

MATH 3012 Vector Analysis

Course Outline and Syllabus

Course Description

Vectors, vector functions, and vector fields. Divergence, curl, and gradient in rectangular, cylindrical, and spherical co-ordinate systems. Line, surface, and multiple integrals. Theorems of Green, Gauss, and Stokes. Students who have previous credit in Mathematics 4012 may not take Mathematics 3012 for credit.

Credit Weight: 0.5

Prerequisite(s): MATH 1230 or ENGI 3021 need to be completed to take this course - Must be taken either prior to or at the same time as this course.

MATH 3012L needs to be registered for at the same time - Must be taken either prior to or at the same time as this course.

Faculty Information

Saeed Ghasemi

Office: T3-B

Email: sghasem2@lakeheadu.ca

Office Hours: Thursdays 3:00 PM - 4:30 PM

Class Schedule

Lecture	Tuesdays and Thursdays	5:30 PM - 7:00 PM	M339
Lab	Mondays	2:30 PM - 3:30 PM	A115

Lab Hour: No new material will be covered in the lab. 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 beneficial to attend.

Course Summary: 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.

Course Resources

- **Calculus: Early Transcendentals, 9th Edition, Stewart/Clegg/Watson**
- **Calculus: Early Transcendental Functions, 8th Edition, Larson and Edwards**

Course textbooks can be ordered online through the [Lakehead University bookstore](http://bookstore.lakeheadu.ca/home) (<http://bookstore.lakeheadu.ca/home>). Purchases can be shipped to students' home addresses. For more information, contact [Lakehead University bookstore](http://bookstore.lakeheadu.ca/contact-us) (<http://bookstore.lakeheadu.ca/contact-us>)

Course Content: We will cover the following chapters in the textbook (according to Stewart's textbook).

Chapter 12: Vectors and Geometry of Space: Dot and Cross Product, Lines and Planes, Parametric Curves

Chapter 13: Vector Functions: Space Curves, Arclength, Curvature

Chapter 14: Partial Derivatives: Limits and Continuity, Partial Derivatives, Gradients, Directional Derivatives, Linear Approximations, Optimization, Lagrange Multipliers

Chapter 15: Multiple Integrals: Double and Triple Integrals in Polar, Cylindrical, and Spherical Coordinates.

Chapter 16: Vector Calculus: Line Integrals, Surface Integrals, Conservative Vector Fields, Green's Theorem, Stokes' Theorem, Gauss' Theorem.

Course Learning Objectives (CLOs): By the end of the course, the student should be able to do the following:

CLO-1: Describe curves and surfaces in three-dimensional space using graphical techniques, parameterization and calculus.

CLO-2: Extend the concepts of single variable calculus to vector valued function. Compute tangent vectors, curvature, etc.

CLO-3: Define and apply vector operations, such as the dot product, cross product, gradient, Laplacian, curl and divergence.

CLO-4: Extend the concepts of differential calculus to functions of several variables, i.e., compute limits, derivatives, etc.

CLO-5: Apply concepts of multivariate differential calculus such as linear approximation, optimization, directional derivatives, and direction of steepest descent.

CLO-6: Extend the concepts of integral calculus to functions of several variables, i.e., multiple integrals in two and three dimensions, line integrals, surface integrals.

CLO-7: Apply concepts of multivariate integral calculus such as moment of inertia, centre of mass, arclength.

CLO-8: Apply calculus techniques to various coordinate systems such as polar coordinates, cylindrical coordinates, and spherical coordinates, and understand when to use them.

CLO-9: Demonstrate the connections between differentiation and integration through the fundamental theorem of line integrals, Green's Theorem, Stokes' Theorem, Divergence Theorem and conservative vector fields.

Evaluation/List of Assessments

The final grade for the course will be based on the following items weighted as Indicated.

Assignments	20%
Midterm Exams (2 x 20%)	40%
Final Exam	40%
Total	100%

- **Assignments:** Assignments are given as topics are covered in class. Assignments will be collected and graded online using the free online homework system WeBWorK. Further information will be provided during the next couple of weeks.
- **Exams:** There will be two midterm exams during the lab hour. The final exam will be scheduled by the registrar's office. No calculators or other external resources are allowed.

Important Dates

Activity	Date
Start Date	September 3, 2024
Thanksgiving – College Closed	October 14, 2024
Midterm 1	October 28
Fall Study Break	October 21 – October 25
Midterm 2	November 25
Last Day of Classes	December 3, 2024
Study Days	December 4, 2024
Final Exam Period	December 6 – December 16
Exam Contingency Date	December 17, 2024
Marks Due	December 20, 2024

Course Policies

- Late assignments will NOT be accepted by the WeBWork system.
- Students who miss a midterm exam due to illness, having a personal/family emergency, or a religious observance must e-mail me within 48 hours from the date of the exam with a brief explanation of their absence. For a valid reason, the weight of the midterm exam will then be transferred to the final exam. There are no deferred midterm exams

Expectations for Successful Participation

1. Attend every class (and if you cannot, ask a learning partner to help you catch up).
2. Check myCourselink regularly for announcements, reading and work assignments and course updates.
3. Ask questions if you need clarification (in class; via email). Please ensure that you “sign” your email with your name and course number.
4. Keep up with your course work. Read the designated material and complete the assigned homework so that you can come to class prepared to discuss the issues and concepts during class time.

