Fall 2023 – University of Toronto – Mary Pugh

MAT294 – Calculus and Differential Equations

Welcome to MAT294! This is my first time teaching the course; the wonderful Professor Fabian Parsch taught it the previous seven times (and others taught it before him). I'm excited about the course and about working with you!

Want to talk? You can always email me at mpugh@math.utoronto.ca or just drop in during my drop-in hours.

Drop-in hours will be posted on Quercus shortly after the term started.

Course spirit. Creating an engaging atmosphere and learning environment is impossible without your help. That's why we (the TAs and I) ask you to equally contribute to the community, by participating, by asking questions, by helping out, and by generally being understanding, good citizens.

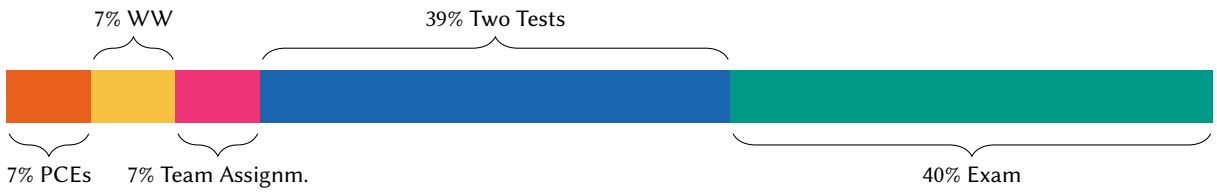
Course Content

Parts A and B. Multivariable Differentiation and Integration. First year calculus was all about functions depending on a single variable, like $f(x)$. However, we do not live in a one-dimensional world. How do we describe quantities that depend on several dimensions? How do we measure their change? For a specific problem, what coordinate system should we choose to give us a model that is as simple as possible but as complex as necessary? There will be lots of (pretty?) pictures!

Part C. Vector Calculus. Broadly speaking, vector calculus is used to study anything that involves directions. How do we describe electric fields? magnetic lines? a stream of water? Is there a way to express intuitive concepts like "swirliness" and "overflow" in a concise mathematical way? What can a rubber duck circling the drain teach us about calculus? And how do we differentiate or integrate vectors in the first place?

Part D. Partial Differential Equations. One of the most famous PDEs is the Heat Equation. How does heat flow? Where does it flow? How fast does it flow? (Spoiler alert: Heat flows from hot to cold.) How do boundary conditions affect things? To solve the Heat Equation and its siblings (e.g. the Wave Equation), we will learn about a tool called Fourier Series. Have you ever wondered how a loudspeaker, that has a single membrane, can "produce several sounds at the same time"? Fourier Series and the Wave Equation will give you an answer!

Marking Scheme



PCEs. There will be approx. 25 Pre-Class Essentials (PCEs). Your lowest five scores will be dropped.

WeBWorK. There will be five WeBWorK assignments. Your lowest score will be dropped.

Team Assignments. There will be five Team Assignments. They will be weighted evenly.
Part of your mark will be based on drafts you write in tutorial.

Tests. The two Tests will be weighted 24% and 15% with the better grade getting the higher weight.
October 11 and November 15: 12:10-2pm held in EX 310.

Exam. Details on the final exam (format etc.) will be announced later.

Learning Goals

You should become fluent in various concepts related to Multivariable Calculus, Vector Calculus and Differential Equations as outlined in the list of modules on page 10. This means you should be able to:

- ... understand concepts instead of "blindly" using tools.
- ... use these concepts to study the properties of systems from physical and engineering applications.
- ... critically analyze your results using these concepts to check whether or not they make sense.

The course is part of your continued training in the art of problem solving. You will learn many things and you will forget much of them. But if you learn things well now you will be able to resurrect what you learnt, and extend it, when you need it later. In your future career as an engineer, you will see problems that you have not seen before. You want to be able to figure out by yourself how to adjust the familiar methods and concept methods to fit new situations and to be confident of your solutions. You can only achieve this by understanding concepts rather than memorizing formulas and methods.

The course is also part of your continued training in the art of team work and communication. As engineers, you'll serve an important role at the boundary between science and its applications. You'll have to talk to business partners, manufacturers, designers, and investors. It's not enough to arrive at correct mathematical answers — others will need to understand you, believe you, and trust you.

