Palomar College
CSCI 212 Machine Organization and Assembly Language
Syllabus Fall 2021

Course Information

Instructor: Duy Nguyen
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Course Number and Section: CSCI 212 Section 70250
Location and Time: Online
Office Hours: Friday, 3:00 – 5:00pm, Monday and Tuesday, 4:00 – 5:30pm, Online
Total Units: 4.0
Prerequisite/Recommend Preparation: CSCI 114 with a 'C' or higher

Catalog Description

An introduction to Assembly Language programming. Language syntax is covered, together with a study of the instruction set mnemonics, segment, index, pointer, general purpose and flag registers. A variety of memory addressing techniques will be covered, as well as stack operations, particularly those associated with passing parameters to subroutine calls. Also includes I/O to screen, printer, and disk interfaces. Emphasis will be placed on interaction between the student's code and the operating system's supplied functions for I/O to peripheral devices. Use of editor and debugging tools will also be addressed.

Course Objective

1. Describe the organization and architecture of a computer system.
2. Apply appropriate usage of the structure and syntax of assembly language programming.
3. Utilize the hexadecimal, binary, and octal number systems.
4. Apply binary logic operations to assembly language programs.
5. Utilize memory management and memory addressing methods.
6. Use the operating system services to interface with devices such as the keyboard, disk drives, and monitor output.
7. Effectively use an interactive source code debugger to analyze and debug low-level code.
8. Employ assembly language directives and operators in an assembly language program.
9. Create and employ assembly language macros and object libraries.
10. Employs conditional assembly to make assembly programs more flexible and maintainable.

Student Learning Outcomes

- Students will be able to effectively use software development tools including libraries, compilers, editors, linkers, and debuggers.
- Students will be able to utilize the syntax and semantics of the ARM assembly and C language in the development of software.
- Students will be able to navigate the Linux environment to edit files, create programs, compile the programs, run the programs, and debug the programs using standard GNU tools.

Required Textbook

Robert G. Plantz, Introduction to Computer Organization: ARM Assembly Language Using the Raspberry Pi. This book is available online and can be found here:
http://bob.cs.sonoma.edu/IntroCompOrg-RPi/index-1.html

Course Work

This course requires more work, mostly on programming, than the average course. In general, you will need to devote at least three hours of study for each class hour. If you are uncertain about your time commitment, please discuss it with your instructor as soon as possible.
Minimum Number of Semester Hours
90 (63 lecture / 27 laboratory)

Computer Lab Assignments
Labs must be written in both the ARM assembly and C language. Six labs will be assigned for the semester and each lab will be graded out of ten or more points. While group discussion is allowed at the algorithm level, you must do your own homework and write your own code. Do not take any portion of the lab from another student. Labs will be due on the date announced and will be accepted late, with penalty, for three days after the due date for spring or fall semester or two days after the due date for summer session. Please note that if you are repeating this class and have previously received a passing grade for a lab, you will not be allowed to resubmit that lab for a grade. You will be assigned a different lab.

Student Code of Conduct
http://www.palomar.edu/Code_of_Conduct_condensed_version.pdf

Collaboration Policy
You are encouraged to discuss course material with other students, provided that you adhere to the following restrictions. Violations carry severe penalties. If you have questions about any of this, or if you need advice for specific situations, please ask your instructor.

All material turned in for credit must be your own work. For the labs you may discuss design issues with other students, but you must write your own code. For the homework you may discuss ideas (and of course go over class material) with other students, but you should work out all details and write up all solutions on your own. Copying part or all of another student's assignment, with or without the student's knowledge, is prohibited. Similarly, copying old solutions is prohibited. You should do the work yourself. Of course, you should always feel free to get help from the instructor during office hours.

Receive help with care. Avoid working too closely with another student. Otherwise, you can unwittingly become dependent on that student's help and fool yourself into thinking that you understand things better than you really do. Always attempt to do as much as you can on your own. Then, after you do seek help, be sure to work through similar problems on your own.

Give help with care. Don't help "too much." When you understand something, you may be tempted to show someone the complete solution. However, if you do this, you will rob them of the learning experience of reaching the solution on their own. Try giving a hint that will help them get "unstuck." If you don't see how to help without "giving away the whole thing," suggest that they see the instructor who may be able to help them through the process gradually.

Although you are allowed to help other students, you are never under any obligation to do so. If you feel uncomfortable answering a student's question for any reason, please do not attempt to answer the question. Instead, suggest that the student see the instructor.

Written Homework Assignments
Written homework assignments will be assigned typically on a weekly basis and will be due approximately one week after it is assigned. Late homework will not be accepted. Students who do not hand in their homework will have their grade considerably affected.

Exams
A midterm and a final exam will be scheduled during the semester to assess the student's comprehension of the course material. The exam material will cover reading assignments, homework, lab material, and any additional material covered throughout the course of the semester. For online students, the midterm and final exams will be available to take in the Palomar College Library Tutoring Center.

My official policy is that there are no makeup exams. I consider very few circumstances grave enough to issue a makeup exam. In the rare instance of illness that prevents you from taking an examination, a doctor's excuse will be required and I must be notified prior to the exam time. Unless special arrangements are made with the instructor, makeup exams must be completed within one week following the scheduled exam.

Drop Policy
The policy and dates stated in the Palomar College Catalog and Class Schedule apply to this course. Please be sure to review them. Students may drop the class through eServices. Students who stop attending class will not necessarily be dropped by the instructor and will receive an appropriate letter grade (A-F) at the end of the semester.