5. Submit your assignments by the deadline! You are strongly advised not to wait until the last minute to submit your assignments in case you have computer problems.

Academic and Student Code of Conduct Policies

- Academic and student policies and procedures for those enrolled in the Lakehead-Georgian programs can be found on the [Lakehead-Georgian Student Portal](#).
- All Lakehead-Georgian programs will follow the Lakehead Regulations as list in the Lakehead University [Academic Calendar](#) (http://csdc.lakeheadu.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&loaduseredit_s=False). The University Regulations include but are not limited to Registration, Examinations, Reappraisals and Academic Appeals, Special Examinations, Academic Misconduct, Withdrawal, and Timely Feedback. Additional Faculty Regulations may also apply. Please review the Academic Calendar.
- The Lakehead University [Student Code of Conduct - Academic Integrity](#) (<https://www.lakeheadu.ca/students/student-life/student-conduct>) will apply to all Lakehead-Georgian students regardless of campus of study.
- The Lakehead University [Student Code of Conduct - Appeals](#) (<https://www.lakeheadu.ca/students/student-life/student-conduct>) will apply to all Lakehead-Georgian students regardless of campus of study.
- The Georgian College [Student Code of Conduct](#) (<http://www.georgiancollege.ca/student-code-of-conduct/>) will apply to the Lakehead-Georgian students studying at the Barrie campus. Additional campus policies of [Sexual Violence Procedure and Protocol](#) (<https://www.georgiancollege.ca/about-georgian/campus-safety-services/tab/sexual-violence>), Alcohol, Drugs and Tobacco (<https://www.georgiancollege.ca/about-georgian/campus-safety-services/tab/alcohol-drugs-and-tobacco>), and [Information Technology Acceptable Use Procedure](#) (<http://www.georgiancollege.ca/wp-content/uploads/2-117IT-acceptable-use.pdf>) also apply.
- The Lakehead University [Student Code of Conduct – Non-Academic](#) (<https://www.lakeheadu.ca/students/student-life/student-conduct>) will apply to the Lakehead-Georgian students studying at the Orillia campus.

Plagiarism and Academic Dishonesty

A breach of Academic Integrity is a serious offence. The principle of Academic Integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding

misrepresentation, is a core principle in university study. Students should view the [Student Code of Conduct -Academic Integrity](https://www.lakeheadu.ca/students/student-life/student-conduct) (<https://www.lakeheadu.ca/students/student-life/student-conduct>) for a full description of academic offences, procedures when Academic Integrity breaches are suspected and sanctions for breaches of Academic Integrity.

Whom to Contact

STUDENT ADVISING (NON-ACADEMIC)		
Fallon Miller Student Success Advisor		Tel: 1-249-388-2447 Fallon.Miller@GeorgianCollege.ca (Georgian, Barrie) Room A143AA
APPLIED LIFE SCIENCES		
Lakehead University Program Coordinator	Dr. David Law	Tel: 705-330-4010, Ext. 2646 dlaw@lakeheadu.ca (Lakehead, Orillia) Room OA 3018
Georgian College Program Coordinator	Dr. Sean Madorin	Tel: 249-388-1116 sean.madorin@georgiancollege.ca (Georgian, Barrie) Room M320E
COMPUTER SCIENCE		
Georgian College Program Coordinator	Ross Bigelow	Tel: 249-388-1646 ross.bigelow@georgiancollege.ca (Georgian, Barrie) Room N211A
Lakehead University Program Coordinator	Dr. Ruizhong Wei	Tel: 705-330-4010, Ext. 2713 rwei@lakeheadu.ca (Lakehead, Orillia) Room OR 2012
Georgian College Lab Technician	Computer Science Help Desk	Tel: 705-728-1968, Ext. 1173 cstech@georgiancollege.ca (Georgian, Barrie) Room A155
ELECTRICAL ENGINEERING		
Lakehead University Department Chair	Dr. Carlos Christoffersen	Tel: 807-343-8010, Ext. 8352 carlos.christoffersen@lakeheadu.ca (Lakehead, Thunder Bay) Room AT 5017
Lakehead University Program Coordinator	Dr. Mohammad Uddin	Tel: 249-388-2509 Muddin@lakeheadu.ca (Georgian, Barrie) Room F118D
Georgian College Program Coordinator	Dr. Majid OstadRahimi	Tel: 249-388-1543 majid.ostadrahimi@georgiancollege.ca

		(Georgian, Barrie) Room N211F
--	--	-------------------------------

ENVIRONMENTAL SUSTAINABILITY

Lakehead University Department Chair	Dr. Sree Kurissery	Tel: 705-330-4010, Ext. 2629 Skurisse@lakeheadu.ca (Lakehead, Orillia) Room OA 3010
Georgian College Program Coordinator	Rhonda Bell-Allen	Tel: 249-388-1702 Rhonda.bell-allen@georgiancollege.ca (Georgian, Barrie) Room A143G

