MecE 390 – Numerical Methods (Winter 2013)

Objectives: To provide a basic familiarity with the numerical methods used by professional engineers in solving various design and analysis problems. Both the principles and application of the numerical methods will be emphasized.

Course topics:

- Introduction to modeling and scientific computing,
- Root finding,
- Systems of linear algebraic equations,
- Systems of nonlinear algebraic equations,
- Functional approximations,
- Numerical integration and differentiation,
- Ordinary differential equations: initial value problems,
- Ordinary differential equations: linear boundary value problems,
- Ordinary differential equations: nonlinear boundary value problems (time permitting).

Instructor and TAs: Dr. Morris R. Flynn (4-31D MEC; mrflynn@ualberta.ca), Ms Suzan Elshaer (elshaer@ualberta.ca), Mr. Chunendra Sahu (chunendr@ualberta.ca) and Mr. Ben Bschaden (bschaden@ualberta.ca).


Lectures: Tuesday-Thursday 8:00 AM to 9:20 AM (ETLE 2-002).

Laboratories: Beginning the week of Jan. 14, Monday, Wednesday or Friday 10:00 AM to 10:50 AM (MEC 3-3). Please note that no laboratories are scheduled over Reading Week, during the week of the midterm exam or on Mar. 29 (Good Friday holiday) and Apr. 1 (Easter Monday holiday).

(Hard) prerequisites: MATH 102, 201 and some exposure to computer programming.

Dr. Flynn’s office hours: Beginning Jan. 17, Thursdays 9:30 AM to 11:00 AM or by appointment.


Problem sets: Beginning Jan. 21, problem sets will generally be due Mondays by 10:00 AM in the box on the 4th floor of MEC. (For more information, please consult the detailed course schedule on the course homepage.) Problem sets will be distributed electronically through the website listed above. Students are permitted to collaborate with one another in completing their assignments, but any submitted material must be one’s own (see Academic honesty below).
Exams: 80 minute mid-term (Tuesday, March 5 in class), two hour final (day and time to be determined by the Registrar’s Office). Both exams are closed book. For the midterm and final, respectively, a single- and double-sided 8.5 × 11 formula sheet is permitted.

Grading: Problem sets (20%), mid-term (30%), final (50%).

CEAB accreditation: The University of Alberta’s engineering programs are evaluated on a periodic basis to ensure quality of instruction. As part of this evaluation process, copies of students’ problem sets and exams (midterm and final) will be made and catalogued. Before making this material available to the accreditation review panel, student names and ID numbers will be removed, i.e. the department will endeavor to safeguard your privacy. Questions regarding the accreditation process can be directed to the department’s chair of undergraduate studies, Dr. C.R. Koch.

Academic honesty: The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.uofaweb.ualberta.ca/secretariat/studentappeals.cfm) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Additional information: Policy about course outlines can be found in §23.4(2) of the University Calendar.
Dr. Flynn’s grading policy

Summarized in table 1 is a generic grading scheme for a representative problem as might appear in an assignment or examination. Note that in order to adequately distinguish between mediocre and superlative students, the average mark on the mid-term(s) and final will typically fall between 55% and 65%. Please do not be overly discouraged if your mark is lower than you had hoped: your relative rather than your absolute standing will determine your final grade for the course. For undergraduate classes, the average final grade will typically fall between 2.6 and 3.2. For graduate courses, the average final grade will typically fall between 3.0 and 3.5. Students who are concerned that they may fail the course are strongly encouraged to speak to me well in advance of the final exam to see what avenues may be pursued.

Table 1: Generic grading scheme.

<table>
<thead>
<tr>
<th>% of marks obtained</th>
<th>Material presented</th>
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<tbody>
<tr>
<td>10</td>
<td>Little or no material presented. Equations irrelevant to the problem at hand.</td>
</tr>
<tr>
<td>20</td>
<td>Correct equations presented with little or no subsequent calculations.</td>
</tr>
<tr>
<td>40</td>
<td>Correct equations presented with incomplete or badly misguided follow-up calculations.</td>
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<tr>
<td>50</td>
<td>Correct approach marred by multiple conceptual flaws OR right answer obtained using an incorrect approach.</td>
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<tr>
<td>70</td>
<td>Correct approach with a single conceptual flaw.</td>
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<tr>
<td>75</td>
<td>Correct approach with multiple algebraic mistakes.</td>
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<tr>
<td>90</td>
<td>Correct approach with a single algebraic mistake (made towards the end of the problem).</td>
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<tr>
<td>100</td>
<td>Correct answer obtained using a correct (and well laid-out) methodology.</td>
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