Textbooks

For parts A, B, and C of the course: Strang & Herman: *OpenStax Calculus Volume 3.* (2016)
https://openstax.org/details/books/calculus-volume-3
Available **for free** as an interactive online textbook/a downloadable PDF/an app.

For part D of the course: chapters 10 and 11 of Brannan & Boyce: *Differential Equations with Boundary Value Problems – An Introduction to Modern Methods and Applications, 3rd Edition.*
Available **for free** directly on the publishers website (click on the "10" and the "11".)

We Are Here to Help!

The TAs and I are all very much looking forward to supporting you! First, one clarification: **You are always welcome to ask any question no matter how "basic" you think it is!** We will be happy to explain any content to you. We were also multivariable calculus students at some point and often asked others for help. We still ask others for help, just usually about other things.

Do you have questions about anything, like the PCEs, what was covered in class, or other course content? You can always come to **Drop-In Hours (to be posted on Quercus)**. You can ask your questions on **Piazza** and we will be happy to help you out there as well. And of course the first hour of the tutorial, when everyone is working on suggested problems, is also a great time to ask for support from your TAs. As a bonus, your fellow students can learn from your questions, too!

Don't skip tutorials. Each *one* hour of attending tutorial easily saves you *several* hours of studying by yourself. You'll get an opportunity to ask and discuss any questions, and time with your team to get a head start on the assignment with support from the TA. It's a great combination!

How to learn in this course

This course is organized along modules. You will encounter each module in five different stages, gaining more and more independence.

	hours/week contact	hours/week self-study
1. Pre-class essentials. Learn the basics through self-study.	0	1.5

For each of the three class hours, you will spend 30 minutes learning about the elementary concepts of the module. Afterwards, there will be a short quiz with one or two questions. The quiz is designed so that it is straightforward if you have studied the pre-class essentials. All PCEs will be published at least one week before they are due.
Because we have two classroom hours on Thursdays, *there usually will be two PCEs before Thursday classes.* So plan for 2 PCE quizzes before Thursday classes and 1 PCE quiz before Monday classes.
Essentials are essential. The in-class activities are designed for students who have done the pre-class essentials. If you did not do so, you will quite likely struggle in class.

2. Class. Apply the basics and dive in deeper.	3	0

Class will be a mix of my introducing concepts and your working in teams.
MAT294 Teams. You will be randomly assigned to a team of four or five students. During class, you will often discuss questions in teams. Teams will be reshuffled several times during the term.
Do not skip class. It is the best way to ensure that you stay on track and don't fall behind.
Lecture slides. *Unannotated* lecture slides will be available on Quercus before class.

3. Tutorials. Clarify concepts and get started on the Team Assignment.	2	0

Selected questions. For the first half of tutorial, your TAs will select some suggested problems from the study booklet for you to work on. They will be happy to support you! This is also a perfect time to ask any questions about the course content.
Get started with the Team Assignment. For the second half of tutorial, your team will discuss one Team Assignment question, submitting a draft solution at the end of tutorial. *This draft will NOT be judged for correctness*, but for effort. Just describe what you tried, with or without success. You will then get brief feedback from the TA to help you work out the details when you submit the actual team assignment. The grade on the draft will be part of your team assignment grade (only teammates who were present will get these points).

4. Studying. Solidify your knowledge.	mileage varies*

Based on your classroom experience, you will now have an idea which concepts are clear to you and which you should work on. There are many resources at your disposal to help you study: You can find suggested problems in the textbook as well as a set of problems, composed specifically for this course, to work on in the *Study Booklet*.
Support is available! See the previous page on the many ways you can access our help.
Study smart. Your learning experience in this course will improve dramatically if you follow a schedule that distributes the load across your twelve weeks, rather than falling behind and trying to catch up right before exams. Study math at least two or three times a week, every week.

5. WeBWorK/Team Assignments. Check and polish your knowledge.	mileage varies*

WeBWorK assignments are your chance to get a benchmark on how well you know the basic concepts and procedures covered in a module, whereas Team Assignments help you to improve your writing. They serve as a good practice for Tests and the Final Exam.
Don't start with these assignments. Finish with them. They should be the last step in your learning process for each module. Don't jump right to them.

* The time you need depends on your own learning experience.
However, in total you should spend at least 10 hours per week on this course (including class time).

