

## ME 462 - MICROCOMPUTER INTERFACING – FALL 06

**COURSE:** ME 462, Section 1: Microcomputer Interfacing for Mechanical Engineers  
Lecture: 2:30 – 3:20 MWF, 215 Hammond  
Lab: Open, 339 Reber, 863-5773

**CREDITS:** 4, satisfies one credit of ME laboratory requirement

**INSTRUCTOR:** Professor C. D. Rahn  
150A Hammond, 865-6237, [cdr10@psu.edu](mailto:cdr10@psu.edu)  
Office Hours: 3:30 – 4:30 MWF or by appointment

**TA:** Vishisht Gupta, [vvg102@psu.edu](mailto:vvg102@psu.edu)  
Office Hours (Held in 339 Reber): TBD

**TEXT:** The Art of Electronics, 2<sup>nd</sup> Edition, P. Horowitz and W. Hill, Cambridge University Press, 1989.

**WEBPAGE:** [www.mne.psu.edu/rahn/me462](http://www.mne.psu.edu/rahn/me462)

**PREREQUISITES:** ME 82 and seventh-semester standing.

**GRADING:** Subject to later revision, the six labs, four quizzes, project, and four homeworks will contribute to the final grade in the following percentages:

<b>Lab Reports (6)</b>	<b>30%</b>
<b>Quizzes (4)</b>	<b>32%</b>
<b>Project</b>	<b>22%</b>
<b>Homework (4)</b>	<b>16%</b>

Homework, lab reports, and projects are due at the beginning of class on the date specified in the attached schedule. Late homework, projects, and lab reports will be accepted only under extenuating circumstances (*e.g.* illness or death in the family). Please see the TA or me **within one week** if you feel you have been graded unfairly. There will be no makeup quizzes. If you are unable to attend a quiz due to extenuating circumstances and notify me in advance, I will release you from having to take the quiz and weight the other quizzes by a higher percentage.

**ACADEMIC HONESTY:** Students are expected to conform to the highest standards of honesty and integrity. Cheating of any kind will not be tolerated and any infraction will be rigorously prosecuted through the appropriate university channels. Students may work together in the preliminary stages of individual homework assignments but the final work must reflect individual efforts. The lab reports and project require group effort and are assigned a group grade. The College of Engineering academic integrity policy includes a statement of behaviors that are in violation of academic integrity and the review process for violations.

([http://www.engr.psu.edu/www/ug/acad\\_int/students/default.htm](http://www.engr.psu.edu/www/ug/acad_int/students/default.htm)).

**CLASS ATTENDANCE:** Class attendance is expected but not required. You are responsible, however, for all material discussed and presented in class. A significant portion of the lecture material will not directly follow the text. My notes are not available for copying.

**COMPUTER USAGE:** Some of the homework and projects require the use of the software package MATLAB and/or SIMULINK. The labs require programming in PBASIC.

**LABORATORY WORK:** There will be six lab assignments throughout the semester. The lab is available (Combination = \_\_\_\_ ) whenever the Reber building is open. On average, you will need 8 hours per week in the lab to complete the assignments. Lab activities will be performed in groups of two. Each group will be assigned a lab station for the duration of the semester. Both group members are expected to understand all lab activities. The breakdown of responsibilities is up to the partners. A group report must be submitted for each lab.

**PROJECT:** Each lab group will be required to propose and complete a hardware project. Begin planning your project early in the semester so that any required hardware can be ordered.

#### **LAB POLICIES:**

- NO smoking, eating, or drinking in the lab.
- Only students registered for ME 462 are permitted to use the lab equipment.
- No removal of manuals, hardware, or software from the lab without explicit permission of the TA. There will be a sign-out sheet.
- Use floppy disks to backup all your work. We assume no responsibility for hard disk failures or viruses.
- You are responsible for the tools, hardware, and manuals at your workstation. They have been marked corresponding to stations and will be checked at the end of the semester. Please help us insure that next semester's class has an equally well-equipped place to work.

#### **PROJECT INFORMATION:**

The last several weeks of the semester will be devoted to building, debugging, and demonstrating a project utilizing the concepts learned in this course. Your project should accomplish at least two of following three functions:

1. Input of data from outside world – can be analog or digital sources such as switches, microphones, strain gages, phototransistors, etc.
2. Use microprocessor to process the input data and calculate some response.
3. Output response to the outside world – can be analog or digital output, such as a lamp, an alarm, motor, LED display, etc.

