Ontinental⅄

The Future in Motion

SUMMER PRACTICE PROJECTS 2024 IAȘI

LET
YOUR
IDEAS
SHAPE
THE
FUTURE

THE SELECTION PROCESS

1. APPLICATION

Fill out the application form available [here](). Please include your top 3 projects (available in this brochure) to which you would like to contribute during the summer internship.

2. TECHNICAL TEST AND DISCUSSION

According to the top 3 projects selected in your application, you will be invited to a technical test. Next step after that is a technical discussion based on the "knowledge must have" and "knowledge nice to have" sections, included in the project descriptions.

3. HR DISCUSSION

Following the technical discussion and depending on the feedback, you may be invited to a meeting with our HR colleagues, to get to know each other and further discuss the next steps.

>> The projects included in this brochure require different times to be implemented and may involve the student's availability from 4 to 8 hours/day, 5 days/week. Thus, the required time and availability will be established individually for each project, during the HR discussion.

THE TIMELINE

WHEN?	WHAT?
February 26th, 2024	Launching Summer Practice projects
February 26th, 2024 – March 22nd, 2024	Open Applications*
April 01st, 2024 – April 05th, 2024	Validation & Project Allocation**
April 8th, 2024 – May 24th, 2024	Technical & HR discussions
May 27th, 2024 – June 28th, 2024	Final results & Contract Signing
July 2024 – September	Summer Practice 2024

* Students in second year or higher can apply.

** Places are limited. If the number of applicants will exceed the number of allocated spots, a pre-selection will be made based on grades in the previous study year.

PROJECTS

CONTENTS

SOFTWARE DEVELOPMENT

SYSTEM TESTING

SYSTEM ENGINEERING

HARDWARE ENGINEERING

MECHANICAL ENGINEERING

SOFTWARE

RC CAR

PROJECT DESCRIPTION

Develop a functional Embedded Car using Atmega328 microcontroller and a raspberry pi 4.
The goal is to program the uC using the datasheet and C programming language and also to program the raspberry using Python.

MAIN RESPONSIBILITIES
- Project documentation
- Setup design
- Create the application code
- Testing the functionality

KNOWLEDGE MUST HAVE
- Medium knowledge of C programming language
- Medium knowledge of Python programming language
- Medium uC knowledge
- Minimum Electrical knowledge skills

KNOWLEDGE NICE TO HAVE

SELF-DRIVING TOY CAR USING JETSON NANO

PROJECT DESCRIPTION

Self-driving toy car using Jetson Nano and Arduino. Car will be able to map the surrounding space to find requested objects and return to starting point.

MAIN RESPONSIBILITIES
- Build the system
- Program Jetson Nano and Arduino
- Train the Jetson Nano to avoid obstacles and to detect requested objects

KNOWLEDGE MUST HAVE
- Language programming C

KNOWLEDGE NICE TO HAVE

DATA ACQUISITION MODULE

PROJECT DESCRIPTION
Program a microcontroller(Arduino/ESP) for measuring and transmitting current signals to other devices via CAN BUS.

MAIN RESPONSIBILITIES
- Understood requirements and develop a solution.
- Programming a Microcontroller using any programming language (C, C++, Python, Arduino...)
- Create a hardware and user interface for the application.

KNOWLEDGE MUST HAVE
- Basic programming with at least one software programming language.
- Basic Electronics knowledge
- Good communication and teamwork abilities
- Self-motivated with passion for learning and a strong willingness to take on new challenges

KNOWLEDGE NICE TO HAVE
- Basic Object Oriented Programming
- Basic understanding of version control systems, such as Git
- Knowledge about data transport protocol (CAN, Flexray, etc)

4 CORNERS AIR SUSPENSION FOR A MODEL CAR

PROJECT DESCRIPTION
Creating an air suspension system using 4 dampers.

MAIN RESPONSIBILITIES
- Project documentation
- Setup design
- Create the application code
- Testing the functionality

KNOWLEDGE MUST HAVE
- C embedded

KNOWLEDGE NICE TO HAVE

CLOUD INFRASTRUCTURE FOR CONFIGURATION MANAGEMENT SYSTEMS

PROJECT DESCRIPTION
Deploy cloud infrastructure for hosting an Android mirror inside a configuration management system.

MAIN RESPONSIBILITIES
- Install all the needed packages and tools required
- Debug performance issues and ensure availability of the setup
- Implement and automate weekly mirrors to ensure the mirror's content consistency
- Perform stress tests for SSH stability

KNOWLEDGE MUST HAVE
- Linux
- Experience with versioning systems such as Gerrit or GitHub
- Debugging skills

KNOWLEDGE NICE TO HAVE
- Python, Git
- Bash, Groovy
- Jenkins or similar tool experience

REPORTING WEB APPLICATION

PROJECT DESCRIPTION
Web Application for displaying projects dashboards of current status and future predictions.

MAIN RESPONSIBILITIES
- Develop the application following the implementation plan, created by the mentor and project coordinator
- Debug performance issues and optimize loading times by using parallelism
- Create unit-tests and execute them
- Make the application run inside a docker container

KNOWLEDGE MUST HAVE
- Docker (basic knowledge)
- Experience with versioning systems such GitHub
- Debugging skills
- Python

KNOWLEDGE NICE TO HAVE
- Knowledge about multithreading/multiprocessing
- Bash
- Basic knowledge about python web frameworks like Flask or Django
- Unit testing

DECENTRALIZED COMMUNICATION SYSTEM FOR VEHICLE SYSTEMS

PROJECT DESCRIPTION
There are different components in the car that need to communicate with each other (sensors, brakes, user interface, driver assistance, autonomous braking, etc.). You will create a system where each of these can send and receive information to all the others. The system will not be affected if any of the components encounters an error and crashes.

