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

Course No.: CEC320 **Title: Microprocessor Systems**
Cr Hrs: 3

Lecture Hours: 3 **Laboratory Hours: 0**

COURSE DESCRIPTION:

Introductory course in operating modern microprocessor-based system on assembly language and hardware level. Presented are basic concepts of microcomputer architecture, microprocessor architecture and programmer's model, assembly programming, binary code representation, interfacing, testing and development. The architecture of the Motorola 68000 microprocessor and its programmer's model is discussed in detail. Prerequisite: CEC 220 This course is Corequisite for CEC322 (Laboratory)

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; understand the programmer's model of a microprocessor (Motorola 68000), 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. Understand the concept of assembly language and the process of creating executable files from the source code.

2. Understand the microprocessor architecture and its components.

3. Understand the programmer's model of a microprocessor.

4. Understand the programmer's model of Motorola 68000 microprocessor.

5. Understand Motorola 68000 instruction set.

6. Design and implement assembly language programs using Motorola 68000 instruction set.

7. Design and implement assembly programs dealing with interrupts.

8. Initialize input/output ports and write assembly programs using I/O operations.

9. Operate microprocessor (cross-) development system.

10. Define computer resources in terms of program space and execution time.

11. Differentiate between hardware and software products on microprocessor market.

12. Recognize basic components and functionality of microcomputer testing and development equipment.

Department of Computing and Mathematics
COURSE OUTLINE FOR CEC320, 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	3	Understand the concept behind microprocessor architecture and operation.
2.	The 68000 Microprocessor - programmer's model	3	Understand the Motorola 68000 Microprocessor and its internal registers, control signals, buses and addressing capabilities.
3.	The 68000 Microprocessor - Board	2	Understand the Microprocessor board that is used for LAB experiments.
4.	Instruction Set and Addressing modes	8	Understand the Motorola 68000 Microprocessor instruction set, their functions, and how to use them in different addressing modes.

	TOPIC (cont.)	CLASS HOURS	COURSE OBJECTIVES (cont.)
5.	Assemblers function and instruction timing.	3	Understand the assembler's functions and operation. Be able to hand decode instructions and determine the time and storage required for instructions.
6.	Assembly Programming	3	Understand 68000 assembly programming concepts and syntax.
7.	Programming Examples	3	Understand different programming technique and the use of subroutines in assembly language.
8.	Input/Output Interface	3	Understand the concept of Input-Output and interfacing via serial and parallel ports. Understand the hardware circuits for such interfacing.
9.	Exceptions and Privilege state processing	3	Understand Exception processing, exception routines, exception vectors and their operation.
10.	Stack and Interrupt Operations	2	Understand stack operation, interrupts, interrupt priority, and interrupt service routines.
11.	Input/Output Interface - Displays	2	Understand how to control switches and displays via software for the target hardware with 68000.
12.	Input/Output Interface - DMA	2	Understand the concept, circuit, and operation of Direct memory access
13.	Beyond M68000	2	A look at the different 68000 microprocessor family such as 68020
14.	Neglected Topics	2	

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:

1. Two mid-term and the final test (all comprehensive, covering the entire material covered)
2. Quizzes: 4-6 short (unannounced) quizzes given at the end of lecture or beginning of the labs to check the class progress.
3. Grading Percentages: midterms 50%, quizzes 10%, Final exam 40%

ESTIMATED CONTENT:

Skills: 30 %
Content: 70 %