MATH*2080 Elements of Calculus II – Winter 2018
Department of Mathematics and Statistics, CEPS
University of Guelph, Guelph Campus

Course Description

This course will expand on integration techniques, and introduce students to difference and differential equations, vectors, vector functions, and elements of calculus of two or more variables such as partial differentiation and multiple integration. The course will emphasize content relevant to analyzing biological systems, and methods will be illustrated by application to biological systems.

- Prerequisite(s): 1 of IPS*1500, MATH*1000, MATH*1080, MATH*1200
- Restriction(s): IPS*1510, MATH*1210

Required/Optional Study Materials

- REQUIRED: CourseLink at: https://courselink.uoguelph.ca/shared/login/login.html.
  - For students that are granted a deferred final examination privilege, (see your program counsellor), CourseLink access is extended for however long is allowed by University policy, for preparation to write a deferred final examination.
  - For all students, CourseLink access is extended through to the end of the first week of classes of the following semester. Students can review their final examination grade, and make a decision about requesting a final examination re-grade.
- OPTIONAL: *Calculus for Biology and Medicine, 3rd. Edition* Author: Claudia Neuhauser, Publisher: Pearson Publishing, © 2011. Homework / readings are referenced from this text.
- REFERENCE: Calculus: Early Transcendentals. Editions 6E, 7E or 8E - all just fine. **Don't confuse this with the "Single Variable" versions also available as 6E, 7E and 8E. We don't want these ones.** We want ISBN-10: 1285741552 or ISBN-13: 978-1285741550.

Learning Outcomes

- Display a capability to apply substitution (& trig substitution), integration by parts, and partial fractions to solve definite and indefinite integrals. Explain the idea of principle angles as applied to trig substitution. Explain the Fundamental Theorem of Algebra as applied to partial fractions.
- Display a capability to solve definite improper integrals, integrate over a discontinuity and to apply l'hopital's rule as needed (after integrating)
- Explain and compute bio-availability as an integral, and eventually as a limit at infinity.
- Display a capability to classify and solve first order homogeneous/non-homogeneous difference equations.
- Explain and describe the discrete logistics equation, its set of equilibria, stabilities, and steady states (in terms of a parameter).
- Explain and describe the set of solutions of a quadratic equation leading to distinct real roots, repeated real roots and complex conjugate roots. Explain a complex number.
- Display a capability to classify and solve second order linear constant coefficient homogeneous/non-homogeneous difference equations. Explain and describe corresponding homogeneous and particular solutions.
- Display a capability to solve separable first order differential equations.
- Explain, describe and solve the logistics equation. Explain and describe its set of equilibria, stabilities, and steady states (in terms of a parameter).

- Display a capability to solve first order linear differential equations via integrating factors. Explain and describe corresponding homogeneous and particular solutions.
- Display a capability to classify and solve second order linear constant coefficient homogeneous differential equations. Explain how to extend these techniques to higher order differential equations. Explain and describe corresponding homogeneous and particular solutions.
- Explain, describe and solve a two-compartment drug model, a second order linear constant coefficient homogeneous differential equation.
- In 3 dimensions, display a capability to compute distances, equations of lines and tangent planes.
- In 3 dimensions, explain a function $z = f(x,y)$, the limit of a function at a point and continuity of a function over an open, connected, convex region. Display a capability to compute partial derivatives and the total differential.
- In 3 dimensions and as an application, explain how to interpret a triple integral as volume.
- In 3 dimensions, display a capability to compute volumes of intersecting solids as the solution of a definite triple integral. Display a capability to change the order of integration.
- In 3 dimensions, explain higher order partial derivatives and compute a Taylor series of degree 2.

Instructors[1]	**Office**	**Meeting Times & Locations**	**Email**
S. Gismondi (Lecturer)	MACN 510	MWF 9:30 – 10:20 in RICH 2520	gismondi@uoguelph.ca
C. Mintah (Lab TA)	TBA	F 16:30 – 17:20 in THRN 1200	cmintah@uoguelph.ca
N. Mudalige (Lab TA)	TBA	F 16:30 – 17:20 in THRN 1200	mudalign@uoguelph.ca

Lecture and Lab Procedures

There are three lectures and one lab every week. Attend all lectures and labs and make your own notes. Lab time in weeks 3, 5, 7, 9 and 11 is for writing tests. Lab time in weeks 1, 2, 4, 6, 8, 10 & 12 is for preparatory work in advance of tests and the final examination.

Assessment Procedures

75% Tests (5) @ 15% each: *There are four "50 minute in class" tests and one take home test.*

- **WRITTEN Test 1, during the week of January 22 -- 26**
- **WRITTEN Test 2, during the week of February 5 -- 9**
- **WRITTEN Test 3, during the week of February 26 -- March 2**
- **WRITTEN Test 4, during the week of March 12 -- 16**
- **TAKE HOME Test 5, available March 29, due April 2 in class**

IF your final examination grade is better than any or all test grade(s), I will automatically replace your test grade(s) with your final examination grade. i.e. this applies to all tests.