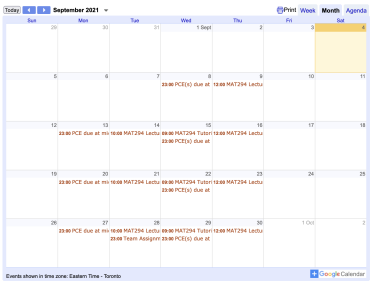
Study Booklets

Each module has an accompanying study booklet. These booklets include module overviews, learning goals and suggested problems of varying difficulty. It is *the* go-to-document when you are looking for exercises to study.

The Calendar and TRACKER

Make sure to access the **MAT294 calendar on Quercus**! It includes all due dates, lecture and tutorial sessions, drop in hours and test dates.

You can either access it through Quercus or you can use the calendar subscription link to add MAT294 to your Google/iCloud/Outlook calendar!



The **TRACKER** is your *Timetable Reminder And Calculus Key Event Review* and is a weekly newsletter that keeps you on track with your study schedule.

Overview of a Typical MAT294 Week

MAT294 will use one "due time" only, namely 10pm on the given day.

Mon	Tue	Wed	Thu
1 PCE due	WW/TA due**	12-2pm Tutorial or Test*	2-4pm Lecture
2-3pm Lecture		1 or 2 PCE due	

*Twice during the term there will be a test instead of tutorial.
**WeBWork/Team Assignment are only due in certain weeks, see page 11

Assessments & Regrade Requests

Except for the Pre-Class Essentials, all assessments in MAT294 happen in **five Assessment Cycles**. Each Assessment Cycle ends with a WeBWorK and Team Assignment. The topic cutoff for each Assessment Cycle will be announced well in advance. Each test covers two Assessment Cycles. The exam, on the other hand is cumulative and will therefore focus on content from the entire term.

WW/TA 1, WW/TA 2 → Test 1 | WW/TA 3, WW/TA 4 → Test 2 | WW/TA 5 → Final Exam

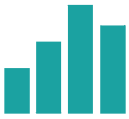
Teams will usually have 4 or 5 members, with the teams shuffled twice during the semester (so in total you will work with three different teams). You will sit with your team in class. During each tutorial, the second hour will be dedicated to writing a draft of one of the team assignment questions (see previous page under "Tutorials").

Regrade requests on Team Assignments or Term Tests can be submitted via gradescope starting 2 days after the item's return and ending 7 days after its return. Late requests will not be considered, absent an approved petition.

Important Tools

Quercus is the central repository from which all course content can be reached. It is where I will post the PCEs, the lecture slides, PDF copies of all assessments, study advice, drop-in hour info, this syllabus, ... Whatever you are looking for, you can probably find it there.

Piazza is our discussion board. Do not hesitate to ask questions on here. It's a great place to both ask questions and to help each other out. We will also be available to answer questions.



Gradescope is our assessment submission and grading software. All Team Assignments and Tests will be administered via gradescope. **Make sure that you use gradescope.ca 🇨🇦 and not gradescope.com (different servers).**

Wolframalpha is a computational tool that can solve many math (and other) problems thanks to its vast *procedural* knowledge. On the other hand, it can not *conceptualize*. The fact that computers can't do that is one of the reasons why MAT294 focusses on concepts instead of procedures.

Desmos and Math3D are free online plotting tools that can be a great help when you are trying to visualize functions and their graphs. They can visualize derivatives, Riemann sums, integrals, tangents, intersections, and many more things. You can even create art with them!

Email policy

1. If you email me, please use your **@mail.utoronto.ca** address. It's the only way I can know that you're you, and not your mischievous cousin.
2. **If you have a question about the course policies, check the syllabus. Then check the syllabus again.** If you still didn't find your answer, please email me at mpugh@math.utoronto.ca.
3. If you send me an email, you are **communicating in a professional context**. Emails are not instant messages on social media. Your email should start with a respectful greeting (hint: "Dear Professor Pugh,"), have organized paragraphs, and be signed with your name. I reserve the right to respond with, "Unprofessional. Try again." But don't worry too much about your grammar or spelling – I really do want to help you, however you write!
4. Please do not email your TA unless they specifically asked you to do so.
5. Please ask math questions on Piazza, not via email.