MAIN RESPONSIBILITIES
- Familiarize yourself with the used technologies (Python, sockets, threads/processes)
- Implement decentralized input and output between components
- Test resulting implementation

KNOWLEDGE MUST HAVE
- Intermediate programming & algorithms

KNOWLEDGE NICE TO HAVE
- Python experience
- Git / Github experience
- Experience working with sockets
- Experience with threads/processes

VIDEO STREAMING OVER ETHERNET

PROJECT DESCRIPTION
The idea of the project is to receive data from one or more cameras connected via ethernet and to analyze how data gets transferred.

MAIN RESPONSIBILITIES
- Connect single/multiple camera and acquire video data
- Configure camera parameters
- Study the communication protocol and analyze its performance in terms of speed, data loss using a dedicated tool
- Tune the data acquisition process so that specific performance indicators are being met

KNOWLEDGE MUST HAVE
- Medium knowledge of C or C++
- Medium knowledge of OOP
- Basic knowledge of GIT
- Basic knowledge of OpenGL
- Interested in discover and learn new things

KNOWLEDGE NICE TO HAVE

OBJECT RECOGNITION SYSTEM

PROJECT DESCRIPTION
Develop an object recognition system using AI and Raspberry Pi.

MAIN RESPONSIBILITIES
- Get acquainted with ML (Machine Learning) & CV(Computer Vision) topics
- Analyse and compare different object detection neural networks
- Develop the image acquisition program
- Gather data & train a neural network for object recognition
- Integrate the trained neural network into the image acquisition program

KNOWLEDGE MUST HAVE
- Advanced Python programming skills
- Basic knowledge about LINUX
- Basic electronics knowledge
- Proficient in English

KNOWLEDGE NICE TO HAVE
- Basic image processing knowledge
- Previous experience with working on a development board

CNC FOR PCB PROTOTYPING

PROJECT DESCRIPTION
Create a CNC machine to be used for fast prototyping of custom PCB. The hardware part is mostly available and it has been used and also integrated into the project. The mechanical part is completely redesigned and usable. We need to create the software interface to control the CNC. At the end it is expected that CNC will be ready to create unique PCB, based on the imported files in the application.
All the software will be hosted and will be running on a raspberry pi unit (debian based OS).

MAIN RESPONSIBILITIES
- Design and create the software interface
- Assembly the existing electronics and mechanical components
- Support the integration between mechanical, hardware and software parts

KNOWLEDGE MUST HAVE
- Good knowledge in programming
- Basic knowledge in electronics
- Practical hands-on

KNOWLEDGE NICE TO HAVE
- Previous project based on r-pi
- Projects that required to implement electronics, mechanical parts and software hands-on abilities and been able to adapt to the quick changes in project design Linux (usage and coding)

REMOTELY CONTROL POWER ON/OFF BUTTON OF DESKTOP PC

PROJECT DESCRIPTION
Build a system that is able to power on/off a Desktop PC remotely by using: mini electromagnet to simulate the button press USB switchbox (relays) to control the electromagnet Raspberry pi accessible from network which controls USB switchbox relays.

MAIN RESPONSIBILITIES
- Develop application on Raspberry PI that can communicate with an FTDI device (switchbox) to be able to control an electromagnet which can press/release a button.
- Raspberry PI should be accessible in the internal Continental network to be able to control the button without physically presence in the testbench room.

KNOWLEDGE MUST HAVE
- C/C++ Application
- Linux OS

KNOWLEDGE NICE TO HAVE
- Networking

OMA-DM SERVER

PROJECT DESCRIPTION
Create a backend implementation for a server based on the OMA-DM standard that would be used to serve various internet enabled hardware components with software update packages. Ex: Telematic Control Unit, Head-Unit.

MAIN RESPONSIBILITIES
- Understand OMA-DM standard, write and implement requirements, test implementation.

KNOWLEDGE MUST HAVE
- C/C++, OOP

KNOWLEDGE NICE TO HAVE
- MySQL, XML, Python, Javascript

PRACTICAL AND THEORETICAL STUDY WITH DIFFERENT CONFIGURATIONS OF DC-DC CONVERTORS (BUCK , RESONANT BOOST)

PROJECT DESCRIPTION
Enhance the existing Automated Interviewing Tool to streamline the interview process.
The upgraded system will automatically check the availability of interviewers, analyze attendance statistics, and intelligently select and assign interviewers for the next interviews. This improvement aims to optimize the allocation of resources, ensuring efficient and effective interview sessions. The project involves integrating smart algorithms to make informed decisions about interviewer availability and assignment, ultimately enhancing the overall functionality and productivity of the Automated Interviewing Tool.

MAIN RESPONSIBILITIES
- Implement scalable solutions to enhance the tool's long-term effectiveness
- Develop the tool using the chosen programming language
- Make decisions and select the best technical solutions to address the challenges encountered during the project
- Work and learn from highly experienced and skilled mentors
- Work with a fun and dynamic team

KNOWLEDGE MUST HAVE
- Basic knowledge: C++, Python, MySQL
- Creativity
- Eagerness to learn

KNOWLEDGE NICE TO HAVE
- Good knowledge in C++, python, Javascript, MySQL

ARCHITECTURE FINDER TOOL FOR A DRIVING FUNCTION BASED ON ARTIFICIAL INTELLIGENCE (NLP)

PROJECT DESCRIPTION
The proposed project is related to a tool/ web application where a system architect can introduce text based data about a driving function (e.g. Traffic Jam Assist) and a reference architecture with the needed blocks shall be generated automatically.
The Artificial Intelligence algorithm is based on NLP techniques/ models.

