GE-1111 Problem Solving and Computation

Course Syllabus
Fall 2014

Instructor: Dr. Rafael Ubal
Email: ubal@ece.neu.edu
Office: 140 The Fenway, 3rd floor (see detailed directions below)
Phone: 617-373-3895
Office hours: Tuesdays and Fridays, 12-1pm, or by appointment
Class schedule: Mondays and Wednesdays, 2:50pm-4:30pm, 429 Dana Research Center

Overview
The primary objective of this course is learning how to apply selected computational tools to solve engineering problems from a variety of disciplines using C++ and MATLAB programming languages. Specific skills include:

- Formulate engineering problems for numerical solutions.
- Select appropriate techniques and computational tools to arrive at a numerical answer.
- Employ computational concepts and skills such as variables, functions, flowcharting, looping, and conditional branching.
- Apply computational techniques for analyzing data and for graphical presentation of results.
- Present computational projects with organization and clarity.
- Debug code and verify solutions.
- Demonstrate facility with two specific software packages (MATLAB and Dev-C++) which can be used throughout the Northeastern experience and beyond for both classroom and real-world problems.
- Demonstrate facility in building and debugging microcontroller-based circuit breadboard applications.
Required Material

- A USB Flash drive is highly recommended to backup all your computer work. You can also email it to yourself or use your COE network “Z:” drive.

Additional References

This is a list of some optional additional texts that you can find in Snell Library, or online:


Software

All software needed in class is available on COE/NUNET.

- **Bloodsched Dev-C++**. From the COE machines, you can access this software through Start → All programs → COE Applications → Bloodsched Dev-C++ → Dev-C++. Dev-C++ is a free software package. If you prefer to install it on your own Windows machine, you can download it from [http://www.bloodshed.net/dev/devcpp.html](http://www.bloodshed.net/dev/devcpp.html).

- **MATLAB**. From the COE machines, you can access this software through Start → All programs → COE Applications → MATLAB → R2013b → MATLAB R2013b. If you wish to run MATLAB remotely, you can do so through a Windows Remote Desktop connection. Please check [http://www.northeastern.edu/its/services/myapps/](http://www.northeastern.edu/its/services/myapps/) for details.
Office Location

1) Find the office building at 140 The Fenway (TF), and enter the main door located at the parking lot.

2) Take the main elevator to the 3rd floor.

3) Once on the 3rd floor, call me at 617-373-3895. My office is in a locked research laboratory. I will meet you on the hallway right by the elevator and let you in.
Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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</thead>
<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Quizzes</td>
<td>20%</td>
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<tr>
<td>Midterm exam</td>
<td>20%</td>
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<tr>
<td>Final exam</td>
<td>20%</td>
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<tr>
<td>Class project</td>
<td>20%</td>
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</tbody>
</table>

- **Homework.** There will be weekly homework assignments with the exact dates shown in the topics list below.
- **Quizzes.** There will be four quizzes during the course, with an approximate duration of 20 minutes each. The exact dates are shown in the topics list below.
- **Midterm.** One midterm will cover the first half of the course material (C++).
- **Final.** A comprehensive final exam will cover material of the entire course, focusing on the contents of the second half of the semester (MATLAB).

Homework

- A homework assignment will be posted on Blackboard at least 6 days before it is due. The due dates for all homework assignments are specified in the calendar below.
- Homework answers must be submitted on Blackboard as one single **PDF document** with a neat, organized, and professional presentation. Individual homework assignments might request additional files to be attached.
- The announced due date is a **strict deadline with no exceptions**. Blackboard will automatically reject any late submission. This means that anybody suspecting a possible submission delay on the same due day (e.g., due to unavailable Internet connection, unavailable computer, etc.) should make sure to upload it in advance.
- The average grade for homework assignments will be calculated by discarding the assignment that received the worst grade (or not handed in). This policy is tolerant to those situations that inevitably caused you to be late to class, while still benefits anybody having submitted all assignments on time.
- All work must be developed individually. Any instances of misrepresentation of individual work will be dealt with by referring the matter to the NU Office of Student Conduct and Conflict Resolution.