☞ **THERE ARE NO ALTERNATE TEST DATES NOR MAKE-UP TESTS. BE PREPARED and don't miss any of these tests (excepting illness, see below).** Missed test marks are automatically transferred to the final examination. But don't get the idea that this is a gift! Sometimes you may not be prepared as well as you'd like, and it's your own decision to skip a test (and opt for an increased weight automatically placed upon the final examination). It's

[1] Office hours posted online. See "Office Hours" in the navigation bar.

NOT advised!! Don't 'mortgage your future'. Unlike final examinations, 1) tests provide opportunities for feedback and 2) in the case of poor performance, there's another test or the final examination, an opportunity to improve. Tests contribute less to your final grade than does the final examination. Poor performance on a test has less impact upon your final grade than does poor performance on the final examination, especially a more heavily weighted final examination. Tests provide 'final examination like' writing conditions, a great way to gain examination writing experience in preparation for the 'biggy', the final examination. Tests encourage you to prepare and learn through-out the semester. That's WHY we do it. Knowledge and capability in mathematics builds in a 'pyramidal' fashion. You need foundation knowledge and practice to move forward. Preparing for the final examination late in the semester is not nearly as 'foundation building' as is a piece-wise, semester long approach. Besides, if you can't make small amounts of time available for study during the semester, do you honestly believe that you'll make large amounts of time available at the end of the semester? Don't chance it.

About How Tests are Returned & Posted Solutions / Marking Scheme

About one week (normally) after a test, your grade is posted to your account on CourseLink and all tests are returned to a set of wooden orange cabinets labelled MATH*2080 located on the 3rd floor of MACN, at the south end of the corridor. If you cannot find your test, then PLEASE LOOK IN OTHER BOXES. Often people are in a rush and they may not re-file papers as originally filed. SAS tests may take longer i.e. they are received 3 days later.

- If you cannot find your test after searching, check CourseLink to confirm that a grade was indeed assigned before contacting your TA or instructor.
- Solutions and marking schemes for all tests are posted to CourseLink.

About Re-grades / Incorrectly Posted Grades / Missing Grades

- Re-grade requests are usually processed "in person" by our lab TA. Please meet with him/her to discuss how you were graded. Be sure to have reviewed the posted online solutions for your test, and be prepared to respond to questions about how your solution method(s) compare to posted solution methods.
- If the grade posted for your test is wrong, please see your lab TA (bring the test).
- If your grade is not posted, then please come and see me directly.

25% Final Examination (1) @ 25%: *There is one two-hour final examination on the date indicated below.* The final examination normally accounts for 25% of your final grade.

- **Final Examination. Wednesday April 18, 2018, 11:30 -- 13:30. Location TBA.**
  ☞ **THERE IS NO ALTERNATE FINAL EXAMINATION DATE NOR MAKE-UP FINAL EXAMINATION excepting special circumstances. THAT IS, *if you miss the final examination, immediately contact your program counsellor. ONLY the program counsellor (not the professor) is allowed to make decisions concerning granting of deferred examinations, scheduling of deferred examinations, academic consideration etc.***

Accessibility & SAS Students

The services of Student Accessibility Services (SAS) are available to students registered at the University of Guelph who have a permanent disability. This includes full-time or part-time, graduate and undergraduate students. SAS also has a number of services available to students with temporary disabilities. Students must provide appropriate documentation from a medical or mental health professional to verify their disability. You must identify yourself as early as possible and no later

than the 40th class day in the semester in which you are requesting accommodation and/or support. Failure to do so will mean that accommodation cannot be guaranteed for that semester. See https://www.uoguelph.ca/csd/current-students for complete details and procedures.
All students registered with SAS 1) are accommodated as per SAS recommendations, AND, 2) write/take their tests and their final examination via SAS. This means contact SAS ASAP – bring this course outline with you when you meet. Then you can be accommodated.

HELP!!! Free HELP from the Mathematics & Statistics Department
The Mathematics and Statistics Department operates a drop-in learning centre. This is YOUR RESOURCE for support with lab and course-work related problems. The TA's ARE FRIENDLY. They KNOW MATH*2080 material, and they are usually AVAILABLE TO HELP YOU 6 hours a day! Our learning centre is located on the third floor of the McLaughlin Library. During the 12-week scheduled class times, scheduled 'open times' are:

Days	Monday	Tuesday	Wednesday	Thursday	Friday
Times	09:30-15:30	10:00 - 16:00	09:30-15:30	10:00- 16:00	09:30-14:30

MORE HELP!!! First: Learning Resources for First-Year Students
First is a collection of resources, services, and technologies designed to help make the transition to university learning smooth and successful. Visit https://admission.uoguelph.ca/template.aspx?SiteID=bfdc36b8-2456-47fe-8c67-10366a3a3b97.