MAIN RESPONSIBILITIES
- Analyze the requirements and system architecture
- Create the AI based algorithm
- Train models for text classification, test similarities
- Deploy end point for web service
- Model performance evaluation
- Hold a live demo on project data

KNOWLEDGE MUST HAVE
- Python (Restful end point)
- Basic AI/ML knowledge

KNOWLEDGE NICE TO HAVE
- TensorFlow, PyTorch, NLP

FUNCTION TESTING - PYTHON BASED REQUIREMENTS SIMILARITY TOOL THAT CAN BE USED TO GROUP REQUIREMENTS BASED ON FUNCTIONALITY

PROJECT DESCRIPTION
Requirement similarity tool that can be used to analyze all requirements within a project and group them based on functionality in order to provide an improved method of assigning test tasks, the main emphasis being that in order to better test a SW functionality it is necessary to understand the entire implementation of that functionality. The application will consist of the analysis algorithm used for classification and a user interface that can be used to filter the analysis results.

MAIN RESPONSIBILITIES
- Implement a requirement database analysis tool based on Python
- Implement a test similarity machine learning algorithm (e.g. Semantic cosine similarity)
- Implement a user interface for the requirements analysis tool

KNOWLEDGE MUST HAVE
- B Python
- SQL

KNOWLEDGE NICE TO HAVE
- HTML

PROJECT METRICS FOR BUSINESS INTELLIGENCE USING PYTHON AND POWERBI

PROJECT DESCRIPTION
Extract relevant data from different sources: excel files, reports, Jira, etc.
Modeling of data and prepare it for visualization.
Generate reports in PowerBI in real-time.

MAIN RESPONSIBILITIES
- Design and develop appropriate solutions in Python (and not only)
- Display data in a consistent format in PowerBI
- Optimize and automate the solutions as much as possible

KNOWLEDGE MUST HAVE
- Python
- GIT
- Data Structures
- Algorithmically thinking

KNOWLEDGE NICE TO HAVE
- PowerBI

STB - SILENT TESTING BACKEND

PROJECT DESCRIPTION
Create backend simulator for different outside of the vehicle communication and storage.

MAIN RESPONSIBILITIES
- Understand Continental processes phases like: requirements analyze, architecture, design description, implementation and testing
- Implementing the solution in collaboration with Summer Practice Coordinator
- Work in Agile processes with latest environments

KNOWLEDGE MUST HAVE
- Good analytical thinking in problem solving
- Good knowledge of OOP (C/C++)
- Linux scripting

KNOWLEDGE NICE TO HAVE
- Networking

STATISTICS & ANALYTICS FRAMEWORK

PROJECT DESCRIPTION
User will provide an initial set of data and will select the possible metrics provided by the tool.
The input can be an excel file or .csv.
Features:
- preprocess data (for example, normalize it or in case of different units of measurement, bring the data to same units)
- generate plots based on data
- ability to store the results or export in various formats
- Graphical User Interface for making the usage easier
- possible API for further usage of some modules in other applications

MAIN RESPONSIBILITIES
- Understand Continental processes phases like: requirements analyze, architecture, design description, implementation and testing
- Implementing the solution in collaboration with Summer Practice Coordinator
- Work in Agile processes with latest environments

KNOWLEDGE MUST HAVE
- Python
- OOP
- Basic math knowledge

KNOWLEDGE NICE TO HAVE
- PyQT
- Statistics knowledge

REQUIREMENT TRACEABILITY CHECKER

PROJECT DESCRIPTION
Check if the requirements are up to date for SDD, MTS and Code compared to DOORS maturity status

MAIN RESPONSIBILITIES
- Understand the requirements
- Create the application code
- Testing the application for an ongoing project

KNOWLEDGE MUST HAVE
- Medium knowledge of C programming language
- Medium knowledge of Python programming language

KNOWLEDGE NICE TO HAVE
- Experience in building software projects

LIGHT FUNCTIONALITY CONTROL FROM LINUX ENVIRONMENT (RASPBERRY PI)

PROJECT DESCRIPTION
Main target of project will be to create a C application in Linux environment which will control the regulator chip drivers which will power LED strings. Application will use generic drivers developed inside in Continental. Each driver will be compiled as dynamic library and should be loaded dynamically in application based on provided configuration. Integrate CAN communication in Linux environment used for having control of application from PC simulation.

MAIN RESPONSIBILITIES
- Develop Linux application in C
- Understood how are working dynamic libraries in Linux
- Use provided testbench to test the application
- Learn CAN communication bus

KNOWLEDGE MUST HAVE
- Basic Linux
- Basic embedded systems
- C programming language

KNOWLEDGE NICE TO HAVE
- Linux dynamic library programming
- Embedded communication protocols (I2C, SPI, CAN)

MASTER MATCH

PROJECT DESCRIPTION

The goal of the project is to create an application that will connect those who have knowledge about certain software tools / hardware equipment / have specific knowledge in certain areas (like "experts") with those who need information about the tool. In addition to the „experts", we will be able to find answers to certain questions using the database that stores errors and possible solutions to that error. Also, the application will be useful for newcomers, because the application aims to offer an easy-to-use skill development solution that allows the users to assess their skills, choose their trainings and allows management to schedule short courses according to users profile, availability and skills.

