CENG 3430 Rapid Prototyping of Digital Systems

Final Project Specification (2019/20)

■ **Objectives**
- Practice how to employ Hardware Description Languages (HDLs), C/C++, Shell Scripts, embedded Linux, Field Programmable Gate Array (FPGA), Pmod or other peripheral devices to build useful digital systems or to develop hardware accelerators via high-level synthesis (HLS)

■ **Requirements**
1) It is a group-based project: at most **two** students in one group.
2) Your project should be designed based on **Xilinx ZedBoard™**.
3) Your project should include: **input(s)**, **output(s)**, and the **control** (FSM), **unless** your project is about **high-level synthesis (HLS)**.
   - At least one Pmod device should be used as input(s) or output(s).
   - VGA is suggested to offer better display for game-based projects.

■ **Marking Scheme (60%)**
1) **Proposal (10%)**
   - Each group has **5-10 minutes** to present your final project proposal during **the lab hours (16:30~18:15) on April 14** via ZOOM.
   - You **must** give the presentation based on the released time table. (Note: There would be **NO** chance to have a make-up presentation.)
   - Your presentation may include, but not limited to, the following:
     a) Project title and objectives
     b) Information of group member(s)
     c) Main functionalities and FSM diagram of your digital system
     d) Prototyping style: how do you plan to implement your project?
     e) (Optional) Any additional equipment needed:
        ➢ Each group will be given **no more than HKD 500** to purchase additional equipment for developing final project.
        ➢ You **must first get approval from TAs** via emails, then purchase the items by your own. (Please keep receipts, and get reimbursement from Ms. Tracy SHUM at general office.)
        ➢ You can search for Pmod peripheral devices at: http://store.digilentinc.com/, https://world.taobao.com, etc.
   - **Submission Deadline**: You must submit your final project proposal (in pptx or pdf format) to blackboard by **23:59 on April 13, 2020**. (Note: Late submission is **NOT** acceptable.)

2) Demonstration (25%) and Report (25%)

- o You must film a video to demonstrate your final project. The final project demonstration will be evaluated based on the following:
  - a) Creativity (5%)
  - b) Completeness/Difficulty/Techniques used in the project (20%)
- o The report should be typed on A4 papers, and may include, but not limited to, the following:
  - I. Introduction
    - ➢ What is the system you want to design? Why?
  - II. Design
    - ➢ Overview: Describe the overall architecture, inputs, and outputs of the system. You are highly suggested to use flowcharts and block diagrams for better presentation.
    - ➢ Module Descriptions: Discuss each module of the system clearly and the interactions among them.
  - III. Implementation
    - ➢ Discuss in detail how you implement the system. You can take screenshots to provide step-by-step instructions.
    - ➢ You must provide the screenshot of the validated block design (*if any*).
  - IV. Discussions and Results
    - ➢ What have you achieved? Have you realized the preset goals?
    - ➢ What are the difficulties or limitations encountered during the implementation, and how you resolved them?
    - ➢ What are the further improvement and possibilities?
  - **V. Division of Labor (Compulsory)**
    - ➢ State clearly the division of labor between group members. (Note: We may **grade separately** for each group member.)
  - VI. Conclusion
    - ➢ State clearly what you have achieved in this project.
  - VII. References
    - ➢ State clearly if you followed any open-sourced projects or online tutorials to implement your final project.
    - ➢ Fail to state the references are subject to **grade penalty**.
- o **Submission Deadline**: You must submit **1) the demo video** and **2) the final project report** (in docx or pdf format), and **3) all the source codes** (e.g., .vhd, .xdc, .c, .sh) to blackboard by **23:59 on ~~May 12, 2020~~ May 19, 2020**. (Note: Late submission is **NOT** acceptable.)