Copyright Notice

Missed Assessments

If you miss a Team Assignment, a Test, or the Final Exam without a petition that was deemed valid, you will receive a zero on that item.

The petition policy of the Faculty of Applied Science and Engineering can be found here.

http://uoft.me/petitions

It is an academic offence to feign illness (or other things) to skip any coursework.

The language on the petitions page mentions "other extenuating circumstances". Petitions can be granted for things other than illness, death, and crises. If you've got something coming up please contact your department's academic advisor to find out if it might be something that could be petitionable. In unexpected, emergency situations where you can't speak with your academic advisor first, you should petition and work on getting the supporting documentation.

TAs are not authorized to give any kind of accommodation.

Missing a Test

If you miss a Test and filed a petition that was deemed valid, I will choose, at my discretion, one of the following options for you: make-up written assessment, make-up oral assessment, or a redistribution of your marking scheme.

Missing PCEs

Do not submit petitions unless you miss more than five PCEs. Any such petitions will be irrelevant because the lowest five PCE marks are automatically dropped.

If, for example, you missed eight PCEs but six of these are due to a concussion, then you need to file a petition for those six PCEs. Don't worry about the other two — they would be part of the five that don't need petitions.

At the end of the day, I take all of your PCE marks and I keep any zeros that occurred due to academic offenses. If there were any petitions that were deemed valid, I drop the impacted PCE marks. From the remaining marks, I drop the lowest five and then compute the average of non-dropped marks.

Missing WeBWorK

The same rules as for PCEs apply, by replacing "five" with "one".

Missing a Team Assignment

If you have a petitionable reason to miss a team assignment you must do two things: File a petition in the system ***and* inform *all* your teammates in an email CCed to me**. I will then email instructions to you and your team.

You only need to inform us *that* you filed a petition. You do not need to explain *why* you did.

Ghosting your team.

Keep in mind that you have a week to work on each Team Assignment and that your team members depend on you. Be kind to each other and considerate of each other's study schedule and workload.

You are considered to have ghosted your team if you didn't provide your part of the submission by a deadline that you all agreed upon in writing or if, at any time, you didn't reply to an email from one of your teammates within 36h (if email sent Sun-Thu) or 60h (if sent Fri-Sat).

You are also considered to have ghosted your team if you don't send a petition notification email as explained above.

If you ghosted your team, you will be removed from the Team Assignment and will have to work by yourself on subsequent Team Assignments.

University can be really hard at times.

Life can be complicated. Everyone is different. Each of us has our own strengths, weaknesses, gifts, and needs. Please be gentle to yourself and kind to others. If you are experiencing challenges that are having an impact on your academic work, please seek support sooner rather than later.

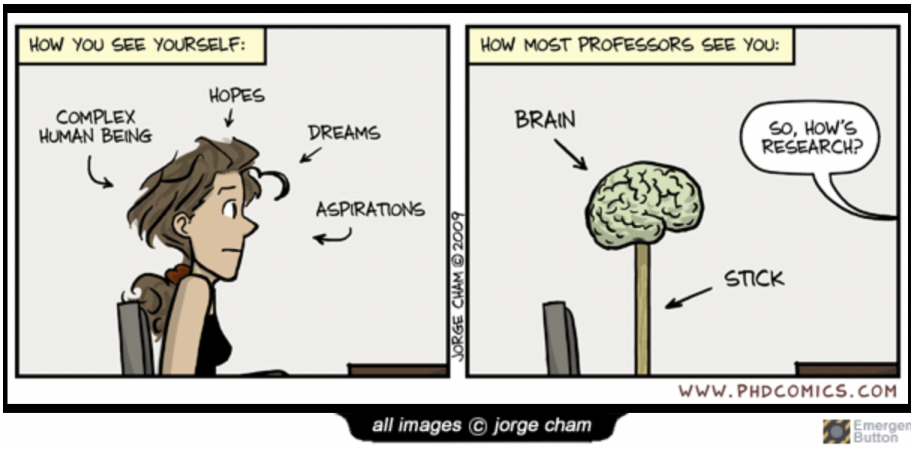
All FASE students have an academic advisor who can advise on academic and personal matters. You can find yours here: http://undergrad.engineering.utoronto.ca/advising-support-services/academic-advising/ In addition, a learning strategist https://www.studentlife.utoronto.ca/asc/hours can provide individualized support. They can help you: learn to manage time and stress, and address procrastination issues; develop new strategies including active studying, reading and note-taking, and exam preparation; improve research, assignment completion and presentation skills; and navigate the University's academic systems and services. If you're an international student, also check out the CIE https://studentlife.utoronto.ca/department/centre-for-international-experience/ .

