No	Project Name/Topic	Project Short Description	ADI Hardware proposed	Category(industry target)	Proposer	Should know	Type of work involved
1	Software defined distributed control system	Modern indusrial automation and process control systems are pushing control intelligence towards edge devices capable of fast and secure communication with a central PLC or SCADA system and having complete software configurability for the functionality of their I/O ports enabling interfacing with a wide variety of analog and difital sensors and actuators. The scope of this project is to implement a software defined network of Remote Terminal Units based on Analog Devices' AD-SWIOT1L-SL system and show how this can be used to control an industrial process such as a robotic object picking application.	AD-SWIOT1L-SL	Industrial/Communications	Andrei C.	hardware, software, systems controll	
2	FPGA-based Network Data Filtering/Manipulation Prototype	The prototype can contain operations like network packets|payloads filtering at a reconciliation sublayer (RS) level [GMII/RGMII/RMII interfaces] (using the CN0506+FPGA_SOC approach's programmable capabilties) (tbd).	CN0506, Zedboard/ZCU102/ZC706	Communications	Alin S.	HDL, IP Networking, Softwa	HDL, Software
3	Visual Studio plugin to run HW tests	C tests wrapper over python automated tests, so the automated tests can be ran with default runner and give results back (Pass/Fail) as any standard C/C++ test - There can be integrated KPBC (Kuiper Post Build Checker) for basic checking after boot like dmesg errors, devices etc. Can use ssh (ethernet connection) or uart (serial connection) to overwrite SD card boot files and also, by using the IP, to be able to run tests on any hardware setup connected to the network.			Stefan		
4	Comparison between regular SPI controllers and SPI Engine	- An overview of the significance of SPI in embedded systems. - The benefits and limitations of the SPI Engine. - The benefits and limitations of the regular SPI Controller. - Developing a testbench to compare the performance of the SPI Engine and the regular SPI Controller. - Updating the current software used to control the system when the regular SPI is used, to obtain higher sampling rates and improved performance. - Creating a Python script to validate the correct functionality and performance of the system, including: o Signs of life from the system. o Configuration register checks. o HLD IP configuration check (clock frequency, PWM frequency, configuration parameters for the SPI Engine). o Measuring hardware performance metrics such as SNR, THD, SFDR, and SINAD.	AD7984, CoraZ7s	Instrumentation	Paul P.	HDL,C Programming, Python	HDL, Software
5	Acceleration Sensor Measurement System	- Data acquisition from the ADC's output. - Displaying the accelerometer data on a 7-segment display. - Processing the acquired data through digital filters in HDL. - Performing seismic measurements on the acquired data in HDL, e.g., displaying the magnitude on the Richter scale and changing the LEDs color based on it. - Using the input/output components (switches, buttons, 7-segment display, LEDs) to interact with the system, e.g., changing the X/Y/Z acceleration on the 7-segment display using the buttons available on the board.	ADXL327, AD5592R, CoraZ7s	Instrumentation	Paul P.	HDL,C Programming	HDL, Software
6	Comparison of Clock-Domain Crossing Techniques Implemented in Systems Using FPGAs	- Research existing CDC solutions. - Choose three existing solutions and describe them. - Create a testbench to simulate the CDC techniques and evaluate their behavior. - Develop a project that requires a CDC to acquire data from a high-speed instrumentation ADC. - Implement each proposed solution in the design and compare their performances.	High-speed instrumentation ADC, ZedBoard	Instrumentation	Paul.P.	HDL, C Programming	HDL, Software
7	DC motor PID control experimental stand	Design an experimental stand for PID study using a DC motor - DC motor theory study - Comparison study of different approaches on how a negative feedback control loop can be implemented and of different algorithms. - Choose the DC motor and the driver to use - Create a modular testbench that lets the user implement different control methods - Simulate the solutions in Simulink - Write the code for the target MCU - Compare the simulation results with the experimental results and between the different implementations **multiple diploma projects can be done each with a different control method.**	Trinamic, MAX FTHR, M2K	Industrial	Radu E.	Digital/Analog control, Electrical machines, C programming, Simulink/Matlab, laboratory equipment	hardware and software
8	Bidirectional type2 IC-CPD	Design a type 2 EVSE that can deliver energy both ways. In this way V2X can be implemented at small scale. - Starting from the AD-ACEVSECRDSET-SL modify the schematic and the software to enable bidirectional energy transfer. - Propose a method to measure the voltage at both ends keeping the isolation barrier - Propose a method to check the upstream PE on both sides - Make the necessary hardware/software modifications to give DC charging cappability to the device (mainly software) - Make modifications to the software to implement the proposed solutions - Make measurments during implementation and validate the solution	AD-ACEVSECRDSET-SL	Auto electrification/Energy	Radu E.	Electronic systems design, C programming, PCB design, laboratory equipment	software/hardware
