PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

MICROPROCESSORS II W/LAB
EET 2320

Class Hours: 3.0   **Credit Hours: 4.0**

Laboratory Hours: 3.0   **Date Revised: Spring 02**

 NOTE: This course is not intended for transfer credit.

Catalog Course Description:

A study of modern 16/32 bit microprocessors based primarily on the Motorola 68000 and 68020. Topics include architecture, capabilities (e.g., interrupt systems), programming the 68000, and the use of logic analyzers for troubleshooting.

Entry Level Standards:

The student must have an understanding of 8 bit microprocessor basics. This includes full instruction set understanding as well as comprehension of interrupts and interfacing of several devices to the CPU.

Prerequisites:

EET 2310

Textbook(s) and Other Reference Materials Basic to the Course:

Textbook:
Microprocessor Interfacing, Heathkit, Heath Company
M 68000 Programmer's Reference Manual, Motorola
References:
1. *16 Bit Microprocessors,* Triebel, Prentice-Hall
2. *The Motorola MC 68000,* Harmon, Lawson, Prentice-Hall
3. *16 Bit Microprocessor Architecture,* Dollhoff, Reston

I. Week/Unit/Topic Basis:

Week	Topic
1	Digital to Analog and Analog to Digital Converters
2	Programmable Timers
3	Modems and Other Interfacing Circuits
4	Internal Registers and Basic Architecture
5	The 68000 Address Space Organization; Addressing Modes

6	Instruction Set of the MC 68000	
7	Control Lines	
8	Asynchronous and Synchronous Bus Control	
9	Exception Processing	
10	Interrupt Vectors	
11	Program Examples	
12	Intro to ATE	
13	IEEE 488 Basics	
14	VXI	
15	Tektronix VXI Software	
16	Final Exam	

II. Course Objectives*:

A. Understand the principles of Analog to Digital and Digital to Analog conversion. I, II, III

B. Understand Programmable Timers and interface them wit the CPU. I, II, III

C. Understand how the address space is organized. II, IV, V, VI

D. Understand internal registers and basic architecture. II, IV, V, VI

E. Understand the addressing modes. II, IV, V, VI

F. Understand the instruction set. II, IV, V, VI

G. Understand the control bus. II, IV, V, VI

H. Understand exception processing. II, IV, V, VI

I. Write and assemble 68000 assembly language programs. VI, VII

J. Analyze 68000 programs as they are executed using a logic analyzer. IV, V, VI, VII

K. Understand how personal computers may be used for automated testing. II, VI, VII

L. Understand Tektronix VXI Software. II, VI, VII

*Roman numerals after course objectives reference goals of the

III. Instructional Processes*:

Students will:

1. Participate in classroom discussions which challenge their abilities to think creatively and visualize complex spatial and mathematical relationships to solve problems. *Problem Solving and Decision Making Outcome*

2. Work in teams to conduct laboratory experiments and also to solve special problem assignments. These activities are designed to foster interpersonal skills in teamwork and develop and enhance leadership skills, students' abilities to express ideas, and students' abilities to reach consensus solutions for the team through negotiation. *Active Learning Strategy, Problem Solving and Decision Making Outcome, Personal Development Outcome*

3. Use electronic test equipment to test electrical circuits constructed from schematics in the laboratory and acquire data. Use computers with applications software to simulate, analyze, and predict the behaviour of electrical circuits. Compare expected responses to experimental responses of electrical circuits. Use the internet for special assignments such as locating data sheets on electronic components. Use computers with word processing software to prepare reports. *Technological Literacy Outcome, Information Literacy Outcome, Numerical Literacy Outcome*

4. Prepare reports on laboratory experiments which include methodology, mathematical analyses of electrical circuit models, a comprehensive comparsion of calculated results with experimental results, and conclusions. *Communication Outcome, Numerical Literacy Outcome*

5. Discuss the importance of personal qualities such as personal responsibility, time management principles, self-esteem, sociability, self-management, integrity and honesty in school and in the workplace, and dyamics of change in the workplace. *Personal Development Outcome, Cultural Diversity and social Adaptation Outcome, Transitional Strategy*

*Strategies and outcomes listed after instructional processes reference Pellissippi State's goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should be able to:

1. Interface digital-to-analog converters to a microcomputer via the PIA. A

2. Interface analog-to-digital converters to a microcomputer and write software to start conversions and load data from eight different analog inputs. A

3. Describe the internal structure and I/O lines of the 6840 PTM. B

4. Interface the 6840 PTM to a 68000-based system and initialize the PTM to perform the task below. B

5. Generate time delays, continuous waveforms, and one-shot pulses using the 6840 PTM. B

6. Explain how the 68000 provides a 16 megabyte address space. C

7. List the four functional bus categories of the 68000 I/O lines. C

8. Explain how 68000 data is organized in memory. C

9. Describe the internal CPU register structure of the 68000. D

10. State the difference between the 68000 user and supervisor modes. D

11. Define each of the following 68000 addressing modes:

* implied addressing
* immediate addressing
* absolute addressing
* register direct addressing
* register indirect addressing
* program counter relative addressing E

12. List the five instruction categories of the 68000 instruction set. F

13. Describe the operation of the various 68000 MOVE instructions. F

14. State the arithmetic and logic capabilities of the 68000. F

15. State he function of the 68000 program control instructions. F

16. Write a 68000 program to move a block of data within memory. F

17. Describe the function of each of the 68000 I/O lines. G

18. State the difference between asynchronous and synchronous bus control. G

19. List the 68000 asynchronous and synchronous bus control lines. G

20. Show how the 68000 provides both synchronous and asynchronous bus control. G

21. State the five status indications provided by the 68000 function code lines. G

22. Define exception processing. H

23. Describe how exceptions can be generated internally and externally. H

24. List the five 68000 instructions that can be used to generate an exception. H

25. Calculate a user interrupt vector address, given a user interrupt vector number. H

26. Write 68000 programs on a VAX Cross-Assembler. I

27. Assemble, Link, and Download these programs to a 68000-based system. I

28. Run program that have loaded to a 68000-based system and analyze these with the HP Logic Analyzer. J

29. State the operating principles of ATE. K

30. Use a PC to output data to a test circuit. K

31. Use a PC to make measurements of a circuit under test. L

32. Write procedures using available software to test a given IC. L

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures:

The evaluation in the classroom will be determined by a combination of chapter tests, homework, and a final exam. The laboratory portion of the grade will be determined by a combination of performance within the lab and the quality of demonstrated comprehension of the lab report. A lab test and lab project may also be included. There will be at least twelve labs during the semester to go along with the classroom material. The percentage that each of these factors count and the frequency of tests and homework is left to the discretion of the instructor, but the following if offered as a guide:

Chapter Tests: 55%
Homework: 5%
Final Exam: 20%
Lab: 20%

B. Laboratory Expectations:

The laboratory serves as a medium for verifying classroom theory. The laboratory report serves as a means to practice both organizing a laboratory notebook and presenting technical observations in written form. Clean, concise, well-organized report writing in an engineering environment is of paramount importance to the EET student. Correct usage of English in the report is necessary and will be evaluated. The report grade may be reduced up to two grade levels as a result of incorrect usage of English.

A. Digital to Analog Conversion
B. Analog to Digital Conversion
C. Programmable Timers
D. Log on the VAX editor and Program Assembly
E. Assemble, line and simulate a 68000 program
F. Further Assembly language programs
G. Down loading a program to the 68000 system and connecting the logic analyzer to verify operation
H. Further practice with the logic analyzer and down loading from the VAX to the 68000 system
I. More 68000 programming practice and logic analyzer usage
J. Lab Test
K. Intro to VXI
L. Intro to VXI software
M. Testing on IC

C. Field Work:

N/A

D. Other Evaluation Methods:

N/A

E. Grading Scale:

93 - 100   A
85 - 92   B
70 - 84   C
60 - 69   D
Below 60 F

VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course (PSTCC Catalog). Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent. Class Attendance for Lab: Attendance is required to all lab sessions unless excused by the instructor. Students missing more than four unexcused sessions will receive an "F" and no credit will be received. Students tardy past half an hour will be considered absent.

B. Student Conduct:

The student is encouraged to read the regulations for student conduct in the PSTCC Catalog and Handbook.