The university has a contract with an outside service, Telus Health Student Support (formerly called MySSP), that students can call (or text). It provides a friendly ear and support in 146 different languages. Good2Talk https://good2talk.ca also provides confidential support services for post-secondary students.

Immediate help is available 24/7 through Telus Health Student Support. You can call via phone or wifi 1-844-451-9700 or even chat using the app.
https://mentalhealth.utoronto.ca/telus-health-student-support/
To find out more about the service, including questions about confidentiality, please see
https://myssp.app/ca/faq

Here's the general UofT mental health page https://mentalhealth.utoronto.ca/ , as well as this list of university and non-university (community) resources for academic/financial/housing/mental health distress or sexual assault/safety https://studentlife.utoronto.ca/task/support-when-you-feel-distressed/

I would like to think that the following cartoon is somewhat out of date and that the "most" is now "some", but I don't know if this is so. If, at some point, you feel that I'm behaving in a thoughtless manner please let me know in a clear and gentle manner (and be persistent, if needed).



Indigenous Matters

I acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people, including First Nations, Inuit and Métis peoples, from across Turtle Island and we are grateful to have the opportunity to work on this land. Toronto is covered by Treaty 13 signed with the Mississaugas of the Credit, and the Williams Treaties signed with multiple Mississaugas and Chippewa bands. The name Turtle Island is from a creation story for North America. Please see the course's quercus page for more information.

Diversity Statement

At the University of Toronto we embrace diversity of age, background, beliefs, ethnicity, gender, gender expression, national origin, religious affiliation, sexual orientation, and other visible and non-visible categories. All students are welcome!

Names and Pronouns: You have a right to be addressed however you prefer. To ensure that you are addressed properly, you are welcome to let me know your pronoun(s) and/or preferred name at any time.

If you are discriminated against in this course, please feel free to contact me.

Accessibility Needs

Making MAT294 accessible to everyone is very important to me. If you require accommodations, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible at http://www.studentlife.utoronto.ca/as.

You are welcome, but not in no way obliged, to speak directly with me about any accommodations you require to succeed in your learning. You can rest assured of my confidentiality.

Academic Integrity: Why It Matters

We at U of T want you to feel proud of what you accomplish as a student. Please respect all of the hard work you're doing this term by making sure that the work you do is your own.

We don't expect you to score perfectly on the assessments and there will be some things that you may not know. Using an unauthorized resource or asking someone else for the answer robs you of the chance later to feel proud of how well you did because you'll know that it wasn't really your work that got you there.

Success in university isn't about getting a certain mark, it's about becoming the very best person you can by enriching yourself with knowledge, strengthening yourself with skills, and building a healthy self-esteem based on how much you've grown and achieved. No one assessment captures that but your conscience will stay with you forever. Make yourself and your loved ones proud of the student that you are by conducting yourself honestly at all times.

The text on the previous page outlines why academic integrity is so important to me, to the university, and to the professional engineering society, and why it should also be important to you. I know that the vast majority of students are honest. If you are one of them, I want to say that I appreciate this and thank you for your commitment to learning! Honouring the achievements of hardworking students like you is one of the major reasons why we implement the policies below. Honesty always pays off in the long run!

If you are experiencing personal challenges that are having an impact on your academic work, please do NOT commit an academic offence. Instead, talk to me or your academic advisor. I am very understanding and happy to help if you are facing any issues. There is never a valid reason for committing an academic offence. Please talk to us!

Academic Integrity: The Fine Print

Familiarize yourself with the University of Toronto's Code of Behaviour on Academic Matters, available at https://www.academicintegrity.utoronto.ca/.

You are expected to know the rules. Not being aware of a rule is not an acceptable excuse for not having followed it (just like in "real life").

If you have any questions about what is or is not permitted in this course, please do not hesitate to contact me.