Course Policies

No Calculator Rule
Regarding all tests and the final examination, calculators are NOT ALLOWED. Additional aids are not allowed e.g. notes, books, communication or scrap paper.

Group Work
There is no *assessed* group work. BUT of course work together to help better understand things. Just know that all assessment is generated by independent completion of tests and the final examination.

About Recording of Labs, Lectures, Conversations, Casual Meetings, Office Hour Meetings and All Written, Recorded, Presented Materials, Utterances, Stories and EVERYTHING related and vaguely related to information acquired in the course of study here at the University of Guelph IS ALLOWED FOR THIS COURSE FOR THE COMPONENT THAT I TEACH a.k.a lectures. THIS IS MY WRITTEN PERMISSION that material recorded is restricted for use with MATH2080. Copy whatever you need (in my lecture and office hour times) in order to successfully complete the course. BUT NEVER violate copyright laws, nor violate privacy laws e.g. postings to YouTube etc., slanderous comments in chats, messages, tweets etc. Of special note, the textbook is copyright material from Pearson Publishing – author Claudia Neuhauser. I have no authority. Don't copy the text. These issues become legal issues, and affect students'/professors' professional career. See http://www.cmec.ca/Publications/Lists/Publications/Attachments/291/Copyright_Matters.pdf for details about copyright, limited permissions to copy and definitions.

About Illness & Sudden Illness

If prior to a test or the final examination, and even during a test or final examination, you are/become ill and are unable to complete, YOU MUST 1) seek help for your illness that very instant and 2) later when you become well, obtain documentation as per "Undergraduate Degree Regulations: Illness or Compassionate Reasons". ***You cannot re-write, be excused or change the grade that you receive, if for example AFTER WRITING A TEST OR EXAMINATION, you indicate that you were/became ill. Illness (inc. scheduled surgery) or compassionate reasons can be accommodated in advance/during assessment in accordance with University policy, but RARELY after assessment. DO NOT INCLUDE MEDICAL NOTES, WRITTEN EXPLANATIONS RE: PERFORMANCE ISSUES ETC. ATTACHED TO/WRITTEN ON YOUR TEST OR EXAMINATION (OR IN A SAS ENVELOPE). I CANNOT GRADE THE TEST OR EXAMINATION IN AN UNBIASED WAY. I WILL TREAT THIS KIND OF COMMUNICATION AS A REQUEST TO BE EXCUSED FROM THE TEST / EXAMINATION.***

"Not Withstanding" Clause a.k.a. What About Unforeseen Fateful Events?

When fate intervenes e.g. snow days, emergencies, work disruptions & other fateful events, and the conduct of the course falls outside of my control in a way that lectures, labs, and tests etc. might need to be cancelled/rescheduled, then please refer to CourseLink for further instruction ***which may now deviate in any manner whatsoever from published course outlines, past cases and any other commitments previously made by me with or without knowledge of these unforeseen fateful events.***

➔ ***IN THE EXTREMELY UNLIKELY EVENT THAT ALL COMMUNICATIONS FAIL (strike/lock-out, pandemic, war, terrorism etc., AND EVEN CourseLink is unavailable):***

1. ***DURING THE FIRST TWO WEEKS, try to keep to our schedule (last page) independently however you can manage i.e. try and stay current so that it'll be easier when we finally resume from where we left off.***
2. ***BEYOND TWO WEEKS, it's a disaster. We'll worry about it later, if ever.***

Miscellaneous Comments

- PERSONAL TUTORS: If you would like to find/work with a private tutor, then perhaps work with all of the TA's in the learning centre, and if you find that you get along especially well with a particular TA, why not ask them if they would tutor privately? You might also like to try these links.
  - https://www.uoguelph.ca/tutoring/welcome-tutoring-guelph-tag
  - http://www.kijiji.ca/b-tutor-language-lessons/guelph/math-tutor-guelph/k0c16911700242
  - https://helphub.me/networks/university-of-guelph
- UNIVERSITY RELATED EVENTS THAT WILL BE ACCOMMODATED re: TEST CONFLICTS. For University related events only, e.g. sporting events, if you need to be away from campus at the same time that a test is scheduled, then ask your coach to contact me. I'll try (NOT promise) to arrange for you to write the test under your coach's supervision while you are away.
- SHARING COURSE MATERIALS: UNIVERSITY OF GUELPH BASED TEACHING ORGANIZATIONS e.g. SLG's: We completely support our SLGs. Please feel free to share course materials with SLG members and leaders.
- SHARING COURSE MATERIALS: NON-UNIVERSITY OF GUELPH BASED TEACHING ORGANIZATIONS: We neither endorse nor support these groups, e.g. Prep

