UNIVERSITY OF DETROIT MERCY
COLLEGE OF ENGINEERING AND SCIENCE
Electrical and Computer Engineering
EE 386/486 Introduction to Microcontrollers
Term I, 2006-07

COURSE DESCRIPTION: (3 Credits) An introduction to embedded systems based on microcontrollers. The overall objective of this course is to present basic computer architecture, teach assembly language programming, and present an introduction to interfacing.

PREREQUISITES BY TOPICS:
Number systems, Logic design, Sequential network design, Basic electrical circuit principles (as acquired via required college physics courses).

PREREQUISITES: EE364/EE365 Digital Logic I, PHY 162/163 (electrical physics) or EE350 Circuit Theory, E-204 C-language Programming, Co-Requisite of EE387 Microcontroller Lab. If you did not receive a grade of C or better in the listed prerequisites, you most likely do not have a sufficient command of the necessary background materials. You should meet with the instructor to discuss your preparedness for this class.

TEXTBOOK:

REFERENCES:


Document numbers:

1. CPU12RM/AD
2. 9S12DP256BDGV2/D
3. MC9S12DP256/D (opt)
4. EB376/D (opt.)
5. S12ATD10B8CV2/D
6. S12CPU15UG/D
7. S12CRGV2/D
8. S12DP256PIMV2/D
9. S12ECT16B8CV1/D
10. S12EETS4KV2/D
11. S12ICV2/D
12. S12PWM8B8CV1/D
13. S12SCIV2/D
14. S12SPIV2/D
15. S12VREGV1/D
16. S12FTS256KV2/D

A complete set of documentation is available for each registered student and may be signed out for the semester. Note that the associated PDF files are available on the Freescale web site.
INSTRUCTOR:
Dr. Nizar Al-Holou, Professor
Department of Electrical and Computer Engineering
Room E330/331, 993-3365, alholoun@udmercy.edu

OFFICE HOURS:
Monday 12:00-2:00 PM; Tuesday/Thursday 3:20-5:20 PM, anytime my office door is open, other hours by appointment.

LECTURE: Tuesday and Thursday 2:00-3:15 PM, Room E237

Electronic Bulletin Board: there will be Electronic newsgroup to post announcements and to allow students to post questions or discussion and homework help at http://knowledge.udmercy.edu. Special announcements may be made in the lectures and at the website. Students should visit the web site frequently. These announcements may overwrite previous handouts and announcements. Students are responsible for material made in announcements.

COURSE OBJECTIVES:
Synopsis: This course seeks to provide a fundamental introduction to microcontrollers via an in-depth study of a specific processor. The overall objectives are to present basic microcomputer architecture, teach assembly language programming, and present an introduction to interfacing. Homework problems and regular checkpoint quizzes are utilized to develop student creativity and encourage confidence. This course is offered in coordination with the Laboratory Course EE387 which is a co-requisite.

COURSE OUTCOMES:
Students successfully completing this course (and the associated laboratory) will:
1. have the ability to work with the numerical and character based information associated with microcontrollers and microprocessors. (ECE a,e);
2. be familiar with basic microcontroller architecture, and thus have the ability to explain the fetch and execute structure (simplified access cycle specification) for the 68HC11/12 family of microcontrollers (ECE e);
3. have the ability to write, assemble, download, debug, and execute basic assembly language programs for the Freescale Semiconductor, Inc. 68HC12/HS12 microcontroller to solve specific engineering problems (ECE 3c,k); and
4. have the ability to utilize a number of the Input/Output systems common on today’s microcontrollers to interface to the external environment. (ECE 3c,e).

TOPICS:
1. Introduction to the HCS12 Microcontroller
2. HCS12 Assembly Programming
3. Members and Hardware and Software Development Tools
4. Advanced Assembly Programming
5. Interrupts, Clock Generation, Resets, and Operation Modes
6. Parallel Ports
7. Timer Functions
8. Serial Communication Interface (SCI)
9. Serial Peripheral Interface (SPI)

Homework Assignments: Homework assignments will be given periodically in lecture. Assignments are due at the time and date announced. Solutions to homework assignments will be posted after the submission deadlines. Assignments is due at the beginning of the lecture period when it is due and will not accepted after due date. Homework assignments are provided to reinforce or expand on topics discussed in lecture. They may also touch on topics that will be covered in exams. It is to your advantage to work on the problems yourself. You are encouraged to discuss homework problems with your classmates. However, everyone must write up their own unique solution. Any question regarding the grading of a problem set must be raised within a week of its return date.

HOMEWORKS:

EE386 Syllabus -- Term I 2006-07.doc
It is advised that each student make a sincere attempt to understand and solve the homework assignments on his/her own. In general, homework are reviewed for completeness (check, check+ and check- grade designations may be assigned) but generally not formally graded. However, homework problems are used as the basis for the quizzes and major examinations in the class.

All work must be neatly presented taking advantage of the computer aided schematic software and word processing software available in the College and Department Computer Laboratories.

ATTENDANCE:
Attendance will be taken at the beginning of each class (at first verbally, and later visually). A student's attendance record will be considered in the assessment of his/her commitment to learning the course material and will be used when decisions for special consideration are requested (report rewrites, extra credit etc).

GRADING POLICY:
A straight grading scale will be used for the final assignment of letter grades at the course's end. The scale used is as follows:

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<thead>
<tr>
<th>Score</th>
<th>Grade</th>
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<tbody>
<tr>
<td>93</td>
<td>A</td>
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<tr>
<td>88</td>
<td>A-</td>
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<td>84</td>
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<td>56</td>
<td>D</td>
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Individual graded elements may be curved to account for difficulty (exams or design assignments for example).

Tentative* percentage structure:
- Examination 1, October 17: 30%
- Exam 2: 40%
- Homework: 10%
- Quizzes: 20%

- Tentative in this context means that percentage adjustments may be made between the various components to allow for difficult to predict variations in project, homework, or exam difficulty. This will only be done if all students benefit from the adjustment.
- When possible, examinations (excluding the final) will be given outside of the normal lecture schedule to allow for more time.

Graduate students are expected to answer extra exam questions, and write an additional report.

IMPORTANT DATES
- September 13: Last Day to Add a Class
- September 29: Last Day to Drop a Course without a W
- November 20: Last Day to Withdraw from Class
- November 23-26: Thanksgiving Recess (University Closed)
- December 11-16: Final Exam Week
- December 18: Official End of Term I/fall 2006-2007

Acknowledgement: We would like to acknowledge the support that we received from Motorola & Freescale to build the UDM-Board & provide brand new boards.