9	AD-PQMON-SL - power supply stage	Design a power supply stage for the AD-PQMON-SL using as main source a small size PV panel and a battery - Design or choose a bidirectional PS to charge the battery and supply the board - Simulate the solution in LTspice or similar software - Choose the PV panel and run tests with the PS - Design the schematic and the PCB (can be added on the PQMON board or as an addon) - Implement the MPPT controller and the charging controller if not already include in the PS (write code for the MCU if numerical implementation is chosen) - Do a test report with the measurements	AD-PQMON-SL, ADI IC's	Energy	Radu E.	SMPS, Power electronics, PCB, laboratory equipment	hardware/software
10	Eliminate the ghost voltage in IC-CPD	Design of a circuit to eliminate the ghost voltage from the ADE reading, that appears in IC-CPD due to capacitive coupling when measuring voltages after the main relay. - Simulate the AD-ACEVSECRDSET-SL to replicate the measurement stage - Study the method to add a low impedance path for the current in order to eliminate the ghost voltage (Add capacitor) - Add a buffer(voltage follower) at the input of the ADE. - Find a way to supply the buffer keeping the isolation barrier - Make the necessary changes to the PCB - Test the two methods and draw some conclusions.	AD-ACEVSECRDSET-SL	Auto electrification/Energy	Radu E.	Analog circuit, Electronic systems design, Power electronics, laboratory equipment	hardware
11	Analog computer for PID implementation	Design an analog computer for PID study. - Literature review of analog computers - Design the analog computer and choose the number of Op-amps used (integrators, derivative blocks, multipliers, sum ...) for plant simulations / PID controller implementation. - Simulate the solution - Design and implement the testbench - Choose an example to test the setup	M2K and IC's	Industrial/Educational	Radu E.	Analog control, design of analog circuits, PCB design, Simulink/Matlab, laboratory equipment	hardware

12	Bidirectional DC-DC converter with digital control loop for PID study	Design the DC-DC converter or choose a converter that gives acces to the driver - Implement the control loop in analog domain in LTSpice or similar software translate the controller into digital domain - Compare the results of the two implementations - Write the code for the MCU target (or generate it from Matlab/Simulink if it was used in the design process) - Run tests on the testbench and obtain the bode plots and time response - Compare the results with the simulations	LT DC-DC converter, MAX MCU	Energy/Educational	Radu E.	SMPS, Control System, Microcontrollers, Matlab/Simulink	software/hardware
13	EVSE state machine simulation model	Translate the AD-ACEVSECRDSET-SL state machine in state-flow Simulink - Make a simulation model of the EV car from CP point of view - Translate the CP function into state-flow - Translate the States logic into state-flow - Run the model together - Interface the model with the real world (SIL / HIL / MIL) **an interface board with D/A input and A/D output should be used for last point**	AD-ACEVSECRDSET-SL, ADCs, DACs	Auto electrification/Energy	Radu E.	Matlab/Simulink	software
14	BLDC PID control design experimental stand	Design an experimental stand for PID study using a BLDC motor and driver from Trinamic and a MAX MCU.	Trinamic motors and drivers, MAX FTHR, M2K	Industrial	Radu E.	Digital control, Analog control, Electrical machines, C programming, Simulink/Matlab, laboratory equipment	mainly software
15	Energy management in an EV parking lot using BLE	Design and implementation of an energy management systems in a small scale parking lot emulator using BLE and type 2 EVSEs	AD-ACEVSECRDSET-SL	Auto electrification/Energy	Radu E.	Embedded systems design, C programming, Microcontrollers, Communication protocols	software
16	PV installation tester	Design and implementation of a power quality meter with an integrated pyranometer for PV installations testing using max78000 MCU family.	AD-PQMON-SL, MAX78000	Energy	Radu E.	Embedded systems design, C programming, Power electronics, SMPS, PCB design	hardware/software
17	IOT monitoring system for PV installations	Design and implementation of an IOT system for monitoring a PV panels installation.	MAX FTHR, Sensors	Industrial/Energy	Radu E.	Embedded systems desing, C programming, Microcontrollers	software
18	Artificial intelligence/vision on KRIA KV260 using PYNQ library	Desgin a custom AI model or AV program to showcases the concept of accelereated harwdware. This projects mixes software and hardware concepts. The accelerated hardware is made with custom HDL applications that can be used for artificial intelligence & image processing tasks.	KRIA KV260	Research/Educational	Cristian P.	Python, AI concepts, Image processing, HDL	software/hardware
19	FPGA based motor control	When it comes to accurate motion control FPGAs, because of their low latency and parralel compute capabilites, can efficiently implement complex and high-accuracy control algorithms. This project will use Simulink to implement a BLDC motor control algorithm based on traditional algorithms such and closed loop postion and current control and also to implement an AI control loop. The Simulink models will be translated into Verilog/VHDL code using MATLAB's HDL coder tool and then integrated into the FGPA design.	Lattice motion control system	Industrial	Andrei C	Digital control, Simulink/Matlab, FPGA	software/HDL/hardware
