MATH_V 317 201 2024W2 Calculus IV

✎ Edit

MATH 317 Multivariable and Vector Calculus

Contact info:

- Instructor: Prof. Jim Bryan, jbryan@math.ubc.ca (mailto:jbryan@math.ubc.ca)
- Teaching Assistants: Ray Ng, rayng18@math.ubc.ca (mailto:rayng18@math.ubc.ca) and Mukul Rai Choudhuri mukul@math.ubc.ca (mailto:mukul@math.ubc.ca)

Course Structure:

Lectures will be in person:

- Monday, Wednesday, Friday, 2:00 pm to 2:50 pm in LSK 200.
- Office hours: Fridays 3:00pm - 4:00pm in Math 226.
- TA Office hours: Mukul: Wednesdays 1:00pm-2:00pm, AUDX132. Ray: Thursdays 3:00pm-4:00pm, AUDX 133.

Learning Materials:

- Main Text: CLP-4 Vector Calculus Textbook by Joel Feldman, Andrew Rechnitzer, and Elyse Yeager. This locally developed text is available here (http://www.math.ubc.ca/~CLP) . The companion Problem Books (draft versions) to this text, available at the same site, will also be useful.
- I will post my lecture notes under "pages"-->"notes"
- I will post practice midterms and finals before each midterm and final.
- Piazza: Access our course Piazza page from Canvas. The TA and I will answer questions there.

Webwork

Weekly webwork assignments will appear on the Assignments tab in Canvas. Assignments are due on Monday at 3am. **Always access the webwork assignment through the link in Canvas** (otherwise the grades don't sync correctly).

Assessment of Learning:

There will be weekly webwork assigned as well as two midterms. The course grade will normally be given by the *better* of the following two schemes:

- 50% Final Exam + 40% Midterm grades + 10% WebWork Grade, or
- Scaled Final Exam grade - 10

Please note that grades may be scaled.

Midterm 1: In class, Wednesday, February 12th.

Midterm 2: In class, mid March.

Final Exam: 3 hours, TBD

Course Policies:

- There will be two midterms during the term. There are no make-up midterms. Missing a midterm for a valid reason normally results in the weight of that midterm being re-distributed to the remaining midterm and final exam. Any student who misses a midterm is to present the **Department of Mathematics self-declaration form (https://owncloud.math.ubc.ca/index.php/s/mumsWsljdjR1idJ#pdfviewer)** for reporting a missed assessment to their instructor within 72 hours of the midterm date. This policy conforms with the UBC Vancouver Senate's Academic Concession Policy V-135 and students are advised to read this policy carefully.

Course Topics:

The topics fall broadly under two categories:

Vector valued functions of one variable:

We will study parameterize curves, velocity, acceleration, arclength, curvature, normal and binormal vectors, tangential and normal components of acceleration, planetary motion.

Vector valued functions of several variables:

We will study vector fields, line integrals, conservative vector fields, and the fundamental theorem of line integrals. We will discuss necessary and sufficient conditions for a vector field to be conservative and learn how to find a potential function. We will study various

forms of derivatives in vector calculus: Gradient, Curl, and Divergence. We will learn to parameterize surfaces and study integrals of functions over surfaces and flux integrals over surfaces. We will learn integral theorems: Green's theorem, Stoke's Theorem, and the Divergence theorem. Time permitting, we will use differential forms to translate vector calculus into a unified language that works in any dimension.

Schedule of Topics:

This is a tentative schedule. As the semester plays out, it will be adjusted accordingly.

Week 1: Introduction, parameterized curves, velocity, arclength. Chapters 1.0, 1.1 of CLP4

Week 2: Parameterization by arclength, curvature of a curve, unit tangent vector and principle normal vector. Chapters 1.2 and 1.3, some of 1.4 and 1.5

Week 3: Motion, Velocity, Acceration, Newton's law, planetary motion. CLP4 1.3, some of 1.4 and 1.5, 1.10

Week 4: Vector Fields, conservative vector fields, potential functions. CLP 2.1, 2.3

Week 5: Line integrals, fundamental theorem of line integrals. CLP 2.4

Week 6: Parameterized surfaces, tangent planes, CLP 3.1, 3.2

Week 7: Surface area. Integrals of functions on surfaces, integrals of vector fields (flux). CLP 3.3, 3.4, 3.5

Week 8: Gradient, Divergence, Curl. CLP 4.1

Week 9: Divergence theorem, Green's theorem. CLP 4.2, 4.3

Week 10: Stoke's theorem. CLP 4.4

Week 11: Review and differential forms. CLP 4.7