University of Toronto  
Department of Electrical and Computer Engineering  
ECE411H1S – Real-Time Computer Control  

Information Sheet

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Teaching Assistants  
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Lectures:  Monday, 4-5, GB221  
          Tuesday, 5-6, GB221  
          Thursday, 4-5, GB221

Labs: All labs are held in BA3114. Please do not change lab section unless you have received approval. There will be five labs in alternating weeks, starting the week of January 26, 2015.

<table>
<thead>
<tr>
<th>Section</th>
<th>Day and Time</th>
<th>Lab 1</th>
<th>Lab 2</th>
<th>Lab 3</th>
<th>Lab 4</th>
<th>Lab 5</th>
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</thead>
<tbody>
<tr>
<td>PRA01</td>
<td>Wednesday, 9-12</td>
<td>Jan 28</td>
<td>Feb 11</td>
<td>March 4</td>
<td>March 18</td>
<td>April 1</td>
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<tr>
<td>PRA02</td>
<td>Friday, 12-3</td>
<td>Jan 30</td>
<td>Feb 13</td>
<td>March 6</td>
<td>March 20</td>
<td>April 3</td>
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<tr>
<td>PRA03</td>
<td>Thursday, 9-12</td>
<td>Jan 29</td>
<td>Feb 12</td>
<td>March 5</td>
<td>March 19</td>
<td>April 2</td>
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Tutorial: Tuesday 4-5, GB405, in weeks alternating to the labs, starting the week of January 19, 2015.

Midterm: There will be one midterm administered during the second week of March.

Textbook: There is no required textbook. Course notes will be provided on Blackboard. They are self-contained and serve as a textbook for this course.

You may also consider consulting the following references:


Grading:  
Labs 20%
Midterm 25%
Final Exam 55%
Syllabus: Major Topics

1. Discrete-time linear systems: solution of difference equations, analysis using $z$-transforms, state models and their analysis, state space realization of transfer functions.

2. Sampled-data systems: sample and hold operations, continuous-time state equations and their discretizations; transform analysis and discretization of continuous-time transfer functions; effects of sampling on frequency response, aliasing.

3. Control design using state space methods: controllability and stabilization by state feedback, observability and state estimation using full-order observers, output feedback; tracking and regulation, exomodels, internal models.

4. Control design by discretization of continuous-time controllers: the bilinear transformation and its properties, discretization errors, pole-zero matching.

5. Introduction to real-time scheduling: priority scheduling, deadlines, schedulability of periodic processes; rate monotonic scheduling and rate monotonic bound for schedulability, earliest deadline first scheduling; timing diagrams. TrueTime simulation tool.