20	Battery management system	Mobile robots are being used more and more in the industry to move materials and goods on the factory floor. All these robots are battery powered and require complex battery management systems to ensure reliable and optimal operation, maximizing battery life and reducing idle times for charging. This project will focus on implementing the battery charging and state of health and state of charge algorithms for a mobile robot battery management system.	ADI robot battery mangement system	Industrial/Energy	Andrei C	Embedded systems design, power electronics, Battery management systems	software/hardware
21	AI using FPGAs	Due to their parralel compute capabilities FPGAs are ideal candidates for running neural networks. Even though this technology is very promising for AI models execution, the tools and flows for implementing AI models in FPGAs are still in their early stages. This project will study the flows to define and train an AI model and then deploy it into an FPGA. It will also evaluate the performance of the deployed model in terms of accuracy and processing speed.	Xilinx ZedBoard	AI	Andrei C		software/HDL
22	Software defined wireless communication system	Modern communication systems are software defined, meaning that the modulation/demodulation happens in software or RTL logic on a processor or an FGPA rather than in an ASIC with predefined functionality. This project will use ADI's AD-PLUTO-EBZ software defined wireless communication sytem to implement a point to point data communication protocol, to create an wireless Ethernet bridge between two end nodes.	AD-PLUTO-EBZ	Telecom	Andrei C.		software/HDL
23	Water treatment system	This project will implement a water treatment system to control the pH level of the water. The AD-APARD32690-SL board will be used to implement a pH measurement and dosing system. The scope of the project is to implement a closed loop real-time control system with connectivity to a central SCADA system for monitoring and supervisory control.	AD-APARD32690-SL	Industrial	Andrei C		software/hardware
24	Robot AI vision	The scope of the project is to implement an AI machine vision system for a robotic arm enabling it to pick and place objects. The development is based on ADI's AI capable microcontroller connected to a 2D RGB camera.	MAX7002 camera system	Industrial	Andrei C		software/hardware
25	Linux drivers development and applications	The project proposal is a set of Linux drivers for one or more ADI parts, example: Implementation of a Linux driver for AD4052 IC and documentation to demonstrate the driver functionality/capabilities and usage, developed with respect to Linux Kernel code guidelines. The graduate will work with state-of-the art hardware and will learn about Linux Kernel programming, the Linux IIO subsystem, and versioning tools, such as Git.	EVAL-AD4052-ARDZ, Platforms like: Rapsberry pi 4, Intel, Maxim, ST, Xilinx	Industry/Instrumentation	George Mois	git, embedded software, C/C++, Linux basics	software embeded
26	Bare-metal drivers development and applications	The project proposal is a set of bare-metal drivers for one or more ADI parts, example: Implementation of a no-OS driver for a part and at least one example to demonstrate the driver functionality/capabilities and usage, developed with respect to no-OS code guidelines. The graduate will work with state-of-the art hardware and will learn about bare-metal programming, the IIO framework, and versioning tools, such as Git.	Platforms like: Rapsberry pi 4, Intel, Maxim, ST, Xilinx	Industry/Instrumentation	George M.	git, embedded software, C/C++	software embeded
27	Sensors and data acquisitions systems	Signal Chain/Data acquisition systems including various sensors and connectivity, signal analysis, sensors characterisation using M2K as a measurement and analysis tool (below are some examples, but topics should not be limited only to those) Various sensors and data acquisition system using FPGA/uC boards Ultrasonic experiments: Distance measurement Bat detection Ultrasonic walkie-talkie with GNURadio - upconvert audio centred at 40kHz, transmit, down convert.	ADALM2000, system boards like: Rpi4, Xilinx, ST, ADALM-Pluto	Data Acquisition	Monica I	software, hardware, RF	software/hardware
28	FMCW radar using ADALM Pluto	Develop an SDR application that implements Frequency Modulated Continuous Wave (FMCW) radar using the ADALM-Pluto. This project bridges software (free choice of Python, C, gnuradio, MATLAB) and RF hardware design, welcoming experimentaion with-, and evaluation of: antenna design, power levels (respecting ANCOM regulations), frequency modulation patterns, target characteristics (size, material, shape, etc), range / resolution / refresh rate tradeoffs, all while abstracting away the minute details of RF signal chain engineering. Inspiration: Jon Kraft "Build Your Own Radar", using the ADALM-PHASER https://www.youtube.com/playlist?list=PLxC4LYGYcMqmPDEr8E8AlktQPcuHx4izm	ADALM-Pluto	RF	Ioan D.	software, hardware, RF	software/hardware

29	3D surround view for infotainmant system	Modern cars are equiped with multiple cameras that are being used to enable the driver to have a surround view of the car's surrounding environment. This project will be using 4 x GMSL cameras connected to an Nividia SoC to create a 360 view of the environment providing the option to rotate the view in a 3D space. Optionally objects detecion using AI can be implemented using the Nvidia AI engines.	AD-GMSL522-SL	Automotive	Andrei C.	software, hardware	software/hardware