Muhammad Hamza Shafiq

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Education

• **FAST - National University of Computer and Emerging Sciences, Islamabad.**	
• **Bachelor of Science (Electrical Engineering)**	**2025**
Major: Electronics	
F.Sc (Pre-Engineering)	**2021**
APS Askari IX Rawalpindi	
Matric (Science)	**2019**
Fouji Foundation College for Boys (FFCB) Rawalpindi	

Projects

Final Project:

FPGA-Based Autonomous Quadcopter:
Designed and implemented a **Guidance, Navigation, and Control** (GNC) system for a quadcopter. Complete onboard system was implemented on **Zynq-7000 SoC** based Zynqbeery board interfacing IMU, GPS, Magnetometer and Propeller drives. The achieved goal was successful flight testing of the quadcopter in autonomous mode with hard-real time implementation of computationally intensive kernels of partitioned GNC algorithm on the **FPGA fabric.** The corresponding control flow part of GNC was executed on the SoC ARM core.

Other Projects:

FPGA IP Cores development in Verilog HDL:

- **Pseudo-Random Number Generator core:**
  This 8-bit core for pseudo-Random number was designed and developed in Verilog HDL for Spartan 6 device. This design is scale-able to implement 16- or 32-bit cores.
- **UART core:**
  Implemented a Full Duplex UART core to transmit random number data from FPGA for detailed randomness analysis in MATLAB running on desktop computer. An external TTL-UART to USB converter was used for direct acquisition of data in to MATLAB.
- **VGA core:**
  A VGA core is implemented to directly display data on VGA monitor without any need of a computer and operating system to serve the purpose. It takes data/commands from a controller's UART interface and displays directly on VGA accordingly.

Design and Development of Embedded Systems:

- **Industrial Monitoring System for Environment Sensing & Control:**
  A meter was designed as a complete embedded product with battery, LCD display, casing and embedded software to monitor Carbon-Dioxide, Temperature and Humidity using professional suite of sensors for stable and reliable output. The CO2 accuracy was 10,000 ppm and that for Temperature and Humidity was $\pm 0.5^o C$ and ±5% respectively. This work is scalable for relevant environmental control implementations.
- **Whack a mole using Digital Logic Discrete Devices:**
  A complete system design comprised of a combination of digital glue logic, hardware random number generator, timers, displays, PCB designing and fabrication from JLC PCB for fast track evaluations.
- **Back Scrubber project:**
  Designed a prototype using **discrete electronic components and motors** to automate the scrubbing process. Implemented **directional control and adjustable speed settings**, allowing customized operation based on user preferences.