ELECTRICAL ENGINEERING 382
Microcomputer Programming
Fall 2002 Syllabus
Block 1 Objectives and Assignments

This block introduces you to the 68HC12A4 Evaluation Board (EVB) and assembly language. By the end of the block, you should feel comfortable with writing, assembling, downloading, and running assembly language programs on the 68HC12A4 EVB.

In this block, you should learn how to:
- Design assembly language programs, which use the built-in functional units of a specified microcontroller.
- Interpret and explain, orally and in writing, the functions of a given assembly language program.
- Evaluate, analyze, debug, and modify a given program to improve its execution of a specified task.

Lsn	Lab	Topic	Reading	Assignments	Items Due
1		Course Introduction. Intro to the 68HC12.	pgs 1 – 9	Numbering Systems Review	
2		Programming Model. 68HC12 Instruction Set & Execution.	pgs 9 – 23	F2.1	
3		Addressing Modes. Lab 1 Introduction.	pgs 48 – 53 Lab 1	F2.3, F2.7, F2.8, F2.12, A2.3 — A2.8	**Numbering Systems Review**
4	√	Lab 1 – Introduction to the 68HC12.		Lab 1	
5		Branch Instructions.	pgs 53 – 59	F2.5, A2.2	**Lab 1 Handout**
6		Basic Instruction Set.	pgs 23 – 30 pgs 44 – 46 pgs 76 – 77	C2.1	
7		Directives. Assembly Process. Lab 2 Introduction.	pgs 59 – 61 pgs 71 – 75 Lab 2	F2.11, F3.1, F3.3 Lab 2 Pre-lab	
8	√	Lab 2 – Branches.		Lab 2	**Lab 2 Pre-lab**
9		The Stack. Subroutines.	pgs 78 – 82 pgs 82 – 91	F3.5, F3.6, A3.2	**Lab 2 Notebook (T-9)**
10		Subroutines.	pgs 82 – 91		
11		Logical, Arithmetic Operations.	pgs 31 – 44		
12		Structured Design and Test. Lab 3 Introduction.	pgs 99 – 110 Lab 3	F3.4 Lab 3 Pre-lab	
13	√	Lab 3 – Subroutines.		Lab 3	**Lab 3 Pre-lab**
14	√	Lab 3 – Subroutines.		Lab 3	
15		GR #1			

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Block 2 Objectives and Assignments

This block shifts focus from assembly language programming to the hardware components of a basic microcontroller. You will need the skills from the previous block to write programs to control these components as well as hardware interfacing skills.

In this block, you should learn how to:
- Interface with provided D-Bug12 subroutines to perform Input/Output (I/O) operations.
- Interface with external devices and perform I/O using the 68HC12's parallel I/O hardware.
- Initialize, program, and interface with the 68HC12's interrupt system.
- Use the 68HC12's powerful timing system to perform "real-time" processing.

Lsn	Lab	Topic	Reading	Assignments	Items Due
16		D-Bug12 Subroutines.	pgs 91 – 99 Lab 4	Lab 4 Pre-lab	**Lab 3 Notebook (T-16)**
17		Ports and Parallel I/O.	pgs 177 – 184	A5.5, A5.6	
18		Parallel I/O and Polling. Software Delay Routines. Lab 4 Introduction.	pgs 177 – 184 pgs 188 – 195 pgs 234 – 238	Lab 4 Pre-lab	
19	√	Lab 4 - Polling & D-Bug12 Subroutines.		Lab 4	**Lab 4 Pre-lab**
20	√	Lab 4 – Polling/D-Bug12		Lab 4	
21	√	Lab 4 – Polling/D-Bug12		Lab 4	
22		Interrupts & Interrupt Service Routines.	pgs 185 – 186 pgs 199 – 207	A5.1, A5.2,	
23		68HC12 Interrupt System. Lab 5 Introduction.	pgs 207 – 229 Lab 5	Lab 5 Pre-lab	**Lab 4 Report**
24	√	Lab 5 – Parallel I/O & Interrupts		Lab 5	**Lab 5 Pre-lab**
25		68HC12 H/W Config. External Flags. Timing System.	pgs 166 – 183 pgs 240 – 255 pgs 271 – 272	A5.7, A5.8	**Lab 5 Notebook**
26		Input Capture.	pgs 255 – 259 pgs 262 – 267 pgs 272 – 274	F7.1, F7.2	
27		Output Compare. Lab 6 Introduction.	pgs 259 – 267 pgs 274 – 278 pgs 280 – 286 Lab 6	C7.1 Lab 6 Pre-lab	
28	√	Lab 6 – Forward Control.		Lab 6	**Lab 6 Pre-lab**
29	√	Lab 6 – Forward Control.		Lab 6	
30	√	Lab 6 – Forward Control.		Lab 6	**Lab 6 Sign Off**
31	√	Lab 7 – Directional Motor Control.	pgs 286 – 290 Lab 7	Lab 7 Pre-lab	
32		GR #2			

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Block 3 Objectives and Assignments

This block requires you to synthesize all that you've learned to analyze, design, and build a mobile robot. The only new microcontroller subsystems that are introduced are the pulse accumulator and the A/D converter. At the end of the block, you and your robot will compete in a maze competition.

In this block, you should:
- Use your knowledge of the 68HC12's Timer System to control your mobile robot.
- Interface Infrared (IR) sensors with the 68HC12's A/D Converter to give your robot the ability to sense its environment.
- Program your robot to navigate through a maze.

Lsn	Lab	Topic	Reading	Assignments	Items Due
33	√	Lab 7 – Directional Motor Control.		Lab 7	
34	√	Lab 7 – Directional Motor Control.			
35		A/D converter. Lab 8/9 Introduction.	pgs 351 – 390 Lab 8/9	F9.1, F9.2, F9.3, F9.6, F9.7, A9.4	**Labs 6 & 7 Notebook**
36	√	Lab 8 – A/D converter.		Lab 8	
37	√	Lab 8 – A/D converter.		Lab 8	
38	√	Lab 8 – A/D converter.		Lab 8	**Lab 8 Sign Off (T-38)**
39	√	Lab 9 – Maze Navigation.		Lab 9	
40	√	Lab 9 – Maze Navigation.		Lab 9	
41	√	Lab 9 – Maze Navigation.		Lab 9	
42	√	Maze Competition.			**Lab 8 & 9 Notebook**