101. They exist separate from, and independent of the University. They may or may not be useful, credible, helpful etc., they are in no way associated with the University, and they may or may not act in your best interests. We do not provide materials, hints, notes, sample tests, examinations, texts, course outlines etc. to these groups, no matter what you may be shown and/or told. Whatever materials these groups develop, promote, claim as relevant to the course etc., these materials are in no way sanctioned by us and/or the University. While these groups can be helpful to you, they are not accountable to the University, unlike University of Guelph instructors that are accountable for their decisions - a benefit and security that you surrender in dealing with these groups. Do not copy / provide any course materials to these organizations i.e. copyright issues to be resolved. Contact me directly if you are asked to share your materials with these groups.

University Policies

E-mail Communication

As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.

Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day – **FRIDAY MARCH 9**; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes

academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

Lecture, Lab & Textbook Reference Schedule *Textbook homework will be assigned in class, not handed in. Detailed HW posted online.	Test Schedule
Week 1: Jan. 8-12 • Lectures as regularly scheduled. Integration techniques e.g. substitution, trig inverse and trig substitution, integration by parts, and partial fractions. Text 7.1-7.3. • Lab Friday Jan. 13. Preparation for test 1, e.g. download & work sample tests. **Week 2:** Jan. 15-19 • Lectures as regularly scheduled. Continuing integration techniques. • Lab Friday Jan. 20. Preparation for test 1, e.g. download & work sample tests.	
Week 3: Jan. 22-26 • Lectures as regularly scheduled. Improper integrals and l'hopital. Text 5.5, 7.4 • In class or lab Test 1. **Week 4:** Jan. 29-Feb. 2 • Lectures as regularly scheduled. Continuing improper integrals, l'hopital, bio-availability and introduction to two-compartment drug model. • Lab Friday Feb. 3. Preparation for test 2, e.g. download & work sample tests.	**Test 1 Week 3 in LAB or CLASS (15%). Usually covers all material from weeks 1 & 2. BUT the instructor will advise with certainty. Always attend lecture!**
Week 5: Feb. 5-9 • Lectures as regularly scheduled. First and second order linear constant coefficient homogeneous/non-homogeneous difference equations. Discrete logistics equation. • In class or lab Test 2. **Week 6:** Feb. 12-16 • Lectures as regularly scheduled. Continuing difference equations. • Lab Friday Feb. 17. Preparation for test 3, e.g. download & work sample tests.	**Test 2 Week 5 in LAB or CLASS (15%). Usually covers all material from weeks 3 & 4. BUT the instructor will advise with certainty. Always attend lecture!**
**** READING WEEK, February 19-23. NO CLASSES and NO LABS. ****	
Week 7: Feb. 26-Mar. 2 • Lectures as regularly scheduled. First and second order differential equations. The logistics growth model, differential equation, solution, and stability analysis • In class or lab Test 3. **Week 8:** Mar. 5-9 • Lectures as regularly scheduled. Continuing with differential equations and development the two compartment drug model. • Lab Friday Mar. 10. Preparation for test 4, e.g. download & work sample tests.	**Test 3 Week 7 in LAB or CLASS (15%). Usually covers all material from weeks 5 & 6. BUT the instructor will advise with certainty. Always attend lecture!**
Week 9: Mar. 12-16 • Lectures as regularly scheduled. Introduction to $z = f(x,y)$, pictures and the idea of multivariate calculus. Area and volume via double and triple integrals. Computing volumes of solids and intersecting solids. • In class or lab Test 4. **Week 10:** Mar. 19-23 • Lectures as regularly scheduled. Continuing with volumes and integration. • Lab Friday Mar. 24. Preparation for test 5, e.g. download & work sample tests.	**Test 4 Week 9 in LAB or CLASS (15%). Usually covers all material from weeks 7 & 8. BUT the instructor will advise with certainty. Always attend lecture!**
Week 11: Mar. 26-29 • * HOLIDAY * on Friday Mar. 30 (Good Friday) • Lectures as regularly scheduled. Multivariate limits, continuity and partial derivatives. Text 10.1-10.4. • Take Home Test 5 available online, March 29. **Week 12:** Apr. 2-6 • Take Home Test 5 due in class April 2. • Lectures as regularly scheduled. Continuing multivariate. Total differential, tangent planes, higher order partial derivatives and Taylor series. • Lab Friday Apr. 7. Preparation for final examination. e.g. sample examinations.	**Take Home Test 5 Week 11 available March 29, due in class April 2 (15%). Usually covers all material from weeks 9 & 10. BUT the instructor will advise with certainty. Always attend lecture!** **Final Examination (25%). Date: Wednesday April 18, 2018. Time: 11:30-13:30. Location: TBA. Covers all material from all weeks.**