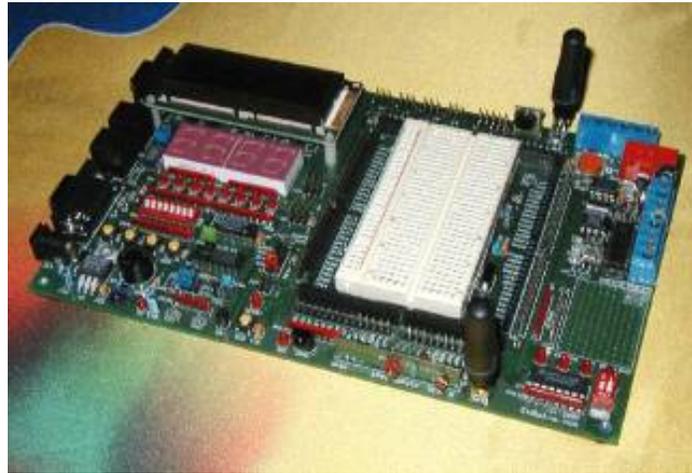


ECE 3120 Project



1- Requirements

- Design, implement, and test an embedded hardware/software system based on the Dragon12 microcontroller board.
- **The purpose of this project is:-**
 - 1- To provide a hands-on design and coding experience with the HCS12, hardware, and hardware interfacing functionality of the HCS12.
 - 2- To assimilate the different concepts learned in the course to implement a real system and to develop and utilize your creativity.
 - 3- Develop these skills: (1) working in a team, (2) critical and logical thinking, (3) problem solving, (4) self-learning, and (5) writing technical reports.

Self-learning means you may need to learn new stuff by yourself. We only help but you will do most of the work.

Problem solving: you are responsible to solve any problem you face. It is not our responsibility. We just help.

- You will determine the characteristics of the system and provide an acceptable solution that is bounded within the confines of the constraints.
- The program must be written in HCS12 assembly code. You must use good program design techniques and a logical, organized program structure, and comments.
- As with any embedded system, the program should run continuously.
- It must be user friendly in every way.
- Detect and report all possible error conditions and recover from them gracefully.

- You must NOT damage the Dragon12 board, or you may have to pay for its replacement.
- The project can be done individually or in a group of two students.
- A significant part of your grade, 15% of the final grade.
- The team members should organize/manage the work we will not interfere. Learn how to work in a team. The group members will do the work equally.
- **Copying from others will result in getting zero in the project or failing in the course**

2- Phases

Phase 1: proposing a project

- Decide a project and propose it.
- We will approve/disapprove or ask for modifications and additions.
- In the proposal you have to describe the functionality of the project. A list of potential projects is given in a file called potential_projects. You can propose a project that is not in the list, or select/modify one of these projects.
- In marking we will match what you will do with your proposal. You can do more than what you proposed.
- In the proposal, you have to state the objective, characteristics of the system, and provide an acceptable solution that is bounded within constraints.

Example 1:

The objective: secure accessing a room

Characteristics: The microcontroller will enable the authorized persons to access a room. Only the people whose usernames are in a list can access the room.

Solution: Ask for a user name and a password, check in a database and open the door if they are right. After three wrong trials, activate an alarm system.

Example 2:

The objective: measure voltage

Characteristics: measure DC voltage in the range of 0 to 20 V

Solution: Ask the user to enter the voltage range, convert the voltage to digital value.

Read/calibrate it and display the measurement

- I expect that your proposal will include the use of some basic peripherals such as switches, LEDs, stepper motors, sensors, LCD, infrared sources and sensors, timers, D/A, A/D, etc.
- I expect it should do a useful application.

Phase 2 – System Design Report

Each team will submit a project system design report with the following contents in order:

- Title Page with project title, title, date of submission, team name and member names.
- Project Specification and Description, expanded and clarified from these given specs.
- Your algorithms showing in flow charts.
- Your overall program structure.
- Design for proper functionality and efficiency.

Phase 3 – Final Report & Demo

Each team will email the instructor and the grader (Kiran) a zipped file (file name is your 3120team name.zip) which contains all electronic documents related to this project. A hardcopy should also be submitted to the instructor. **The report must be done on the computer** (all design work, code, and reports) - nothing by hand (except page numbers, which may be handwritten if necessary).

The final report should include the following contents in order:

- **Title Page** (team name, members, class number and name, submission date)
- **Table of Contents** (TOC)
- **Introduction**
What do you want to do, what applications can be implemented by your project, how important is that, briefly explain what you have done and what you have not done, what problems you have faced, how you solved them, provide a brief functional description of your project, give overview to the rest of the report.
- **Project Specifications and Description:**
Describe the project, draw a block diagram and explain how it works.
- **Detailed algorithms:**
Project structure, pseudocode and flowcharts explaining overall program structure, modularity, and algorithms
- **Detail implementation:**
Interface design: Describe any external interfaces utilized (e.g., switches, LEDs, sensors),
Microcontroller resource utilization: describe how the microcontroller's peripherals (timers, A/D, PWM, I/O ports) as well as its other on-chip resources (RTI, SRAM, flash memory, etc.) were utilized including the mode(s) in which they were programmed to operate, provide rationale for the choices made.

Software: Describe what the software does and how it is organized/structured. Submit your complete assembly code (**comments are mandatory**). Explain stack frames for subroutines. Illustrations/pictures of your project hardware.

- **Analysis**:

Functionality, and testing results. **How did you test the proper operation of the project.** You can add illustrations/pictures of your project tests.

- **Conclusion and future work**:

Conclude the project and discuss possible future work, e.g., how this work can be extended or improved in the future: example, to improve the accuracy, to add new functionality, to improve efficiency (H/W and/or S/W), or to consider new applications.

Example for a good report:

https://engineering.purdue.edu/ece362/MiniPrj/PDF/sample_report_F07.pdf

Demo: Each team will demo the project functionality on allotted day and time. From the discussion we will:-

- List what works and what does not work
- Match your project with your proposal to ensure that you did all what you had proposed.
- Ensure that the project has been done by you not by someone else or copied. **We may ask about the details.**

3- Grading

- Projects will be graded on the documentation, functionality, and understanding the project.

- **Demo 50%**

Functionality 30%

Answering questions 20%

- **Final report 50%**

[10%] Writing/organization: Writing style, professionalism, technical content, succinctness of report, professional documentation, proper English, good grammar and clear writing style, etc.

[25%] Project Specifications and Description, Detailed algorithms and Detail implementation

[5%] Analysis

[10%] Future work

- **No marks on phase 1 and 2 but both of them are mandatory.**
- 5 points per day late will be deducted for late submissions.

4- Schedule

- **Oct. 14:** Phase 1: form groups and proposal
- **Nov 1:** Phase 2: System Design Report
- **Dec 1-6:** Phase 3 – Final Report & Demo