

Vector Analysis

MATH 3012 - Fall 2021

Instructor: Dr. Serhii Myroshnychenko, **email:** smyroshn@lakeheadu.ca

Schedule:

- ✓ Lectures: Tuesday, Thursday 9:30 - 11 EST via zoom.
- ✓ Labs: Monday 13:00 – 14:00 EST via zoom.
- ✓ Office hours: Tuesday, Thursday 12:00 – 13:00 EST and by appointment via Zoom.

Recommended textbook:

- *Calculus: Early transcendental Functions* by Larson, Edwards, Brooks/Cole.
- *Multivariable Calculus* by James Stewart, Brooks/Cole.

Important dates:

- Final date to register: Monday, September 20, 2021.
- Final date to withdraw: Friday, November 5, 2021.
- Midterm: Monday, October 18, 2021.
- Final: **TBD.**

Exams: There will be one midterm exam during the **lab hour**. The final exam will be scheduled by the registrar's office. The exams will be closed book with no calculators or other aids allowed.

Grade: Please note that no alternate grading scheme will be used in this course.

Written Homework	10%
Online Assignments (WeBWork)	20%
Midterm	30%
Final	30%
Quizzes	10%

Homework: Written HW is assigned **bi-weekly**. Online assignments are assigned **weekly**.

Course content: The course will cover the topics on vectors and operations on vectors, space coordinates, lines, planes, surfaces in space, vector-valued functions and their differentiation and integration, tangent vectors and normal vectors, functions of several variables, limits, continuity, partial derivatives of functions of several variables, tangent planes and normal lines, iterated integrals, double integrals, triple integrals, volume and surface areas, Jacobians, line integrals, Green's Theorem, surface integrals, Divergence Theorem, Stokes' Theorem.

Lab Hour: No new material will be covered in the labs. The lab will reinforce concepts through examples, as well as provide students with the opportunity to ask questions about the content given in class or assignment problems. Though the lab is not mandatory, it is very beneficial to attend and **required to take quizzes**.

Course Policies:

1. Late written HW assignments will be **accepted and reviewed, but not graded**. There will be **no** make-up exams. If you miss the midterm for a legitimate reason which you can document (e.g. doctor's note), the weight of the midterm will be *transferred* to the final exam. The documented proof of absence should be provided no later than 3 days after the is scheduled.
2. All electronic devices (phones etc.) are prohibited during the exams. In case when such a device is detected during the exam (**activated or not**), it would be treated as an **academic misconduct** situation.

Accommodations: Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all their academic activities. If you think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as soon as possible. For more information please visit:

<https://www.lakeheadu.ca/students/student-life/student-services/accessibility/>

Awards and scholarships for current/returning students:

<https://www.lakeheadu.ca/studentcentral/financing-budgeting/scholarships-for-current-returning>

Any questions? Feel free to reach out to the instructor by e-mail or "in-person" with any questions, concerns, comments you might have. Also, check-out the following useful page for several related student resources:

<https://www.lakeheadu.ca/students/student-life/student-conduct/resources>

Tentative schedule

Week	Topics
1	Cartesian coordinates, vectors, equations of lines and planes, the scalar and vector products, length and distance, matrices, determinants.
2	Cylindrical and spherical coordinates. Paths, curves, motion in space. Arc-length.
3	Real valued functions of several variables. Limits and continuity.
4	Partial derivatives. Gradient and directional derivatives. Optimization problems. Method of Lagrange multipliers.
5	Vector fields. Divergence and curl.
6	Double and triple integrals. Cylindrical and spherical coordinates.
7	Change of variables in double and triple integrals. Jacobian.
8	Integrals in spherical and cylindrical coordinates. Applications to mass calculations.
9	Line integrals. Surfaces.
10	Area of a surface, integrals of scalar functions over surfaces, surface integrals of vector fields.
11	Green's theorem. Conservative vector fields.
12	Stokes's theorem. The Divergence theorem.