EE 4380: Microprocessor Design Project
(Fall 2000, Tuesday and Thursday: 3:30–4:45 p.m., EC 2.120)

1 General Information

Instructor: Mehrdad Nourani
Office & Phone: EC 3.522, 972-883-4391
E-mail: nourani@utdallas.edu
Office Hours: Tuesday and Thursday 2:30–3:30 p.m., or by appointment.
References: Any good book on the 8051 microcontroller systems. Examples are:
1. The 8051 Microcontroller and Embedded Systems, Muhammad A. Mazidi and
4. 8051 Microcontroller: The Hardware, Software and Interfacing, James W.
Course Web Page: http://www.utdallas.edu/~nourani/Teaching/fa00_ee4380/
Teaching Assistant: To be announced.

2 Catalog Description

EE 4380: Microprocessor Design Project (3 semester hours).
Detailed design, assembly and testing of a microprocessor system. All students must submit a written report and
make an oral presentation at the culmination of the project.
Prerequisite: Senior standing, Digital design (e.g. EE 4320).

3 Grading

Grading will be based on step-by-step implementation of a microprocessor-based system project using the 8051
family of microcontrollers.

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\begin{align*}
\text{Project proposal} & \quad 05\% \quad \text{(Thur. 9-14-2000)} \\
\text{Board setup and demo} & \quad 15\% \quad \text{(Tue. 10-3- and Thur. 10-5-2000)} \\
\text{Progress report and demo} & \quad 30\% \quad \text{(Tue. 10-31- and Thur. 11-2-2000)} \\
\text{Final report} & \quad 20\% \quad \text{(Tue. 11-28 and Thur. 11-30-2000)} \\
\end{align*}
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4 Course Policy

- **Objective:** The objective of this course is to present a balanced view of microprocessor-based design and
development. Through a practical project, it is expected that the student will acquire a clear understanding of
both the hardware and software techniques and strategies for developing an embedded system. This obviously
requires sufficient time and effort.

- **Projects:** You can work on the project individually or in a group of two. Since the students have different
backgrounds, experience levels and interests, they are allowed to define and work on projects that they like
as long as the fundamental course framework (e.g. using microcontrollers, reasonable complexity) is satisfied
and it is different (or have different specifications) compared to the other groups. A list of typical projects will
be posted on the course web page to provide some ideas and stimulate your thinking and innovation.

- **Laboratory:** The Embedded System Laboratory (EC 3.120) will be available to the students to help them
with their projects. In addition to TA(s) present for consultation, some key lab equipments such as PC hosts
with some general-purpose softwares, oscilloscope, logic analyzer, function generator, power supply, PROM programmer and eraser, etc. will be available during the lab hours (to be announced in the web page).

- **Development Board:** Each group needs to purchase a 8051-family development board or assemble it. There are variety of such boards (see web page or reference 1 for some vendors). The selection should be done based on the project and specifications. Sample 8051 boards are also available in the lab and you are welcome to use them. However, due to the learning curve and the need to keep the assembled components of your project for further development, having your own board is required. This will give you also more flexibility to develop significant part of project (e.g. software development and assembling components) in your convenient time and use the lab equipments for further observation, simulation, debugging, completion etc.

- **Report/Demo:** The most important criterion for project evaluation is that your project must work. You need to setup your demo in a way to show clearly the correct functionality of your project according to your proposed specifications. Additionally, during demos the group members will be also questioned about the fundamental microcontroller issues and the details of their designs and implementations. Late or make-up reports and demos will not be accepted unless the student has obtained permission from the instructor before the due date. Permission will not be given without documentation of exceptional circumstances.

- **Attendance:** Regular attendance is highly recommended. Announcements and complementary materials will be posted on the course web page.

### 5 Syllabus & Tentative Lecture Plan

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Readings (Ref. #1)</th>
<th>Topics Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue.</td>
<td>Thur.</td>
<td></td>
</tr>
<tr>
<td>8/24</td>
<td></td>
<td>Introduction: course introduction; technologies and style; y-chart; current CAD design methodologies; review of logic circuits.</td>
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<tr>
<td>8/29</td>
<td>8/31</td>
<td>Microprocessor Systems: datapath and controller path microarchitectures; overview of the 8051 family.</td>
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<tr>
<td>9/5</td>
<td>9/7</td>
<td>The 8051 Microcontroller: architecture; introduction to the 8051 assembly language;</td>
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<tr>
<td>9/12</td>
<td>9/14</td>
<td>Embedded Systems: specification and representation; development boards; software/hardware interfacing; Project Proposal submission.</td>
</tr>
<tr>
<td>9/19</td>
<td>9/21</td>
<td>The 8051 Programming: addressing modes; jumps and loops; procedure calls; I/O port access.</td>
</tr>
<tr>
<td>9/26</td>
<td>9/28</td>
<td>arithmetic instructions; No lecture on 9/28. Optional lab attendance for board setup.</td>
</tr>
<tr>
<td>10/3</td>
<td>10/5</td>
<td>Development board setup demo.</td>
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<tr>
<td>10/10</td>
<td>10/12</td>
<td>Ch 7 Ch 8</td>
</tr>
<tr>
<td>10/17</td>
<td>10/19</td>
<td>Ch 9 Ch 11</td>
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<tr>
<td>10/24</td>
<td>10/26</td>
<td>Ch 11</td>
</tr>
<tr>
<td>10/31</td>
<td>11/2</td>
<td>Progress report and demo.</td>
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<tr>
<td>11/7</td>
<td>11/9</td>
<td>Ch 10 Ch 12</td>
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<tr>
<td>11/14</td>
<td>11/16</td>
<td>Ch 13, 14,15</td>
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<tr>
<td>11/28</td>
<td>11/30</td>
<td>Final demo, presentation and report.</td>
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