Grading Policy
Tentative grading policy will be as follows:
20% - Homework
15% - Midterm Exam
15% - Final Exam
50% - Computer Labs

Final course grades will tentatively be determined as follows:
90% - A
80% - B
70% - C
60% - D
Below 60% - F

Academic Integrity:
Palomar College does not tolerate cheating. You are responsible for ensuring the academic integrity of all work presented. Violation of this requirement may result in a grade of F for the work and/or your final grade. PLEASE DO NOT PLAGIARIZE. Copying and pasting from the Internet or your colleagues violates Palomar College's integrity policy and will result in a grade of F.

Disability Accommodation
Students with disabilities, whether physical, learning, or psychological, who believe that they may need accommodations in this class, are encouraged to contact Disability Resource Center (DRC) as soon as possible to ensure that such accommodations are implemented in a timely manner. Their phone number is 760-744-1150 Extension 2387, or e-mail at dsps@palomar.edu. They will help you determine what assistance is available to you.

Outline of Course Content

Week 1: Overview of course, introduction to Raspberry Pi and Linux environment, compiling code, using the editor, using the debugger, etc.

Week 2: Review of number systems (binary, hexadecimal, octal, decimal), data storage, introduction to assembly code

Week 3: (Monday is a holiday) Computer arithmetic, basic data types, Boolean algebra, continue introduction to assembly code

Week 4: Logic gates, logic circuits, CPU

Week 5: Programming the Raspberry Pi in C and assembler to drive the breadboard

Week 6: Programming in ARM assembly language, structure of the main function, instruction details, program flow constructs

Week 7: Bit operations, multiplication and division, data structures

Week 8: (Midterm - take home), data structures

Week 9: General purpose Input/Output (GPIO) device – connection between Pi and breadboard via GPIO

Week 10: Fractional numbers

Week 11: Interrupts and exceptions

Week 12: Input/Output

Week 13: More Input/Output, work on lab projects

Week 14: Thanksgiving Break

Week 15: Advanced projects with the Pi and breadboard

Week 16: Advance projects with the Pi and breadboard

Week 17: Review & (Final exam - take home)

Assignment and Laboratory Schedule

Due Date	Details		
8/29/21	Number System	Assignment 1 (2.2, 2.4, 2.6, 2.8)	due by 11:59pm
9/05/21	Intro Assembly	Lab 1 (Handout)	due by 11:59pm
9/12/21	Computer math	Assignment 2 (2.10, 2.12, 2.14, 2.16)	due by 11:59pm
	Discussion Topic	Raspberry Pi CPU and FPU	Information Only
9/19/21	Logic gates	Assignment 3 (Sect 5.2 P1-6, Sect 5.6 P1-7)	due by 11:59pm
9/26/21	First assembly code	Lab 2 (Handout)	due by 11:59pm
10/03/21	Assembly code syntax	Assignment 4 (Sect 8.6 P1-2, Sect 9.4 P1-5)	due by 11:59pm
10/10/21	Bits Operation	Assignment 5 (10.4, 10.6, 12.2, 12.4)	due by 11:59pm
	Linking C and assembly code	Lab 3 (Handout)	due by 11:59pm
10/17/21	Discussion Topic	Hooking up Robot to Pi	Laboratory Practice
11/07/21	Logic/flow control	Assignment 6 (Sect 13.3 P1-5)	due by 11:59pm
	TBD	Lab 4 (Handout)	due by 11:59pm

Due Date	Details		
11/14/21	Data structure	Assignment 7 (14.2, 14.4, 14.7)	due by 11:59pm
11/28/21	Stacks/heap memory	Assignment 8 (15.2, 15.5, 15.7)	due by 11:59pm
11/30/21	TBD	Lab 5 (Handout)	due by 11:59pm
12/05/21	Fractional number	Assignment 9 (E16.6, P1-3)	due by 11:59pm
12/18/21	TBD	Lab 6 (Handout)	due by 11:59pm

All laboratory and written assignments shall be graded according to the following rubrics.

Labs Rubrics

Description	Excellent	Good	Needs Improvement	Unsatisfactory	Max Score
Code Compilation	Code compiles without errors or warnings (50)	Code compiles without errors but has warnings (31-49)	Code compiles with minor errors (11-30)	Code compiles with many errors (0-10)	**/50**
Code Execution	Code runs to completion and produces correct results for all test cases (40)	Code runs to completion and produces correct results for most test cases (30-39)	Code runs to completion but produces incorrect results (10-29)	Code execution produces run-time errors (0-9)	**/40**
Code Documentation	Code has sufficient and detailed documentation (10)	Code has sufficient documentation but lack details (5-9)	Code has minimal documentation, lacking details (1-4)	Code has no documentation (0)	**/10**
Total Score					**/100**

Written Assignment Rubrics

Description	Excellent	Good	Unsatisfactory	Max Score
Solution Correctness	Answers are > 80% correct, sufficient work shown for each problem (8)	Most problems completed correctly (50% to 80%) with work clearly shown (3-7)	Less than half of the work completed, or no work shown (0-2)	**/8**
Solution Legibility	Answers and work clearly written, problems numbered accordingly, answers circled (2)	Written work although legible, is messy, OR problem not clearly labelled, OR solution not circled (1)	Work is messy, problems not clearly labelled, AND solutions not circled (0)	**/2**
Total Score				**/10**