As specified on the first page, usually the better test gets the higher weight. Also, your lowest PCE and WeBWorK scores are dropped. These rules do **not** apply for assessments in which you committed an academic offence and received a sanction of "zero on the assessment". Such an assessment will always receive the highest weight possible according to the syllabus.

Potential offences include, but are not limited to:

- Posting assessment questions on any kind of website/online forum to solicit help.
- Using someone else's ideas or words without appropriate acknowledgement
- Using or possessing unauthorized aids during an exam or test
- Looking at someone else's answers during an exam or test
- Misrepresenting your identity
- Obtaining or providing unauthorized assistance on any assignment (this includes working in groups on assignments that are supposed to be individual work).
- Falsifying or altering any documentation required by the University, including (but not limited to) forms related to a petition.

It is an Academic Offence to receive or provide unauthorized assistance. It does not matter if you "helped" or "were helped".

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. Every year, students get expelled from the University of Toronto for academic offences.

While it might make you feel better, you learn close to nothing from looking at solutions.

Remember that you enrolled in University to learn something.

Module overview

		Class hours (approx.)	Textbook reference
A	**Multivariable Differentiation**		
A1	Functions of Several Variables	2	CV3, 4.1
A2	Partial Derivatives	2	CV3, 4.3/4.5
A3	Linear Approximation	1	CV3, 4.4
A4	Directional Derivatives	1	CV3, 4.6
A5	The Gradient	1	CV3, 4.6
A6	Minimum/Maximum Problems	2	CV3, 4.7
B	**Multivariable Integration**		
B1	Introduction to Double Integration	1	CV3, 5.1/5.2
B2	Double Integrals in Rectangular Coordinates	1	CV3, 5.1/5.2
B3	Double Integrals in Polar Coordinates	1	CV3, 5.3
B4	Triple Integrals in Rectangular Coordinates	1	CV3, 5.4
B5	Triple Integrals in Cylindrical Coordinates	1	CV3, 5.5
B6	Triple Integrals in Spherical Coordinates	1	CV3, 5.5
C	**Vector Calculus**		
C1	Vector Fields	1	CV3, 6.1
C2	Tangential Line Integrals	1	CV3, 6.2
C3	Conservative Vector Fields	2	CV3, 6.3
C4	Normal Line Integrals	1	CV3, 6.2
C5	Green's Theorem	2	CV3, 6.4
D	**Partial Differential Equations**		
D1	Modeling with PDEs	2	not in textbook
D2	The Superposition Principle, Boundary Conditions	1	not in textbook
D3	Fourier Series	2	B&B, 10.1/2
D4	The Heat Equation	3	B&B, 11.1/2
D5	The Wave Equation	2	B&B, 11.3

CV3 refers to "OpenStax Calculus Volume 3"

B&B refers to Brannan & Boyce "Differential Equations"

MAT294 – Fall 2023 – Schedule

Subject to change

				Sep 7 A1 A1	Sep 8	Sep 9
Sep 10	Sep 11 A2	Sep 12	Sep 13 Study Adv. Session	Sep 14 A2 A3	Sep 15	Sep 16
Sep 17	Sep 18 A4	Sep 19	Sep 20 Tutorial	Sep 21 A5 A6	Sep 22	Sep 23
Sep 24	Sep 25 A6	Sep 26 WW/TA	Sep 27 Tutorial	Sep 28 B1 B2	Sep 29	Sep 30
Oct 1	Oct 2 B3	Oct 3	Oct 4 Tutorial	Oct 5 B4 B5	Oct 6	Oct 7
Oct 8	Oct 9 Thanks-giving	Oct 10 WW/TA	Oct 11 Test 1 EX310	Oct 12 B6 [buffer]	Oct 13	Oct 14
Oct 15	Oct 16 C1	Oct 17	Oct 18 Tutorial	Oct 19 C2 C3	Oct 20	Oct 21
Oct 22	Oct 23 C3	Oct 24 WW/TA	Oct 25 Tutorial	Oct 26 C4 C5	Oct 27	Oct 28
Oct 29	Oct 30 C5	Oct 31	Nov 1 Tutorial	Nov 2 [buffer] [buffer]	Nov 3	Nov 4
Nov 5	Nov 6 Study break	Nov 7	Nov 8	Nov 9	Nov 10	Nov 11
Nov 12	Nov 13 D1	Nov 14 WW/TA	Nov 15 Test 2 EX310	Nov 16 D1 D2	Nov 17	Nov 18
Nov 19	Nov 20 D3	Nov 21	Nov 22 Tutorial	Nov 23 D3 D4	Nov 24	Nov 25
Nov 26	Nov 27 D4	Nov 28	Nov 29 Tutorial	Nov 30 D4 D5	Dec 1	Dec 2
Dec 3	Dec 4 D5	Dec 5 WW/TA	Dec 6 Tutorial			

