MATH 2Z03
ENGINEERING MATHEMATICS III
(Fall 2009)

Time & Place:

Section **C01**: Tu We Fr 12:30–13:20 in BSB/147

Section **C02**: Mo We Th 13:30–14:20 in BSB/B136

Section **C03**: Mo We Th 17:30–18:30 in JHE/376

Tutorials:

T01 Tu 17:30–18:20 in TSH/B128
T02 Th 10:30–11:20 in TSH/B128
T03 Tu 10:30–11:20 in JHE/376
T04 Fr 09:30–10:20 in BSB/117

Computer Labs:

Mo 9:30–11:30 in BSB/244
Tu 9:30–11:30 in BSB/244
We 12:30–2:30 in BSB/244
Th 10:30–12:30 in BSB/244
Fr 9:30–11:30 in BSB/244

Instructors:

Section **C01**: Dr. Bartosz Protas
Office HH 326, Ext. 24116, Email: bprotas@mcmaster.ca
Office Hours: Tu, We 10:30–11:30

Section **C02**: Dr. Zdislav Kovarik
Office HH 425, Ext. 23408, Email: kovarik@mcmaster.ca
Office Hours: Mo, We, Th 15:00–16:00, or by appointment (Email preferred)

Section **C03**: Dr. Ramesh Yapalparvi
Office HH 407, Ext. 26079, Email: ramesh@math.mcmaster.ca
Office Hours: TBA

Teaching Assistants:

TBA

Course Webpage: http://www.math.mcmaster.ca/~bprotas/MATH2Z03

Outline of the Course: The course provides an overview of ordinary differential equations and covers also some related topics, such as Laplace transforms and elements of linear algebra (eigenvalues and eigenvectors). A number of applications to actual problems will be discussed. Students will also acquire programming skills in MATLAB, and will use them to solve a range of problems introduced during lectures.

Course Objectives: By the end of the course students should be familiar with the basic theory concerning ordinary differential equations, and should be able to apply this theory to solve problems arising in applications. They should also be able to develop MATLAB programs for the solution and visualization of such problems.

Tutorials: An important element of the course are the tutorials during which the Teaching Assistants will introduce MATLAB programming techniques necessary for the solution of homework assignments. MATLAB files containing the material of the tutorials will be posted in advance on the course website, and should be downloaded and reviewed before attending the tutorial. Students are strongly encouraged to bring their own laptops, so that they can actively follow the presentation.

Primary Reference:

1. D. Zill and M. Cullen, "Advanced Engineering Mathematics", Jones and Bartlett, 3rd edition, (2006) [ISBN–13: 9780763745912, ISBN–10: 076374591X]
2. M. Grasselli and D. Pelinovsky, "Numerical Mathematics", Jones and Bartlett, (2008) [ISBN–13: 9780763737672, ISBN–10: 0763737674]

Remark — both textbooks will be the required references for the follow–up course MATH 2ZZ3 (Engineering Mathematics IV) that will be offered in the Winter Term.

Software: All homework assignments will have to be completed using MATLAB. This software will also be used for presentations during tutorials. While MATLAB can be used in a number of computer labs on the campus, students are encouraged to purchase "The Student Edition of MATLAB" to be able to work with MATLAB at home.

Prerequisites: Engineering Mathematics I and II (MATH 1Z04 & MATH 1ZZ5), or equivalent

Assignments: Six homework assignments will be posted on the course website on the dates indicated in the table below. The assignments will be due by midnight on the dates indicated in the table. Solutions of the assignments should be prepared using the template file (`template.m`) available from the course website, and be submitted electronically to the suitable Email address. Please see the course website for a list of Email addresses where students should submit their assignments based on the first letter of their last name. *Late submissions will not be accepted under any circumstances.* The solutions will be posted on the course website after the due date.

Homework Post & Due Dates (tentative):

#	Post Date	Due Date
HW1	Monday, September 21	Monday, September 28
HW2	Monday, October 5	Tuesday, October 13
HW3	Monday, October 19	Monday, October 26
HW4	Monday, November 2	Monday, November 9
HW5	Monday, November 16	Monday, November 23
HW6	Monday, November 30	Monday, December 7

Tests: There will be two tests scheduled tentatively on October 6 and November 17. They will last 75 minutes and will take place in the evening (i.e., at or after 7pm) at a location to be announced later. The tests will focus on analytical issues, although may also address elements of MATLAB programming. Only the McMaster standard calculator Casio fx–991 will be allowed during the tests.

Final Exam: The course will be completed by a three–hour final examination. The date and location of the final exam will be announced by the Registrar's office in mid–term.