MAIN RESPONSIBILITIES

- Planning
- Concept development
- Develop application
- Testing and functionality

KNOWLEDGE MUST HAVE

- Web programming skills
- OOP
- Database design and management
- Good communication and teamwork skills
- User Interface Design

KNOWLEDGE NICE TO HAVE

- Mobile application development skills

SYSTEM TESTING

ARTIFICIAL INTELLIGENCE FOR BIGDATA TEST RESULTS ANALYTICS

PROJECT DESCRIPTION
Using machine learning and AI for big data analytics in test results to determine issues that appear during automotive products life time testing.

MAIN RESPONSIBILITIES
- Identify and research possible existing market solutions that overs our requirements
- Create, define and manage requirements with a global international team
- Create a proof of concept and pilot it on a project

KNOWLEDGE MUST HAVE
- Artificial Intelligence (Machine Learning), Azure, PowerBi, Python, mySQL, LabVIEW, C/C++, C#, python

KNOWLEDGE NICE TO HAVE

TEST EXECUTION MONITORING & ERROR NOTIFYING TOOL

PROJECT DESCRIPTION
The main goal of the project is to adapt and integrate an API within the existing test framework capable of notifying the test equipment operator/user of the error`s that occurred. (The notifications must contain relevant information such as: test cycles, ECU conditions (voltage level, temperature, humidity..) during test execution. All the conditions are obtained by interacting with different equipment).

MAIN RESPONSIBILITIES
- Research best fit solution to bundle notification data together and methods to notify users
- Define operator/user notification template (containing relevant information's)
- Develop an API in a known programming language (LabVIEW, C/C++, C#, python)
- API Integration within the test framework

KNOWLEDGE MUST HAVE
- LabVIEW, C/C++, C#, python

KNOWLEDGE NICE TO HAVE

system testing

EQUIPMENT CONFIGURATION TOOL

PROJECT DESCRIPTION
GUI allowing configuration of test equipment, basic calculations for load parameters, simulating in a visual manner the final placing of resistors on heatsinks and generate assembly documentation for the manufacturing of the equipment.

MAIN RESPONSIBILITIES
- Develop the application, implement and test the GUI according to specifications and requirements provided, expand specifications by reviewing the product with the stakeholders of the project.
- Ensure scalable product for future add-ons

KNOWLEDGE MUST HAVE
- Basic electronics like conceptual calculus for power dissipation, current, voltage, resistance.
- Object oriented programming skills, C++/C#/Python.

KNOWLEDGE NICE TO HAVE
- Graphical User Interface
- Graphical design

POWER STORAGE THROUGH FLYWHEEL INNOVATION

PROJECT DESCRIPTION
Dive into the world of renewable energy storage as you design, build, test, and optimize a flywheel system capable of storing and releasing energy efficiently. Join us in shaping the future of sustainable technology and contribute to a cleaner, greener tomorrow.

MAIN RESPONSIBILITIES
- Research and Planning
- Design and Modeling
- Build prototypes of the flywheel
- Testing and Optimization
- Data Collection and Analysis
- Documentation
- Prepare and deliver presentations

KNOWLEDGE MUST HAVE
- Mechanical Engineering Skills:
    Understanding of mechanics and dynamics.
    Understanding of kinetic and potential energy.
    Knowledge of rotational motion and angular momentum.
- Electrical Engineering Skills:
    Basic electrical circuit knowledge.
    Understanding of power systems and energy storage principles.
    Ability to work with motors and generators.
- Programming and Control:
    Basic programming skills for system control and monitoring.

KNOWLEDGE NICE TO HAVE
- Hands-On and Practical Skills:
    Experience in using tools and equipment for fabrication.
    Experience in assembling and testing mechanical systems.
- Problem-Solving Abilities:
    Critical thinking skills to address challenges and optimize the system.
    Troubleshooting skills for diagnosing and resolving issues.
- Safety Awareness:
    Understanding and adherence to safety protocols during experimentation and fabrication.

system testing

AUTOMATED SCANNER FOR EQUIPMENT

PROJECT DESCRIPTION
The goal of this project is to develop a tool capable of scanning for equipment and licenses within a local network. This tool will provide detailed information about the networked assets, enhancing management and monitoring capabilities.

MAIN RESPONSIBILITIES
- Understand the concept and scope
- Develop the graphic design of the application
- Implement an interface which will access a database and will deliver needed information (e.g.: details about an equipment or a license which is connected into a computer)
- Store the information received automatically into a document
- Decide on the technologies and development tools (e.g., C#, Java, Python).
- Ensure application works as expected

KNOWLEDGE MUST HAVE
- Networking principles and practices.
- Proficiency in C# programming.
- Excel for data management and reporting.

KNOWLEDGE NICE TO HAVE
- Familiarity with Vector products and tools (desirable, but not mandatory).

QUICK SCAN APP

PROJECT DESCRIPTION
Inventory management application, allowing users to easily track and manage a specific type of items.
The application should support scanning items using a device and provide access to the database for efficient tracking.

MAIN RESPONSIBILITIES
- Analyze similar applications to identify unique features or improvements
- Create initial sketches and wireframes for the user interface
- Develop the graphic design of the application
- Decide on the technologies and development tools (e.g., C#, Java, Python)

KNOWLEDGE MUST HAVE
- Programming skills
- Analytical Skills
- Good communication and teamwork skills
- User Interface Design
- Problem solving / Critical Thinking

KNOWLEDGE NICE TO HAVE
- Mobile Application Development skills
- Database Design and Management (ability to design and manage a database)
- Graphic Design

system testing

TEST AUTOMATION FRAMEWORK BASED ON NLP(NATURAL LANGUAGE PROCESSING)

PROJECT DESCRIPTION
Create automatic tests patterns or tests cases based on product requirements using NLP.