WeBWorK and Team Assignments are due at 10pm on the stated days

Note: We have two class hours on Thu

You can use this page to keep track of where you are in terms of learning the material.

Multivariable Differentiation	**A1**	**Functions of Several Variables** 2 classroom hours	CV3 Ch. 4.1	PCEs	Classroom	Studied	WW/Team	Test-ready
	A2	**Partial Derivatives** 2 classroom hours	CV3 Ch. 4.3/4.5	PCEs	Classroom	Studied	WW/Team	Test-ready
	A3	**Linear Approximation** 1 classroom hour	CV3 Ch. 4.4	PCEs	Classroom	Studied	WW/Team	Test-ready
	A4	**Directional Derivatives** 1 classroom hour	CV3 Ch. 4.6	PCEs	Classroom	Studied	WW/Team	Test-ready
	A5	**The Gradient** 1 classroom hour	CV3 Ch. 4.6	PCEs	Classroom	Studied	WW/Team	Test-ready
	A6	**Minimum/Maximum Problems** 2 classroom hours	CV3 Ch. 4.7	PCEs	Classroom	Studied	WW/Team	Test-ready
Multivariable Integration	**B1**	**Introduction to Double Integr.** 1 classroom hour	CV3 Ch. 5.1/5.2	PCEs	Classroom	Studied	WW/Team	Test-ready
	B2	**DI in Rectangular Coordinates** 1 classroom hour	CV3 Ch. 5.1/5.2	PCEs	Classroom	Studied	WW/Team	Test-ready
	B3	**DI in Polar Coordinates** 1 classroom hour	CV3 Ch. 5.3	PCEs	Classroom	Studied	WW/Team	Test-ready
	B4	**TI in Rectangular Coordinates** 1 classroom hour	CV3 Ch. 5.4	PCEs	Classroom	Studied	WW/Team	Test-ready
	B5	**TI in Cylindrical Coordinates** 1 classroom hour	CV3 Ch. 5.5	PCEs	Classroom	Studied	WW/Team	Test-ready
	B6	**TI in Spherical Coordinates** 1 classroom hour	CV3 Ch. 5.5	PCEs	Classroom	Studied	WW/Team	Test-ready
Vector Calculus	**C1**	**Vector Fields** 1 classroom hour	CV3 Ch. 6.1	PCEs	Classroom	Studied	WW/Team	Test-ready
	C2	**Tangential Line Integral** 1 classroom hour	CV3 Ch. 6.2	PCEs	Classroom	Studied	WW/Team	Test-ready
	C3	**Conservative Vector Fields** 2 classroom hours	CV3 Ch. 6.3	PCEs	Classroom	Studied	WW/Team	Test-ready
	C4	**Normal Line Integral** 1 classroom hour	CV3 Ch. 6.2	PCEs	Classroom	Studied	WW/Team	Test-ready
	C5	**Green's Theorem** 2 classroom hours	CV3 Ch. 6.4	PCEs	Classroom	Studied	WW/Team	Test-ready
Partial Differential Equations	**D1**	**Modeling with PDEs** 2 classroom hours	Not in Textbook	PCEs	Classroom	Studied	WW/Team	Test-ready
	D2	**The Superposition Principle** 1 classroom hour	Not in Textbook	PCEs	Classroom	Studied	WW/Team	Test-ready
	D3	**Fourier Series** 2 classroom hours	B&B Ch. 10.1/2	PCEs	Classroom	Studied	WW/Team	Test-ready
	D4	**The Heat Equation** 3 classroom hours	B&B Ch. 11.1/2	PCEs	Classroom	Studied	WW/Team	Test-ready
	D5	**The Wave Equation** 2 classroom hours	B&B Ch. 11.3	PCEs	Classroom	Studied	WW/Team	Test-ready