Attendance and Punctuality

Punctuality in class is indispensable. A student coming in late distracts both the instructor and the classmates. If you need to miss a class or come in late for some reason, please let me know in advance.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>HW due</th>
<th>Reading (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/31</td>
<td>Computing systems, data representation, engineering problem solving methodology. Program structure.</td>
<td>–</td>
<td>Etter: Chapters 1 and 2</td>
</tr>
<tr>
<td>2</td>
<td>9/7</td>
<td>Constants and variables, C++ operators, input/output, library functions, control structures. Machine Science kits introduction and setup.</td>
<td>–</td>
<td>Etter: Chapters 2 and 3</td>
</tr>
<tr>
<td>3</td>
<td>9/14</td>
<td>Algorithms, conditional expressions and selection, control structures. Machine Science tutorials: using buttons, lighting an LED.</td>
<td>HW #1 due Mon 9/15</td>
<td>Etter: Chapters 3 and 4</td>
</tr>
<tr>
<td>4</td>
<td>9/21</td>
<td>Loop structures and applications. Machine Science tutorials: making sounds, sensing light and temperature. <strong>Quiz #1</strong> (Wed. 9/24)</td>
<td>HW #2 due Mon 9/22</td>
<td>Etter: Chapters 4 and 5</td>
</tr>
<tr>
<td>5</td>
<td>9/28</td>
<td>Working with data files, defining, reading, generating data, error checking. Machine Science: controlling the LCD, project plans.</td>
<td>HW #3 due Mon 9/29</td>
<td>Etter: Chapters 5 and 6</td>
</tr>
<tr>
<td>6</td>
<td>10/5</td>
<td>Modular programming with functions, passing parameters, random numbers, practice. <strong>Quiz #2</strong> (Wed. 10/8)</td>
<td>HW #4 due Mon 10/6</td>
<td>Etter: Chapters 6 and 7</td>
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<tr>
<td>7</td>
<td>10/12</td>
<td>Arrays, character strings, arrays in functions, sorting, searching and applications.</td>
<td>–</td>
<td>Etter: Chapters 7 and 8</td>
</tr>
<tr>
<td>8</td>
<td>10/19</td>
<td>2-D arrays, matrices, applications and problems using 2-D arrays. <strong>Midterm Exam</strong> (Wed. 10/22)</td>
<td>HW #5 due Mon 10/20</td>
<td>Etter: Chapter 9</td>
</tr>
<tr>
<td>9</td>
<td>10/26</td>
<td>Using MATLAB, arrays, operations with arrays, script files, plotting.</td>
<td>HW #6 due Mon 10/27</td>
<td>Gilat: 1, 2, 4.1-4.3, 5.1-5.5</td>
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<tr>
<td>10</td>
<td>11/2</td>
<td>Matrix operations, linear equations, file formatting. <strong>Quiz #3</strong> (Wed. 11/5)</td>
<td>HW #7 due Mon 11/3</td>
<td>Gilat: 3, 4.4-4.7</td>
</tr>
<tr>
<td>11</td>
<td>11/9</td>
<td>Functions and program control.</td>
<td>HW #8 due Mon 11/10</td>
<td>Gilat: 6, 7</td>
</tr>
<tr>
<td>12</td>
<td>11/16</td>
<td>Numerical integration, 3D plotting. <strong>Quiz #4</strong> (Wed. 11/19)</td>
<td>HW #9 due Mon 11/17</td>
<td>Gilat: 8.3, 9.3, 9.4, 10</td>
</tr>
<tr>
<td>13</td>
<td>11/23</td>
<td>Combining MATLAB and C++.</td>
<td>HW #10 due Mon 11/24</td>
<td>–</td>
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<tr>
<td>14</td>
<td>11/30</td>
<td>Project presentations and course review.</td>
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(*) Etter = Engineering Problem Solving with C++  
Gilat = MATLAB, An Introduction with Applications
Access to COE Computers

- **COE Account.** We expect that you have a current and active COE account to use for correspondence, to access course directories and to log in to COEwin machines in Labs 208SN, 268SN, 274SN, 368SN, and 429DA.

- **Logging in.** Press Ctrl+Alt+Del, enter your COE user name, enter your COE password), press OK. You can do your programming work at the Desktop level and then save your work either on an external USB drive, or in a folder on the COE network system (usually your Z: drive).

- **Log-in problems.** If you experience any problems logging in or accessing the applications, please check the following reasons:
  - You do not have a valid COE account. Request an account online at http://www.coe.neu.edu/computer
  - Your password is incorrect or case-sensitive. Check for Caps Lock or retry your characters.
  - You are not logging in to COEWIN. Make sure at “Log on to” that you select the COEWIN system.
  - You may be over quota. Delete all nonessential files from your directory once you get logged in.
  - The network may be down. Your professor (then you) should be informed of this by the COE staff.

- **Accessing printers.** Choose the printer through the *Print* menu of your application (room number/building changes for different labs):
  - \coeprint\hp208sn
  - \coeprint\hp268sn
  - \coeprint\hp274sn
  - \coeprint\hp429dn

- **Problems with COE computers.** View the web site and/or go through the e-mail process found at http://www.coe.neu.edu/computer or send a descriptive correspondence to help@coe.neu.edu. If you have any problems with the Windows-based operating systems or Windows applications, please e-mail winhelp@coe.neu.edu. The College of Engineering technicians will address your problem ASAP.