

TECHNOLOGY 430 - Microcontroller Interfacing and Applications

2006-07 Catalog Data: TECH 430 Microcontroller Interfacing and Applications (3 Credits)

Course Catalog Description: Introduction to microcontroller-based systems for embedded control applications. Topics include transducers, signal conditioning, data acquisition, microcontroller programming and interfacing, application of microcontrollers in process control, automation, instrumentation, and communication.

Prerequisites: Tech377 and Tech377A

Textbook:

- *Microcontroller Technology: The 68HC11*, Peter Spasov, Prentice-Hall, Fifth edition, 2004. ISBN: 0-13-112984-8.

References:

- *Microcontrollers: Architecture, Implementation, and Programming*, Kenneth Hintz and Daniel Tabak, McGraw-Hall, 1992, ISBN: 0-07-028977-8.
- *Data Acquisition and Process Control with the MC68HC11*, Fredrick F. Driscoll, et al., Prentice-Hall.
- *68HC11 Microcontroller Laboratory Book*, Robert J. Dirkman and John Leonard, Prentice-Hall, ISBN: 0-13-207523-7.

Instructor: Dr. Abul K. M. Azad

Office: Still Hall 203D

Office hours: *Monday* -1:00pm to 2:30pm; and *Tuesday*- 1:00pm to 2:30pm.

(or by appointment)

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Course Meetings: Tuesday and Thursday 330-500

Objectives with relationship to ABET Outcomes:

1. To demonstrate the understanding of Microcontroller systems. (A and B)
2. To demonstrate the programming skills for a microcontroller systems (A, B, C, D, F, and G)
3. To demonstrate the understanding of data acquisition process from a given system. (A, B, C, D, F, and G.)
4. To demonstrate the integration of a microcontroller system with a physical system. (A, B, C, D, F, and G)

5. To demonstrate the interfacing protocols of a microcontroller system with an external process. (A, B, C, F, G, and N)
6. To demonstrate the use of advanced programming skills for process control operation. (B, C, F, G, L, and N)

ABET Outcome Guideline:

- A. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
- B. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology.
- C. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.
- D. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
- F. An ability to function effectively on teams.
- G. An ability to communicate effectively in writing.
- L. A commitment to quality, timeliness, and continuous improvement.
- N. An ability to use modern laboratory techniques, skills, and/or equipment effectively.

Topics:

1. Microcontroller concept
2. Computerized data acquisition and control concept
3. Transducers and signal conditioning
4. Analog to digital and digital to analog converters
5. Cross assembly and program development
6. Bus concept and modes of operation
7. Microcontroller hardware and clocked operation
8. Interfacing concept and parallel input/output
9. The serial subsystems
10. Programmable timer operations

Computer Usage:

Students will use the computers extensively for microcontroller programming, along with the interfacing applications. They will also use MSWord for the preparation of laboratory reports and pre-laboratory tasks.

Laboratory Projects:

There are some laboratory sessions, which will be incorporated within the course itself. The date and time of these laboratory projects will be announced as we progress through the course.

Group Project:

There will be a group project involving almost all the topics covered within the course. Handouts for this provided will be delivered within few weeks.

Evaluation Process: There will be one incourse exams, a number of homeworks and a final exam. In addition to these, the project reports will also be counted towards the final grade.

Incourse Examination-1	20%
Group Project	20%
Lab Projects and Homework	25%
Final Examination (comprehensive)	25% (<i>To be announced</i>)
Oral Interview	10%

Incourse examination date will be announced one to two weeks prior to the due date.

Grading Criteria:

<u>Marks obtained</u>	<u>Grade</u>
100 - 90%	A
89% - 80%	B
79% - 70%	C
69% - 60%	D

Attendance:

Attendance will be recorded in every class. Late arrival in the class will not be allowed. If a student is absent it is his/her responsibility to obtain lecture notes, homework, and any other information given during that absence.

Missing three classes will result in the reduction of one letter grade, and each subsequent absence result in an additional reduction of a letter grade.

Homeworks and other assignments:

Completed homeworks and project reports need to be handed in “*on or before*” the due date (*printed copy only*). Any late submission will not be accepted.

Academic Misconduct:

This is usually defined as “*Receipt or transmission of unauthorized aid on homeworks or examinations, plagiarism, unauthorized use of examination materials, or other forms of dishonesty in academic matters.*” Misconduct may also include inappropriate or disruptive behavior during the class meetings. This will NOT be tolerated and would affect your grade. For details please consult your student handbook.

Receiving Assistance:

If you have any question(s) related to academic matters and/or anything else, which effecting your performance in this class please don't hesitate to contact the course teacher without any delay.

Classroom Practices:

1. Raise your hand if you have any question(s).
2. Student should switch off all the cell phones and pagers (and any other electronic items which may disrupt the class) before entering the classroom.
3. No side conversations during the class.
4. Report for any planned early leaving.
5. No newspaper reading.