MAIN RESPONSIBILITIES
- Project documentation
- Create the application code
- Use (NLP) Techniques: Logistic regression, Naive Bayes, Decision trees
- Data preprocessing: Stemming and lemmatization, Sentence segmentation, Stop word removal, Tokenization
- Testing the functionality

KNOWLEDGE MUST HAVE
- Basic programming with at least one software programming language.
- Basic Electronics knowledge.
- Good communication and teamwork abilities.
- Algorithmically thinking

KNOWLEDGE NICE TO HAVE
- Basic Object Oriented Programming(Python)
- Knowledge about data transport protocol (CAN etc.)
- Knowledge about NLP
- Knowledge about using AI algorithm(Machine Learning etc.)
- Knowledge about testing techniques

system testing

SYSTEM ENGINEERING

IRON MAN MASK

PROJECT DESCRIPTION
A mask inspired by the movie iron man printed from scratch, controlled by Arduino`s voice recognition sensors, with visual effects due to programmed LEDs

MAIN RESPONSIBILITIES
- Create the 3D model of mask, print and assemble it
- Create the electric diagram
- Program the Arduino

KNOWLEDGE MUST HAVE
- 3D modeling
- Basic Programming (C, C++, Arduino)
- Basic electronics

KNOWLEDGE NICE TO HAVE
- Fusion360
- Microcontrollers

CONTROL OVER CAN INTERFACE FOR A MOTOR CONTROL DEVELOPMENT KIT

PROJECT DESCRIPTION
Project should loop around the S32K144 development board with motor control additional HW.
The reference signals for the control loops should be sent over a CAN Interface from a server (PC) to the local ECU (S32K144).
CAN interface should be designed. For easy usage, a GUI should be designed in MATLAB App Designer.

MAIN RESPONSIBILITIES
- Design the CAN interface (physical and SW layer - Matlab) for connecting the Server (PC) and the development kit
- Design a GUI in Matlab App Designer for generating the commands sent over CAN
- Understand the already existing control chain for the BLDC/PMSM control algorithm
- Measure in real time the system signals and provide a report of the system performances

KNOWLEDGE MUST HAVE
- Electronics - Level - Medium
- SW programming - Level- Medium
- Matlab (Simulink) - Level - Medium
- CAN Communication - Level - Basic

KNOWLEDGE NICE TO HAVE

system engineering

AI USED IN SYSTEMS TUNING FOR CONTROL APPLICATIONS IN MATLAB

PROJECT DESCRIPTION
Search for different AI algorithms which can be used to estimate parameters for system control applications.

MAIN RESPONSIBILITIES
- Identify potential use-cases of using AI in System Control applications
- Select appropriate use cases for Continental applications
- Implement the chosen use cases
- Verify results

KNOWLEDGE MUST HAVE
- Advanced SW
- Learning Algorithms
- Control System Theory
- Mathematics

KNOWLEDGE NICE TO HAVE

IMPLEMENTATION OF ROTOR POSITION SIGNAL CHAIN FOR A BLDC USING MODEL BASED DEVELOPMENT TECHNIQUES

PROJECT DESCRIPTION
The motor position signal chain is a critical component for the safety of the brake system. Nowadays, SW development is accelerated by model-based development techniques. The purpose of this project is to implement the motor position signal chain for a BLDC used in braking systems on a digital signal processor using model-based development methods. As a reference, we will use the signal chain implemented in C code.
The expected project outcome is a MATLAB model of the sensor processing chain and a prototype that will execute the algorithm in real time.

MAIN RESPONSIBILITIES
- Prepare hardware - wiring of the control board with the inverter
- Design and implementation in Simulink of the signal processing chain for rotor position and control strategy of a BLDC used in braking systems
- Provide Model-in-the-loop and Software-in-the-loop files and simulation results
- Prepare model for code generation and deployment on DSP target
- Provide test results

KNOWLEDGE MUST HAVE
- Microcontrollers- architecture, peripherals
- Matlab-Simulink - knowledge of signal processing and control; Ability to use and design systems in Matlab-Simulink
- Hardware basic understanding - digital electronics; analog electronics - ability to apply basic analog electronics theory - Ohm law, Kirchhoff, design first order, second order low, high pass filters
- Basic knowledge of power electronics: e.g. voltage source inverters, DCDC

KNOWLEDGE NICE TO HAVE
- Knowledge of PWM commutation techniques for power inverters
- Advanced knowledge of signal processing: e.g., Kalman filtering, particle filtering, etc.
- Advanced knowledge of system control: e.g., robust, adaptive, model predictive control, etc.

system engineering

HARDWARE ENGINEERING

SNAKE GAME ON FPGA WITH VGA INTERFACE

PROJECT DESCRIPTION
Creating the snake game on FPGA using VHDL / Verilog, or digital electronics. The snake shall be visible on a monitor connected directly to the FPGA development board by VGA / HDMI and the snake is controlled using an external push button matrix connected to FPGA

MAIN RESPONSIBILITIES
- Develop the design using VHDL/Verilog in Vivado
- Create the snake working algorithm
- Create the VGA / HDMI interface

KNOWLEDGE MUST HAVE
- Basic electronics
- FPGA
- HDL

KNOWLEDGE NICE TO HAVE

SOLAR CHARGER FOR CAR BATTERIES

PROJECT DESCRIPTION
Solar battery chargers are devices that extract energy from the sunlight to produce electricity for charging car batteries.

