

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY
Department of Computing and Mathematics
COURSE OUTLINE FOR

Course No.: CEC322
Cr Hrs: 1

Title: Microprocessor Systems Laboratory

Lecture Hours: 0

Laboratory Hours: 2

COURSE DESCRIPTION:

"Hands-on" experience through laboratory experiments with assembly programs, microprocessor development boards and interfacing hardware will be done by students in the scheduled time only in a dedicated microprocessor lab under supervision of the instructor and lab monitor. The experiments will involve writing programs in assembly/hexadecimal code and interfacing target microcomputer system with the external hardware. Some work must be done in your own time on the PowerPC/AIX system using the available Motorola assembler and simulator. Prerequisite: CEC 220 Corequisite for this course is CEC320

GOALS:

The purpose of the course is to have students: appreciate the role of hardware in computer operations; understand the digital and microprocessor system concepts and architecture; write, translate, download, and subsequently execute, and debug assembly/hex programs on the board using an assembler concept and a simple microcomputer cross-development system; use microprocessor simulator; understand concepts of interrupts, input/output, and memory interface; manage computer resources in terms of execution time and memory space; understand principles of operation of microcomputer testing and cross-development equipment.

PERFORMANCE OBJECTIVES:

1. Create executable files from the source code.
2. Down load the code to microprocessor board
3. Observe and understand the memory and the registers during the execution of the program.
4. Design, implement, and execute assembly programs dealing with interrupts, I/O operation, and modular programming.
5. Operate microprocessor (cross-) development system.
6. Recognize basic components and functionality of microcomputer testing and development equipment.

Department of Computing and Mathematics
COURSE OUTLINE FOR CEC322, Continued

TEXTBOOK:

MacKenzie, I. Scott, *The 68000 Microprocessor*, Prentice Hall, 1995.

SUGGESTED SUPPLEMENTAL MATERIALS:

- a. *User's Manual 68KMB – 68000 Microprocessor Development System*, v. 1.0, URDA, 1994.
- b. *User's Manual – I/O Boards for the 68KMB*, URDA, 1994.
- c. Rafiquzzaman, Mahamed, *Microprocessor- and Microcomputer-Based System Design*, 2nd edition, CRC Press, 1995.
- d. Hall, Douglas and Rood, Andrew, *Microprocessor and Interfacing: Programming and Hardware: 68000 version*, McGraw Hill, 1995.
- e. Clements, Alan, *Microprocessor System Design: 68000 Hardware, Software, and Interfacing*, 2nd edition, PWS Kent, 1992.
- f. Hilf, Werner and Nausch, Anton, *The 68000 Family: Architecture, Addressing Modes and Instruction Set*, Prentice Hall, 1989.
- g. Current Articles in such magazines as: Byte, Personal Computing, Dr. Dobbs Journal, PC Magazine, Etc.

PREREQUISITE KNOWLEDGE BY TOPIC:

1. Proficiency in high-level computer programming.
2. Knowledge of number systems and proficient operations with binary/hexadecimal numbers.
3. Knowledge of MSI/LSI digital systems and concepts (in particular such elements as decoders, encoders, multiplexers, and individual logic gates.)
4. Familiarity with such physical concepts as voltage, current, resistor, etc.
5. Familiarity with personal computer operation in DOS environment (basic commands) and a simple text editor (EDIT).

TOPIC	CLASS HOURS	COURSE OBJECTIVES
1. Microprocessor Concepts	2	Introduction to the lab and Motorola 68000 board and other interface boards that will be used during the term.
2. Introduction to PC based cross development environment.	2	Create and edit text files using WordPad. Define terminal emulation. Describe the difference between a DTE and a DCE. Run PC-VT on an NT station though a window to MS-DOS. Configure the baud rate, data format, COM port, and other modes of operation with PC-VT. Issue a file transmit command with PC-VT. Verify that PC-VT is operating properly downloading a test ".HEX" file. Experiment with assembling and linking an assembly program, and understand the different files that are created and their formats.

	TOPIC (cont.)	CLASS HOURS	COURSE OBJECTIVES (cont.)
3.	The PC base 68000 microprocessor simulator.	2	Experiment with assembling and linking an assembly program, downloading it to the 68000 simulator and executing it.
4.	Instruction to 68KMB single board computer and 68000 cross assembler and linker.	2	Introduction to 68000 assembly language programming. Write, assemble, download, execute, modify, and debug simple programming problems using the 68000 and a simulator in the laboratory.
5.	Assembly Programming	2	More advanced assembly programming with different instructions and assembler directives.
6.	Programming and addressing modes	2	Introduction to addressing modes. Use addressing modes in The 68000 Microprocessor. Understand the instruction definitions of allowable addressing modes in The 68000 Microprocessor.
7.	Character I/O	2	Introduction to some Input/Output routines of MON68K board. Use Input/Output routines of the MON68K (traps) to get input from keyboard and output to the monitor. Understand the Input/Output traps and how they work. Understand looping, table building, and indirect addressing modes. Understand BEQ, BRA, and CMP instructions.
8.	Interface to Switches and LEDs	2	Introduction to parallel input/output with the 68KMB. Write programs that input data from the parallel input port on the 68681 DUART. Write programs that output data to the parallel output port on the 68681 DUART. Write programs that synchronize input/output operations using software delays or a programmable timer.
9.	Interface to a 7-Segment LED	2	Introduction to interfacing with 7-segment LEDs. Write a programs that perform counting and code conversion using a 7-segment display.
10.	Interface to a 4_digit Display	2	Using 4-digit display to write programs that perform counting and code conversion. Write programs that perform parallel-to-serial data conversion using parallel output port.
11.	Interface to Hexadecimal Keypad	2	Interfacing a keypad to a 68000 microprocessor through a 6821 peripheral interface adapter (PIA). Write program to detect the key pressed on the keypad.

COMPUTER USAGE:

Access to the microprocessor laboratory with single board microcomputers, power supplies, and the interfacing hardware (prototype boards, TTL circuits, wires, switches, LED's, PROM Programmer, Logic Analyzer, probes, etc.). The boards are running simple monitor, which does allow the user to interface, and entering/executing simple programs. An easy access to stand-alone PC is required to facilitate implementing and debugging assembly programs, translation into a downloadable code, loading the code to the target system and executing. As a back-up an access to the microprocessor assembler and simulator on the university network is required.

GRADING SYSTEM:

Lab grade is determined as a combination of in-lab performance and the lab reports collected one week following the lab – no late reports will be accepted.

ESTIMATED CONTENT:

Skills:	80 %
Content:	20 %