# Carleton University

## Department of Systems and Computer Engineering

***ECOR 2606 A&B*** ***Numerical Methods*** ***Fall 2011/2012***

## Course Outline

**Instructors:**

| Sect | Instructor | Office | Telephone | Email |
|---|---|---|---|---|
| **A&B** | **Kevin Goheen** | **4230ME** | 613-277-3027 | kgoheen@gmail.com |
| **C** | **Lynn Marshall** | **4230ME** | e-mail preferred | lynnmar@sce.carleton.ca |

**Course Description:**

Numerical algorithms and tools for engineering and problem solving. Sources of error and error propagation, solution of systems of linear equations, curve fitting, polynomial interpolation and splines, numerical differentiation and integration, root finding, solution of differential equations. Software tools.
Precludes additional credit for SYSC 2606
Prerequisites: MATH 1005 and ECOR 1606 and (ECOR 1010 or ELEC 1908).

**Instructional Resources:**

- Course material will be posted on WebCT. The URL is http://webct6.carleton.ca
- Textbook: *TBA*

**Grading Scheme:**

| Element | Dates | Weight |
|---|---|---|
| Lab Quizzes | See lab schedule (next page) | 25% (5% each) |
| Midterm Exam (80 min) | TBA (during a scheduled class time) | 25% |
| Final (3 hours) | During the university's exam period | 50% |

a) In order to pass the course, students must pass the final exam.
b) The final examination is for evaluation purposes only and will not be shown to or returned to students.
c) There will be no alternate scheduled time for the midterm examination. Students who miss it will receive a mark of zero unless they have a legitimate reason for being absent (in which case the weight of the midterm will be added to the weight of the final examination).
d) Problem sets will be assigned. They will not be graded but your understanding of the correct solutions will be important for success in the graded components.

**Calculators:**

Only approved calculators may be used during tests. The list of approved calculators will be posted on Web CT. Students whose calculators are not on this list may apply to have them added to it. Any such applications must be made **well in advance** of a test. Graphing and programmable calculators will **not** be considered.

**Health and Safety:**

Every student should have a copy of our Health and Safety Manual. An electronic version of the manual can be found at http://www.sce.carleton.ca/courses/health-and-safety.pdf

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**Lab Schedule:**

| Lab No | | L1 M:1300-1425 | L2 M:1130-1300 | L3 F:1630-1800 | L4 R:1630-1800 | L5 T:1130-1300 | L6 T:1630 -1800 | L7 T:1130 -1300 | L8 R:1130 -1300 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 2 | | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 3 | Quiz #1 | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 4 | | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 5 | Quiz #2 | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 6 | | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 7 | Quiz #3 | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 8 | | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 9 | Quiz #4 | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 10 | | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |
| 11 | Quiz #5 | TBA | TBA | TBA | TBA | TBA | TBA | TBA | TBA |

**Outline:**

| Topic | Textbook |
|---|---|
| Introduction | TBA |
| Root Finding<br>- Matlab: the basics, functions, vectors, plotting, fzero<br>- Theory: Bisection, Secant Method, Newton's Method | TBA |
| Minimization / Maximization<br>- Matlab: fminbnd<br>- Theory: Golden Section Searches | TBA |
| Systems of Linear Equations (Direct methods)<br>- Matlab: matrices, left division, inv, lu<br>- Theory: Gaussian elimination, Gauss-Jordan elimination (not in text)<br>numerical errors,<br>matrix condition, matrix inverse, LU Factorization | TBA |
| Systems of Linear Systems (Iterative methods) | TBA |
| Regression (Linear and General Least Squares)<br>- Matlab: polyfit, left division, qr<br>- Theory: least squares, QR factorization | TBA |
| Interpolation<br>- Matlab: polyfit, interp1<br>- Lagrange polynominal, Newton's polynominal, splines | TBA |
| Numerical Integration<br>- Matlab: trapz, quad<br>- Theory: trapezoidal integration, Simpon's rules,<br>Richardson extrapolation (Romberg integration) | TBA |
| Numerical Differentiation<br>- Matlab: diff, gradient<br>- Theory: forward, backward, and central difference formulas,<br>Richardson extrapolation | TBA |
| Differential Equations<br>- Matlab: ode23, ode45<br>- Theory: Euler's method and improvements on it | TBA |

## Course Outline

**Students with Disabilities:**

Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities for a formal evaluation of disability-related needs. Registered PMC students are required to contact the Centre, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you require accommodation for your formally scheduled exam(s) in this course, please submit your request for accommodation to PMC by November 11th 2011 for Fall term (December exams).