Marking scheme: The final mark will be the *better* one obtained with the following two marking schemes:

- Final exam (3 hrs) — 50%
- Tests (2×75 min) — 20%
- *Five* best homework assignments — 30%

- Final exam (3 hrs) — 40%
- Tests (2×75 min) — 20%
- *Six* homework assignments — 40%

The instructor reserves the right to alter the grade in justified cases. In such situations, however, the grade can only be increased.

Excused Absences: Exemptions from the assignments or tests for valid reasons are possible, but must be requested through the office of the Associate Dean of the Faculty that you are registered with. In the event of an exemption, no make up test or assignment will be administered, but your course grade will be re–weighted by increasing the weight of the final examination to compensate for the missed test or the weight of the remaining assignments for the missed assignment.

Senate Policy Statement: The course is regulated by the following documents: *Statement on Academic Ethics* and *Senate Resolutions on Academic Dishonesty*. Any student who infringes one of these resolutions will be treated according to the published policy. In particular, academic dishonesty includes: (1) plagiarism, e.g. the submission of work that is not one's own, (2) improper collaboration in group work on home assignments, (3) copying or using unauthorized aids tests and examinations. It is your responsibility to understand what constitutes academic dishonesty, referring to *Academic Integrity Policy*.

Important Notice: 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.

Course Schedule

#	Topic	Sections from Ref 1
Week 1	September 10–11	
Lecture 1	Introduction to the Course	—
Week 2	September 14–18	
Lecture 2	Definitions and Terminology Initial–Value Problems	1.1 1.2
Lecture 3	Definitions and Terminology Initial–Value Problems	1.1 1.2
Lecture 4	Solution Curves Without a Solution Separable Variables	2.1 2.2
Week 3	September 21–25	
Lecture 5	Separable Variables Cont'd Nonlinear Models	2.2 2.8
Lecture 6	Linear Equations	2.3
Lecture 7	Linear Models Preliminary Theory: Linear Equations (skip 3.1.3)	2.7 3.1
Week 4	September 28 — October 2	
Lecture 8	Preliminary Theory: Linear Equations Cont'd (skip 3.1.3)	3.1
Lecture 9	Preliminary Theory: Linear Equations Cont'd (skip 3.1.3) Homogeneous Linear Equations with Constant Coefficients	3.1 3.3
Lecture 10	Homogeneous Linear Equations with Constant Coefficients	3.3
Week 5	October 5–9 **(Test #1 on Tuesday, October 6)**	
Lecture 11	Homogeneous Linear Equations with Constant Coefficients Cont'd Nonhomogeneous Equations	3.3 3.1.3
Lecture 12	Undetermined Coefficients	3.4
Lecture 13	Undetermined Coefficients Cont'd	3.4
Week 6	October 12–16 **(Holiday on Monday, October 12)**	
Lecture 14	Sections that are not cancelled are to use this as review or catch up	—
Lecture 15	Variation of Parameters	3.5
Lecture 16	Variation of Parameters Cont'd Cauchy–Euler Equations	3.5 3.6
Week 7	October 19–23	
Lecture 17	Cauchy–Euler Equations Cont'd	3.6
Lecture 18	Linear Models: Initial-Value Problems	3.8
Lecture 19	Linear Models: Initial-Value Problems Cont'd	3.8
Week 8	October 26–30	
Lecture 20	Linear Models: Boundary–Value Problems	3.9
Lecture 21	Linear Models: Boundary–Value Problems Cont'd	3.9
Lecture 22	Review of Linear Algebra	—
Week 9	November 2–6	
Lecture 23	The Eigenvalue Problem	8.8
Lecture 24	The Eigenvalue Problem Cont'd Powers of Matrices	8.8 8.9
Lecture 25	Orthogonal Matrices Diagonalization	8.10 8.12
Week 10	November 9–13	
Lecture 26	Diagonalization Cont'd	8.12
Lecture 27	Preliminary Theory (Systems of Linear Equations)	10.1
Lecture 28	Homogeneous Linear Systems	10.2
Week 11	November 16–20 **(Test #2 on Tuesday, November 17)**	
Lecture 29	Definition of the Laplace Transform	4.1
Lecture 30	Definition of the Laplace Transform Cont'd The Inverse Transform and Transforms of Derivatives	4.1 4.2
Lecture 31	The Inverse Transform and Transforms of Derivatives Cont'd Translation Theorems	4.2 4.3
Week 12	November 23–27	
Lecture 32	Additional Operational Properties	4.4
Lecture 33	The Dirac Delta Function	4.5
Lecture 34	Systems of Linear Differential Equations	4.6
Week 13	November 30 — December 4	
Lecture 35	Series solutions about Ordinary Points	5.1
Lecture 36	Series solutions about Singular Points	5.2
Lecture 37	Review for Exam	—