (LCD display, RGB LED, LED bar, …) to show average results
- Web results can download name of meal from canteen menu website

Success criteria:
Project will be successful after construction of working voting system that will accept students votes for lunches, store them in database and display results in user friendly interface. Project should also follow safety rules according to possibility of placement in moist area (steamy environment). All project parts should be cost efficient and software code should be well designed (time and memory efficient, without bugs). Project documentation has to be prepared based on given template in the range of 15-25 in English and native language.

Developed hard skills: Programming, debugging, electronic measurement, working with optoelectronic parts, working with datasheets, programming, working with network protocols, computer graphics, computer networks, CAD systems, design of PCB, soldering, using encryption and/or data integrity check
Developed soft skills: Cooperation, working with computer, planning, teamwork, tracking progress, communication in foreign language, responsibility, compliance with agreements, respect deadlines, problem solving, finding and processing information, design thinking, following safety and ergonomic rules