

Emirhan Sönmez

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PROFILE

Electrical & Electronics Engineering student focused on FPGA-based digital design and embedded systems. Hands-on experience with VHDL, Xilinx Vivado, RTL communication interfaces, embedded firmware, PCB design, and board-level hardware bring-up across FPGA, STM32, TI C2000, and heterogeneous SoC platforms. Experienced with custom BSP layers, FreeRTOS, bootloaders, and secure firmware update workflows.

EDUCATION

Abdullah Gül University	Kayseri, Türkiye
B.Sc. in Electrical & Electronics Engineering (100% English)	2022 – Jul 2027 (Expected)
GPA: 3.42/4.0	

SKILLS

Programming: VHDL, C, C++, MATLAB

FPGA & SoC Development: Xilinx Vivado, RTL Design, Zynq UltraScale+ MPSoC, PS-PL Integration, AXI Interfaces & DMA, FPGA IP Integration, MIG/DDR3, BRAM/ROM-based Data Paths, FFT IP, MicroBlaze, ILA

Embedded Development: STM32 (HAL, CubeIDE), Custom BSP Development, SDRAM/LTDC/DMA2D, ESP32, FreeRTOS, Bootloader Development, mbedTLS (SHA256/AES), Linux, LwIP, TI C2000, CLB

Communication & Interfaces: UART, SPI, I²C, QSPI, RS485, Ethernet, FSI, CLB-based protocol implementation (Manchester encoding/decoding, single-wire communication)

Hardware & PCB Design: Altium Designer, KiCad, LTspice

Mechanical Design & Rapid Prototyping: Fusion 360, 3D Slicer Applications (Cura, BambuStudio)

EXPERIENCE

FPGA & Digital Design Intern, RST Technology Aug – Sep 2026

Worked on FPGA and SoC development using VHDL and Xilinx Vivado, including Zynq UltraScale+ MPSoC platforms. Gained hands-on experience with RTL development, PS-PL integration, AXI-based interfaces and DMA-based data transfer, FPGA IP integration, timing and I/O constraints, and board-level debugging. Worked with MIG/DDR3 memory interfaces, BRAM/ROM-based data paths, FFT processing, Ethernet interfacing, and ILA-based debugging.

Embedded Systems Intern, T3 Gemstone Project Jul – Aug 2026

Worked on embedded firmware development for the T3 Gemstone O1 heterogeneous SoC platform. Ported ChibiOS to the Cortex-R5 subsystem, integrated ArduPilot with the hardware, and prepared technical documentation for implementation and testing.

Undergraduate Researcher, AGU PowerLAB Dec 2023 – Present

Worked in the AGU PowerLAB research environment focusing on embedded systems and power electronics projects. Contributed to hardware prototyping, embedded firmware development and laboratory testing activities within ongoing electric machine and power electronics research projects.

PROJECTS

Programmable Power Supply Firmware & BSP Platform — AGU PowerLAB Apr 2026 – Present

Developing STM32H750-based firmware for a programmable power supply control unit with custom BSP layers for QSPI flash, SDRAM, LTDC, DMA2D, GPIO, rotary encoder inputs, and peripheral bring-up. Building a FreeRTOS-based architecture with RS485, Ethernet/LwIP, embedded server functionality, and secure firmware update support using custom firmware packaging, checksum validation, version metadata, and AES-based cryptographic mechanisms.

Programmable Power Supply Digital I/O Module — AGU PowerLAB

Nov 2025 – Present

Designed an STM32-based 8-channel digital I/O board supporting 5V/100mA internal outputs and 5–32V/500mA external outputs. Implemented control firmware and communication interfaces (SPI, UART, RS485) together with ADC, DAC and PWM peripherals, and designed a flyback-based 12V to 5V power conversion stage for external supply operation.

STM32 Bootloader & RTOS Firmware Platform — AGU PowerLAB

Jun – Aug 2025

Developed Copy-to-RAM and XIP bootloaders for an STM32 system capable of loading application firmware from external QSPI flash with rollback support. Built a FreeRTOS-based platform integrating Ethernet connectivity (LwIP with DHCP) and an embedded HTTP server. Implemented secure firmware updates via HTTP or USB with SHA256 verification and version metadata, together with a Python utility for firmware packaging.

Wireless Rotor Current Measurement Module — AGU PowerLAB

Dec 2025 – Mar 2026

Developed an ESP32-based wireless motor current measurement module featuring dual 20A current sensing units, battery monitoring and charging circuitry. Designed the supporting power management including onboard 3.3V regulation and integrated the system on a custom PCB for embedded motor monitoring applications.

Magnetic Encoder — AGU PowerLAB

Feb – Jul 2025

Designed a rotary magnetic encoder using three orthogonally placed TMAG5170 Hall sensors for angular position measurement. Implemented SPI communication with an STM32 microcontroller and RS422 differential output on a circular PCB designed for direct motor mounting.

Smart Comfort Monitoring System (Assembly-Level Firmware) — EEE Capsule Project

Feb – May 2025

Designed a smart comfort monitoring and data logging system on an STM32F746 using bare-metal, register-level firmware development. Integrated I²C-based environmental and motion sensors with interrupt-driven sampling, SD card logging via SDMMC, and an LCD interface using SDRAM framebuffers, together with UART debugging and AES-based secure data logging.

Switchable BCD Counter — EEE Capsule Project

Jan – May 2025

Designed digital logic circuits including frequency dividers, multiplexers and BCD counters using flip-flops and combinational logic gates. The design was modeled and verified in LTspice and Logisim before hardware implementation and testing.

VOLUNTEERING**European Solidarity Corps (ESC), Râmnicu Sărat, Romania**

Jul – Oct 2024

Organized educational activities for children and teenagers in an international volunteer team

IEEE Robotics and Automation Society Chair (RAS) — AGU Chapter

2023 – 2026

Leading robotics and automation related activities and events within the IEEE student community

Academic Audio Library — AGU Youth Factory

Translated English reading books into Turkish and recorded bilingual audiobooks for visually impaired individuals.

LANGUAGE

Turkish: Native

English: B2

REFERENCE

Burak Tekgün, Assoc. Prof. Dr. at Abdullah Gül University, burak.tekgun@agu.edu.tr

Dooyoung Hah, Asst. Prof. Dr. at Abdullah Gül University, dooyoung.hah@agu.edu.tr