MAIN RESPONSIBILITIES
- Creating the design architecture
- Creating the schematic , layout, functional prototype
- Electrical tests

KNOWLEDGE MUST HAVE
- Analog circuits
- SMPS topologies
- Microcontroller

KNOWLEDGE NICE TO HAVE
- PCB design
- EDA tools: KiCAD, Eagle

hardware engineering

MATRIX TAIL LIGHT WITH SHORT MESSAGES

PROJECT DESCRIPTION

Controlling a multiplexed display with a microcontroller board based on user input and predefined text messages.

MAIN RESPONSIBILITIES

- Learn how to use a micro-controller board
- Create an Arhitecture and a schematic
- Develop the Software Program

KNOWLEDGE MUST HAVE

- Basic electronic theoretical knowledge
- Basic ability to work with microcontrollers
- Basic C++ knowledge
- Knowing how to connect a dome switch and a relay to a launchpad GPIO pin

KNOWLEDGE NICE TO HAVE

- Basic soldering skills it's considered a plus

AUTOMOTIVE ELECTRONIC DEVICE CHARGER

PROJECT DESCRIPTION

Create an electronic device charger which can charge wirelessly your phone and can be mounted / used in a car.

MAIN RESPONSIBILITIES

- Creating architecture
- Creating schematic design
- Creating layout
- Testing PCB

KNOWLEDGE MUST HAVE

- Basic electronics
- Basic ability to work with microcontrollers
- Understanding a datasheet

KNOWLEDGE NICE TO HAVE

- Basic experience with electronic projects
- Basic soldering skills
- Basic 3D modelling

hardware engineering

ARDUINO TRAFFIC LIGHTS CONTROL

PROJECT DESCRIPTION
The traffic light controller will be used to control flow of cars on 4 way road junction.

MAIN RESPONSIBILITIES
- Creating an HW / SW architecture
- Creating a schematic
- Creating a SW program
- Creating a functional prototype on PCB or / breadboard
- Testing prototype

KNOWLEDGE MUST HAVE
- Basic Electronics / Basic uC architecture and programming
- Schematic and Layout design
- Self drive / time management

KNOWLEDGE NICE TO HAVE

LI-ION BATTERY CAPACITY TESTER

PROJECT DESCRIPTION
Arduino based lithium battery capacity tester will discharge the cell through a resistor while measuring the current and calculate the capacity.

MAIN RESPONSIBILITIES
- Create a schematic
- Create SW sketch / C code lines
- Design a layout / PCB
- Test the functionality on a PCB or breadboard

KNOWLEDGE MUST HAVE
- Basics of electronics, power electronics, MOSFET transistors, OP-AMP
uC basic architecture / programming : C, arduino IDE
- Layout / PCB design
- Test equipment : multimeter, oscilloscope, power supply

KNOWLEDGE NICE TO HAVE

hardware engineering

REAR WINDSHIELD RGB LED MATRIX

PROJECT DESCRIPTION
In everyday traffic there are situations when you need to pass a message to the other participants. A LED matrix controlled by a microcontroller can do the trick.

MAIN RESPONSIBILITIES
- Choose project components (microcontroller type, user input, LED matrix)
- Build first prototype (breadboard)
- Create SW application (arduino/micropython)
- Design and order dedicated PCB

KNOWLEDGE MUST HAVE
- Basic programming (C/python/Arduino)
- Basic microcontrollers knowledge
- Basic electronics

KNOWLEDGE NICE TO HAVE
- PCB design

TRANSMISSION LINES OVER PCB

PROJECT DESCRIPTION
The project is a comprehensive journey into IPC/Conti standards, signal propagation, PCB stackup, impedance-controlled traces, and practical application of equipment like Vector Network Analyzers, with a strong emphasis on hands-on learning and real-world measurements.

MAIN RESPONSIBILITIES
- IPC standards and Signal propagation phenomenas self and guided study
- Define PCB stackup and impedance controlled traces
- Create gerber and order PCB coupons for impedance measurements
- Vector Network Analyser - Equiment understanding. Practical test coupons measurements.

KNOWLEDGE MUST HAVE
- Good English proficiency
- Basic electronics
- High interest in PCB technology for advanced digital designs

KNOWLEDGE NICE TO HAVE
- PCB Design

hardware engineering

LINE FOLLOWER ROBOT CAR

PROJECT DESCRIPTION
The robot will be controlled by Arduino microcontroller using a PID algorithm and IR sensors.

MAIN RESPONSIBILITIES
- Assembling the HW
- Understanding how components and SW works
- Creating arduino SW
- Adding improvement
- Presenting the project to teams

KNOWLEDGE MUST HAVE
- Basics of electronics
- uC basic architecture
- Programming: C, arduion IDE, Test equipment: multimeter, oscilloscope, power supply

KNOWLEDGE NICE TO HAVE

SPEED MEASUREMENT OF SMALL METALLIC HIGH SPEED OBJECT

PROJECT DESCRIPTION
The design and practical implementation of a setup for measuring the speed of small high-speed metal objects.

MAIN RESPONSIBILITIES
- The design and practical implementation of a setup for measuring the speed of small high-speed metal objects

KNOWLEDGE MUST HAVE
- Deep understanding of electronic phenomena
- Mastering OHM and Kirchhoff's laws
- Knowledge of electronic components

KNOWLEDGE NICE TO HAVE
- Programming knowledge

hardware engineering

DC-DC CONVERTER

PROJECT DESCRIPTION
The aim of this project is to design a buck or boost converter.

