

**Assignment 2**  
**Course: Hardware Software Co-Design**  
**Marks: 25**

**Project Guidelines:**

Choose a project that aligns with your professional interests or current job role.

For example, if you are working in the automotive industry, consider implementing a controller for a motor or a communication protocol used in vehicles.

Hardware Components:

- Use the ARM SoC to handle software tasks, such as data processing, control logic, or communication interfaces. Utilize the Programmable Logic (PL) part of the FPGA to implement hardware accelerators, custom peripherals, or real-time processing tasks. Incorporate Block RAM (BRAM) for storing data that needs fast access, such as buffers for signal processing or look-up tables. Use other FPGA components as needed, such as DSP slices for mathematical operations, or GPIOs for interfacing with external devices.

Software Components:

- Develop the software in C/C++ or other appropriate languages, targeting the ARM Cortex cores within the SoC. The software should manage the overall system, including initiating hardware tasks in the PL, processing data, and handling communication protocols.

System Integration:

- Integrate the hardware and software components, ensuring that they work together seamlessly. This may involve setting up communication between the ARM processor and the FPGA fabric using AXI interfaces.

Verification and Testing:

- Simulate the hardware design to verify its functionality before deploying it to the FPGA. Test the entire system, including both the hardware and software components, to ensure that it meets the project requirements.

**Submission Requirements:**

Project Report:

- Submit a detailed report (5-10 pages) describing the project, including the problem statement, design approach, hardware and software implementation, and testing results.

#### Verilog/VHDL Code and Software Code:

- Provide the Verilog or VHDL code for the hardware components, as well as the software code running on the ARM SoC.

#### Simulation and Test Results:

- Include simulation results for the hardware components and test results demonstrating the working system.

#### Presentation:

- Prepare a short presentation (10-15 minutes) summarizing the project, which you will present in the lab.