Projects should be proposed by groups of two persons. Project topics are your choice. Be creative.

Examples of past projects:

- Home control system (thermostat, lighting, stereo control, remote control using telephone)

- Automated vehicle
- Automated test system, or data acquisition system (such as interfacing a digital oscilloscope or FFT analyzer for ME 414W/415W projects or research).

The Internet is an excellent source of ideas and circuits. In addition, many old project reports have been bound and are available in the lab. Go to the library and do some research. Be creative and take some risks. The project does not necessarily have to function perfectly to receive a good grade.

### **PROJECT DELIVERABLES:**

1. Preliminary proposal (5%): This will enable us to give you suggestions and assess the potential success or failure of your project. One page description.
2. Final proposal (10%): 2-4 pages, word processed, with high quality figures describing:
  - a. Objectives, justification, description
  - b. Software required, preliminary flowchart
  - c. Hardware required, preliminary schematic, parts list, including vendor, availability, and price (try to use parts we already have)
  - d. Schedule
  - e. References
3. Final report (60%): detailed, self-explanatory, high quality, technical report.
4. Final presentation (25%): Ten-minute oral presentation during last week of class.

### **Upon completion of the course, students should be able to:**

1. Analyze and design analog DC and AC circuits using resistors, capacitors, inductors, diodes, transistors and op-amps.
2. Analyze and design digital TTL circuits.
3. Build and trouble-shoot analog and digital circuits connected to single chip microcontrollers using prototype wiring and printed circuit board layout.
4. Interface common transducers and actuators to microcontrollers.
5. Filter, digitize and analyze electronic signals using analog anti-aliasing filters, A/D converters, FFT and digital filters.
6. Understand and connect computer peripherals using standard interfaces (RS-232, IEEE 488, USB)
7. Communicate well using verbal, written and electronic methods

**ME 462 MICROELECTRONICS INTERFACING**  
**COURSE SCHEDULE - FALL 2006**

Date		Topic	Reading	Material Due
5-Sep	W	Introduction		
7-Sep	F	Lab Lecture #1	8.01-.03	HW #0
11-Sep	M	RLC Circuits	1	
13-Sep	W	Lab Lecture #2		Lab #1
15-Sep	F	Diodes		
18-Sep	M	Transistors	2.01-.03,15,16	
20-Sep	W	Lab Lecture #3		Lab #2
22-Sep	F	Transistors		
25-Sep	M	Op Amps	4.01-.06,8,9,11,12	
27-Sep	W	"		HW #1
29-Sep	F	Active Filters	5.01-7	
2-Oct	M	<b>QUIZ #1</b>		
4-Oct	W	Active Filters		
6-Oct	F	<b>STUDY DAY - No Class</b>		
9-Oct	M	Active Filters		
11-Oct	W	Electric Motors		
13-Oct	F	Lab Lecture #4		Lab #3
16-Oct	M	Electric Motors		
18-Oct	W	"		HW #2
20-Oct	F	Sensors	15.01-4	
23-Oct	M	<b>QUIZ #2</b>		
25-Oct	W	D/A and A/D Conversion	9	
27-Oct	F	"		
30-Oct	M	Digital Electronics	8	
1-Nov	W	Lab Lecture #5		Lab #4
3-Nov	F	Digital Electronics		
6-Nov	M	"		
8-Nov	W	Lab Lecture #6		Lab #5, Preproposal
10-Nov	F	PC Board Fabrication		
13-Nov	M	Digital Fourier Transform		
15-Nov	W	"		HW #3
17-Nov	F	Digital Signal Processing		
20-Nov	M	<b>QUIZ #3</b>		
21-Nov	T	Digital Signal Processing		Lab #6, Proposal
24-Nov	F	<b>THANKSGIVING</b>		
27-Nov	M	Digital Signal Processing		
29-Nov	W	"		
1-Dec	F	PLCs		HW #4
4-Dec	M	"		
6-Dec	W	<b>QUIZ #4</b>		
8-Dec	F	MEMS		
11-Dec	M	"		
13-Dec	W	"		
15-Dec	F	Project Presentations		Project Reports