MAIN RESPONSIBILITIES
- Project documentation
- Schematic creation (EAGLE)
- Design: calculation (Mathcad) and simulation (PSpice)
- Layout creation (EAGLE)
- Test and validate the prototype (bench tests)

KNOWLEDGE MUST HAVE
- Basic electronics: OHM, Kirchhoff law + active and passive components
- Knowledge of buck/ boost topologies

KNOWLEDGE NICE TO HAVE
- EAGLE
- PSpice
- Mathcad
- MOSFET gate control

SENSORLESS SPEED MEASUREMENT FOR BRUSH MOTORS

PROJECT DESCRIPTION
Measurement of the speed for an brush motor using current measurement method.

MAIN RESPONSIBILITIES
- D Design and Test: EE Architecture - Schematic

KNOWLEDGE MUST HAVE
- Basic electronics
- C language (basic)
- Eagle (basic)

KNOWLEDGE NICE TO HAVE

hardware engineering

FIND AND SOLVE HARDWARE DESIGN ERRORS WITH ELECTRIC SIMULATORS

PROJECT DESCRIPTION
Any great hardware project idea looks is great until you build it and see that is not working as expected, it's not working at all or worse, it ends up in flames! This is why any hardware project design must include a WCCA - Worst Case Circuit Analysis which aims to discover hardware design errors and to propose solutions that will ensure that the end product will always work like a charm. WCCA is traditionally made using specialized engineering calculation tools (e.g. Mathcad). They are great but slow (and boring).
To make them both great and fast (and fun), in this summer practice program we aim to study how we can use Electric Circuit Simulators to perform WCCA. The end goal is: create a simple-to-use workflow for performing a WCCA using Electric Circuit Simulators.

MAIN RESPONSIBILITIES
- Study the main types of WCCA analyses.
- Study how the available Electrical Simulation tools can be used to perform WCCA.
- Collaborate with the mentor to design a simple-to-use workflow for performing WCCA with Electrical Simulation tools.

KNOWLEDGE MUST HAVE
- Basic understanding about how Electronic Components work

KNOWLEDGE NICE TO HAVE
- drawing electric diagrams with Eagle, Orcad, Easy EDA or similar Electric Design tools
- building simple hardware projects

FLEXIBLE ELECTRIC SIGNAL GENERATOR BASED ON ARDUINO

PROJECT DESCRIPTION
Design and build a custom electric signal generator that makes easy-peasy to generate:
- Continuous Voltages and Continuous Currents on multiple outputs;
- PWM signals with adjustable Frequency, Duty Cycle and Amplitude;
- AC signals with adjustable Frequency.

MAIN RESPONSIBILITIES
- Make a list of functionalities that the device will perform
- Design the working principle
- Design the schematic, the PCB layout and build the electronic board
- Develop the needed Arduino software
- (optional) design the generator case in a 3D modeling tool

KNOWLEDGE MUST HAVE
- Basic understanding of how electronic components work
- Basic knowledge about the main types of electric signals

KNOWLEDGE NICE TO HAVE
- programming Arduino boards
- building simple hardware projects
- basic hardware design

hardware engineering

APPLIED AI IN HARDWARE DESIGN

PROJECT DESCRIPTION
Attendees will delve into the real of innovation by creating a prototype of an NFC car access system. Throughout this program, participants will combine their existing knowledge gained from university education with the latest AI tools to design both the hardware and software components of this cutting-edge device.

MAIN RESPONSIBILITIES
- Creating schematic design
- Designing RF matching circuit
- Creating layout design
- Assemble and test design
- Write code for designed module

KNOWLEDGE MUST HAVE
- Basics of electronics
- Basics of electronic filters & resonance circuits
- Basics of C programming
- Basic understanding of microcontrollers architecture
- Experienced user of Microsoft Office Suite
- Experienced user of Windows/Linux

KNOWLEDGE NICE TO HAVE
- Soldering knowledge/abilities
- Understanding of NFC interface/protocol
- Experience with ECAD tools such as Eagle, KiCad, Altium or others
- Experience with generative AI
- Basic command line navigation and interaction

HOT PLATE FOR SOLDERING OR REFLOW SMD COMPONENTS

PROJECT DESCRIPTION
Build a board that incorporates a heated section used to solder or reflow SMD components.

MAIN RESPONSIBILITIES
- Draw block architecture of project
- Design schematic diagram
- Develop PCB based on the schematic
- Write software for MCU
- Solder components to the board
- Test PCB

KNOWLEDGE MUST HAVE
- Basic electronics
- Basic microcontrollers
- Basic programming (eg. Arduino)

KNOWLEDGE NICE TO HAVE
- Basic soldering skills
- Design tools: Altium or another

hardware engineering

INTELLIGENT RESISTIVE LOAD GENERATOR

PROJECT DESCRIPTION
Design and build a Resistive Load Generator aimed to simplify Hardware Testing procedures.
It offers both flexibility and automatic adaptability to the Hardware Testing requirements.

MAIN RESPONSIBILITIES
- Define the list of end-product features
- Design the operating principles
- Design and build the hardware
- Develop and test the Arduino software
- (optional) design and build the end-product case

KNOWLEDGE MUST HAVE
- Basic understanding of how electronic components work

KNOWLEDGE NICE TO HAVE
- Experience in building simple electronic or software projects

PRACTICAL AND THEORETICAL STUDY WITH DIFFERENT CONFIGURATIONS OF DC-DC CONVERTORS (BUCK , RESONANT BOOST)

PROJECT DESCRIPTION
Simulate and measure on real circuit (boost, buck) the working points for increasing the efficiency.

