prerequisites: ME 374 Systems Dynamic Analysis and Design


webpage: http://courses.washington.edu/mengr477

experiments: There will be nine experiments, each requiring a brief report. Instead of physical experiments, for 2021 you will pick up or be mailed a kit.

experiment reports: Reports and homework are due on Canvas as a lab report (.pdf) and source code (.c) by Friday at 8:00 pm.

late reports: The grade will be reduced by 10% per workday late. A report submitted after 5:00 on Friday and before 5:00 Monday is one day late. The maximum late penalty is 50%. You must submit a report for each of the nine labs to pass this course.

exams: There will be one mid-term exam and a final.

grades: homework & labs, 45%
        mid-term exam, 25%
        final exam, 35%

first day: Monday, January 4, 2021

last day: Friday, Mar 12, 2021

final exam: 2:30-3:50 PM, Wed, March 17, 2021
<table>
<thead>
<tr>
<th>Week</th>
<th>Subject</th>
<th>Suggested Reference</th>
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</table>
| 1    | Introduction to Microcomputing  
- Number Systems: Binary, Octal, Hexadecimal, Conversions,  
- Arithmetic  
- Boolean algebra, Combinational logic  
- Memory and memory organization:  
- Physical Types, ROM, RAM, Dynamic, Static  
Handouts each week in bold are due the following week:  
**homework #1 - binary arithmetic**  
**laboratory #0 - mechanics of embedded computing** | Skim myRIO User Guide and Specification |
| 2    | Interpretation: Numbers, Codes, Instructions  
- NI myRIO-1900 Survey  
- Xilinx Zynq-7010 & ARM Cortex-A9 Architecture  
**laboratory #1 - C language & machine language** | Skim Chapter A2 of Arm Architecture Reference Manual |
| 3    | Review of C Language Programming  
- Variables, expressions, control,  
- Use of CDT; debugging.  
**laboratory #2 - keypad & LCD primitive functions** | Use any C language text as a reference |
| 4    | - The LCD and keypad hardware.  
- Data Input/Output: Programmed I/O, Interrupts  
- Serial & Parallel interfaces: Low-level drivers  
**laboratory #3 - keypad & LCD low-level interface** | myRIO Shipping Personality Reference: DIO, and myRIO User Guide: UART |
| 5    | - Instruction Timing  
- Parallel I/O  
- Pulse Modulation Techniques  
**laboratory #4 - parallel input/output and control** | Cortex-A9 Technical Reference Manual Appendix B |
| 6    | - Interrupt Driven I/O  
- Sources: Internal and External  
- POSIX threads  
**laboratory #5 - external interrupts** | myRIO Shipping Personality Reference: IRQ Digital Input interrupt |
| 7    | - Programmable Clocks and Timing  
- D/A & A/D Conversion  
- Digital Signal Theory  
**laboratory #6 - D/A conversion and clock interrupts** | myRIO Shipping Personality Reference: Timer interrupt Notes |
| 8    | - Serial I/O  
- Synchronous & Asynchronous  
**laboratory #7 - dc-motor encoding & open-loop control** | Notes |
| 9    | - Interface Devices  
- TTL Circuits, high-power switches, stepping Motors  
**laboratory #8 – digital closed-loop control** | Notes |
| 10   | - Other Processors  
- Bus Structures |