Course Objectives:

i. To acquire the fundamentals of microprocessor systems design,
ii. to get acquainted with microprocessors and embedded controllers and their applications, and finally
iii. to understand the basic concepts of systems design.

Note: At the end of the semester, students will evaluate how these course objectives have been met.

Course Description:
This course covers the necessary digital logic design issues for understanding microprocessors operation. A coverage of the assembly and machine code language to enable students to experience control and interfacing applications of the microprocessors via software and programming. The course include a detailed study of the 68HC11 microcontroller.

Prerequisite: ECE 45230 Digital Design Fundamentals


Lab usage:
SOME homework assignments and exercises will be implemented using the M68HC12EVBU. A report explaining the aim and procedures for the exercise should be written and submitted to the assigned TA for correction. During arranged hours the TA will be available to help you with your exercises.
Quizzes:
Unannounced short (drop) quizzes may be given during the class period from time to time. They may cover previous work or lectures.

Homework Assignments:
Approximately ten written homework assignments will be given throughout the semester related to the concepts covered during the lectures. Each assignment must be turned in by the end of class on the scheduled due date. Submission of late work will be accepted by the professor; however the maximum possible score will be scaled by the percentage shown in the following table.

<table>
<thead>
<tr>
<th>Homework in due time</th>
<th>100.0%</th>
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<tbody>
<tr>
<td>One day late</td>
<td>75.0%</td>
</tr>
<tr>
<td>Two days late</td>
<td>50.0%</td>
</tr>
<tr>
<td>&gt; Two days</td>
<td>0.0%</td>
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</table>

Special circumstances will be considered provided the professor is contacted before the due date.

Course assessment:
Homework 25 %
Project 10%
Quizzes 5 %
Exam I 15%
Exam II 15%
Final Exam 30%

Exam Dates:
Exam I: Wednesday, October 15th 2003
Exam II Wednesday, November 19th 2003
Final Exam: WEDNESDAY, DEC 17 11:30 AM

Grading policy:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>&gt;95%</td>
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<tr>
<td>A-</td>
<td>90% - 95%</td>
</tr>
<tr>
<td>B</td>
<td>85% - 90%</td>
</tr>
<tr>
<td>B-</td>
<td>80% - 85%</td>
</tr>
<tr>
<td>C</td>
<td>75% - 80%</td>
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<tr>
<td>C-</td>
<td>70% - 75%</td>
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<tr>
<td>F</td>
<td>&lt;70%</td>
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</table>
Course Contents:

PART I

1. Digital Fundamentals (1/2 week)
   a) Combinational Networks
   b) State Diagrams and State Tables
   c) Sequential Networks

2. Microprocessor Fundamentals (2 week)
   a) Microprocessor Components
   b) Programming Model
   c) Microprocessor Operation
      • Instruction Cycle
      • Timing Diagrams

3. Instruction Sets (1 week)
   a) Instruction Formats and Tables
   b) Addressing Modes

4. Assembly Language Programming (2 weeks)
   a) Statement Contents (Number Types, Symbols, Expressions)
   b) Statement Format
   c) Directives (Memory Allocation, Symbol Definitions, etc.)
   d) Program Structure and Design
   e) Examples

5. Advanced Assembly Programming (1 week)
   a) Loops
   b) Stacks
   c) Subroutines

PART II

5. MC68HC12 Hardware (3 weeks)
   a) 68HC12 Configuration
   b) Memory Characteristics
   c) Microprocessors Buses
   d) I/O Parallel and Serial Interfacing
   e) Interrupt Concepts
   f) Special Hardware Operations

6. Advanced MC68HC12 Hardware (5 Weeks)
   a) The Hardware Configuration
   b) Hardware Reset
   c) Interrupt System
   d) Parallel I/O Ports
   e) Internal Flags
   f) Real-Time Clock
g) The Programmable Timer
h) Pulse Accumulator
i) Serial Communication Interface
j) Analog-to-Digital Converter

7. Applications
   a) Input Switches.
   b) Keypads
   c) LCD
RELATIONSHIP BETWEEN COURSE OBJECTIVES AND PROGRAM’S OBJECTIVES

This section is of an informative character. First, it states the common educational objectives of the Electrical and Computer Engineering Programs. Second, for the sake of clarity, it restates the course objectives of section 2, and third, it establishes the connection between program and course objectives.

Program’s Educational Objectives:

I) Fundamental Knowledge: The Electrical and Computer Engineering Programs will provide students with fundamental knowledge of mathematics, Sciences and engineering, in order for them to apply this knowledge to the solution of electrical engineering problems.

II) Design and Practical Skills: The Electrical and Computer Engineering Programs will enable students to perform engineering design subject to engineering standards and constrains. In addition, the program will provide students with hands-on experience for implementing such designs.

III) Social and Professional Aptitude: The Electrical and Computer Engineering Programs will provide a broad-based education which instill in our diverse student body professional and ethical conduct, communication and teamwork skills, and the desire for life-long learning to interact effectively with the members of engineering profession as well as society at large.

Course Objectives

i. To acquire the fundamentals of microprocessor systems design,
ii. to get acquainted with microprocessors and embedded controllers and their applications,
iii. to understand the basic concepts of systems design.

Link between Course Objectives and Program Objectives

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Contributes to</th>
<th>Program Objective</th>
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<tbody>
<tr>
<td>(i)</td>
<td>→</td>
<td>I, II</td>
</tr>
<tr>
<td>(ii)</td>
<td>→</td>
<td>II</td>
</tr>
<tr>
<td>(iv)</td>
<td>→</td>
<td>II</td>
</tr>
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