The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

MED PHYS 3R03
Computational Medical Physics
http://www.science.mcmaster.ca/medphys/courses.html

<table>
<thead>
<tr>
<th>(Term 2)</th>
<th>M. WIERZBICKI</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01: Tu, 11:30am - 12:20 pm, ETB 224</td>
<td>Juravinski Cancer Centre, 4-27</td>
</tr>
<tr>
<td>Th, 11:30am - 1:20 pm, ETB 224</td>
<td><a href="mailto:mwierzbi@hhsc.ca">mwierzbi@hhsc.ca</a></td>
</tr>
<tr>
<td>L01: Mo, 11:30am - 1:20 pm, BSB 241</td>
<td>Phone Extension: 67155</td>
</tr>
</tbody>
</table>

Description:
Medical Physics 3R03 is a problem-based course. Students work through several medical physics problems, each requiring a mathematical model and numerical solution. In this way, basic numerical methods and scientific programming are learned. The problems are taken from radiation therapy, radiology, and nuclear medicine. The MATLAB programming language is used.

Objectives:
Provide exposure to scientific computing as used in medical physics.

Topics:
- Solving nonlinear equations
- Computational error
- Numerical integration
- Monte Carlo particle transport simulations, statistics
- Solving linear ordinary differential equations
- Solving partial differential equations

Text:
Lecture notes will be provided. Additional texts will be identified, but are not required.

Evaluation:
- Assignments (5 × 5%) (25%)
- Midterm tests (2 × 15%) (30%)
- Final Exam (45%)
Calculator Requirements:
A calculator is required for lectures. The McMaster Standard Calculator (Casio fx 991) may be used on the midterm tests and the examination.

Assignment Requirements:
Written parts may be done using pen, pencil, or software and will be submitted in class. Programming components must be done in MATLAB and will be submitted using the Avenue to Learn system.

Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Medical Physics Topic</th>
<th>Applied Math/Numerical Method(s) Demonstrated</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (day 1)</td>
<td>Preliminaries</td>
<td>Introduction to MATLAB</td>
<td>-</td>
</tr>
<tr>
<td>1 – 2</td>
<td>Compton scattering in an attenuation experiment</td>
<td>Solving nonlinear equations</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>2 – 3</td>
<td>Nonspecific to medical physics</td>
<td>Computational error</td>
<td>-</td>
</tr>
<tr>
<td>4 – 5</td>
<td>Dose at a point from distributed radioactivity</td>
<td>Numerical integration</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>5 – 7</td>
<td>Tissue heterogeneities in radiation therapy</td>
<td>Monte Carlo particle transport simulation, statistics</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>8 – 9</td>
<td>Compartmental modeling/pharmacokinetics</td>
<td>Numerical solution of ordinary differential equations (initial value problems)</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>10 – 12</td>
<td>Bioheat transfer equation</td>
<td>Numerical solution of partial differential equations (boundary value problems)</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Policy Reminder:
Attention is drawn to the Statement of Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office. Any student who infringes one of these resolutions will be treated according to the published policy.

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only three forms of academic dishonesty:
1. Plagiarism, e.g. the submission of work that is not one’s own or for which credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.