MAIN RESPONSIBILITIES
- Simulate the buck , boost circuits in LTspice
- Calculate the efficiency
- Measuring signals on real circuit
- Understanding boost , buck functionalities

KNOWLEDGE MUST HAVE
- Basic knowledge of using multimeter, oscilloscope
- Basic knowledge in simulation program (LTspice)
- Basic knowledge of circuits and dimensioning calculus

KNOWLEDGE NICE TO HAVE
- LTspice, multimeter, oscilloscope

VOLTAGE MEASUREMENT EQUIPMENT WITH AUTOSCALE FUNCTION

PROJECT DESCRIPTION
Define and build one channel device used to measure voltages in range of 1mV to 100V with high precision and PC interface (Arduino + LabView).

MAIN RESPONSIBILITIES
- Define schematic and layout (Eagle or other CAD software)
- Programming uC (Arduino)
- Test Automation (LabView)

KNOWLEDGE MUST HAVE
- Basic Electronics
- Ability to use Power Supply, Oscilloscope, Signal Generator
- Basic Programming
- Office
- English

KNOWLEDGE NICE TO HAVE
- Eagle (CAD application for PCB Desgin)
- SPICE Simulations
- LabView

MECHANICAL ENGINEERING

TEST BENCH FOR HOT SPOT MEASUREMENTS

PROJECT DESCRIPTION
The activity consists in making constructive solutions for cooling concepts used for different electrical the components.

MAIN RESPONSIBILITIES
- ME responsibility - design different configuration of cooling systems (e.g. different cooling concepts - geometries and materials
- EE responsibility - design for a system with different power consumption

KNOWLEDGE MUST HAVE
- ME student - GD&T, Material Science, Manufacturing Methods, Thermotechnics, 3D modeling & Drafting
- EE student - PCB design and electronic components

KNOWLEDGE NICE TO HAVE

REMOTE DESKTOP POWER ON/ POWER OFF

PROJECT DESCRIPTION
Design an adjustable device that can be placed on any PC cases for remotely PC power on-off or restarting.

MAIN RESPONSIBILITIES
- Brainstorming session
- Design creation using Catia V5
- Print the plastic parts
- Order additional components
- Assembly

KNOWLEDGE MUST HAVE
- 3D modeling/ drafting -> Catia V5
- GD&T

KNOWLEDGE NICE TO HAVE

mechanical engineering

WIRELESS CHARGER WITH AUTOMATIC POSITIONING OF COIL

PROJECT DESCRIPTION
The Wireless Charger will be integrated into the car arm rest. It consists in an automatically positioning coil under the passenger or driver's phone, in order to charge it during driving.

MAIN RESPONSIBILITIES
- Design of ECU
- Creation of Samples using Rapid Prototyping
- Assembly of the ECU
- Definition of control algorithm

KNOWLEDGE MUST HAVE
- Mechanical Design
- Rapid Prototyping

KNOWLEDGE NICE TO HAVE
- Programming know-how

CONNECTOR PINS PRESS FOR PROTOTYPE USE

PROJECT DESCRIPTION
Design and build a press used for cutting and bending connector pins

MAIN RESPONSIBILITIES
- Research (search of materials and calculate the forces)
- Design 2D and 3D model using Catia V5
- Tolerance calculations
- Simulations (improve the design)
- Sourcing
- Build
- Test

KNOWLEDGE MUST HAVE
- Basic mechanical knowledge
- Material science
- Manufacturing methods and processes
- Basic physic
- Basic modeling and drafting
- Measuring tools

KNOWLEDGE NICE TO HAVE
- Catia V5

mechanical engineering

PRESENTATION STAND FOR CHASSIS CONTROL - DAMPING

PROJECT DESCRIPTION
Development, sourcing and build of presentation stand for CCU.

MAIN RESPONSIBILITIES
- Research of the current market available products.
- Development of a in-house created presentation stand.
- CAD design of physical stand (3d modelling & 2d drafting).
- Tolerance calculation & mechanical simulation of the presentation stand.
- Execution of physical stand (materials sourcing, sample shop assembly, mechanical loads testing etc.).
- Mounting of the dampers on the stand (including fixture design and execution).
- Creating a pneumatic rooting for damping live demonstration (optional).

KNOWLEDGE MUST HAVE
- Basic mechanical knowledge
- Material science
- Manufacturing methods and processes
- Basic physics
- Basic modeling and drafting
- Measurement methods and tools usage

KNOWLEDGE NICE TO HAVE
- Catia V5
- HW elementary knowledge
- Basic knowledge of pneumatics

DEVICE FOR THERMAL INTERFACE COMPOUND SPREADING

PROJECT DESCRIPTION
Assembling by hand of prototypes using thermal interface compounds is difficult.
A press will help with this process.

MAIN RESPONSIBILITIES
- Design a fixture easy to adjust for different housing geometries
- Design a press head with configurable contact points
- Design a mechanism that can engage the press head on the fixture

KNOWLEDGE MUST HAVE
- 3D modeling Catia V5
- Basic material strength calculation
- Mechanisms and kinematics

KNOWLEDGE NICE TO HAVE
- Rapid Prototyping

mechanical engineering

ENCLOSURE FOR EMISSIVITY MEASUREMENTS

PROJECT DESCRIPTION
Design an enclosure dedicated for measurement of material thermal emissivity.

MAIN RESPONSIBILITIES
- Design an enclosure appropriate for working temperature
- Design fixing rings for necessary tools and devices

KNOWLEDGE MUST HAVE
- Material's thermal behavior
- 3D modeling
- Device/mechanisms design
- Basic material structural design

KNOWLEDGE NICE TO HAVE
- Rapid Prototyping
- Measurement knowledge

mechanical engineering

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