SCIENCE LABORATORY SUPPORT

Lakehead University Laboratory Technician	Chase Moser	Tel: 249-388-1602 cmoser@lakeheadu.ca (Georgian, Barrie) Room A150A
---	-------------	--

COOP CONTACTS

Georgian College Co-op Consultant (Student Services for Computer Science- Computer Programmer; Course only for Electrical Engineering)	Maureen Arbour	Tel: 249-388-0728 Maureen.arbour@georgiancollege.ca (Georgian, Barrie)
Georgian College Employer Relations Consultant (Employer relations and co-op monitor for Computer Science- Computer Programmer)	Jodi Derrick	Tel: 249-388-0698 jodi.derrick@georgiancollege.ca (Georgian, Barrie) Room F118A
Lakehead University Co-op Coordinator (Student and Employer Services for Electrical Engineering)	Caitlin Reeves	Tel: 807-343-8010, Ext. 7190 Coopadvisor@lakeheadu.ca (Lakehead, Thunder Bay) Room SC 0017B

Student Services and Supports

Student Advisors (<https://georgiancollege.sharepoint.com/sites/student/Student-Services/StudentAdvisors/SitePages/Home.aspx>)

- Help students build both academic and personal resilience so that they can flourish at Georgian and beyond
- Provide individual, group and web-based advising sessions
- Are housed within the academic areas
- To book an appointment with your advisor go to the <https://outlook.office365.com/book/StudentSuccessAdvisorFallonMiller@georgiancollege.onmicrosoft.com/>

Library (<http://library.georgiancollege.ca/main>)

Customer Service

- Off campus access

Research help

- Help finding books, articles and credible sources.
- Using specialty databases.
- Creating a search strategy.

Academic Success (<https://library.georgiancollege.ca/help/contact-academic-success>)

Writing Centre (http://library.georgiancollege.ca/writing_centre)

- Improve your writing.
- Help with citing sources and laying out your paper.

Math Centre (http://library.georgiancollege.ca/math_centre)

- Make sense of math questions.
- Understand concepts and develop skills.

Tutors (<http://library.georgiancollege.ca/tutoring>)

- Further understand course content.
- Build your study practices.

Accessibility Services (<https://www.georgiancollege.ca/student-life/student-services/accessibility-services/>)

If you are a student experiencing a disability who may require academic accommodations and have not yet registered with Accessibility Services, please contact their office at 1-877-722-1523 email studentsuccess@georgiancollege.ca, or visit their offices in B110. You must be registered with Accessibility Services to access academic accommodations. Support for those students whose success at college may be affected by a disability include:

- Ongoing support from our Accessibility Advisors including arranging a confidential psychoeducational assessment where required

- Training in the use of specialized computer technology
- Classroom and test accommodations

Testing Services (<http://www.georgiancollege.ca/student-life/student-services/testing/>)

- Accommodated testing
- Missed/Makeup testing
- Proctoring services are also available for external and Ontario Learn exams

Counselling (<http://www.georgiancollege.ca/student-life/student-services/counselling/>)

- Free, confidential counselling is available to all students
- Walk in counselling is available on a daily basis Monday to Friday

Career Success (<http://www.georgiancollege.ca/student-life/student-services/co-op-and-career-services/>)

Career assessments and exploring options

- Job search workshops
- Labour market information
- Resume/cover letter help
- Interview practice
- Graduate employment information
 - Links to job postings and online resource

Campus Safety and Security Syllabus Addendum

Emergency Evacuation (<https://www.georgiancollege.ca/about-georgian/campus-safety-services/emergency-management/#fire>)

- Evacuate buildings when a fire alarm is activated or an official announcement is given. Review [evacuation guidelines](https://www.georgiancollege.ca/about-georgian/campus-safety-services/emergency-management/#fire). (<https://www.georgiancollege.ca/about-georgian/campus-safety-services/emergency-management/#fire>)
- Students requiring assistance in emergency situations must inform their faculty during the first week of class.
- Familiarize yourself with all fire exit doors of classrooms and buildings you may occupy.
- Do not re-enter a building until instructions are given by the Fire Department or college personnel.

Lockdown (<https://www.georgiancollege.ca/about-georgian/campus-safety-services/tab/lockdown>)

- Lockdown is initiated when there is a potential or actual violent incident on campus that could result in a serious injury or threat to life.

- Students can download the new Safe@Georgian app to stay updated on Campus Safety and Security information including lockdown.
- Familiarize yourself with the [College Lockdown procedure](https://www.georgiancollege.ca/wp-content/uploads/Lockdown.pdf) (<https://www.georgiancollege.ca/wp-content/uploads/Lockdown.pdf>)
- Lockdown tests occur each semester.

Resources:

- [Get Out, Hide, Fight Lockdown Video](http://youtu.be/JA8cckMbVDk) (<http://youtu.be/JA8cckMbVDk>)
- [Lockdown quick reference sheet](http://www.georgiancollege.ca/wp-content/uploads/COM-15-416_LockdownProcedure_Signage_FVR3_print.pdf) (http://www.georgiancollege.ca/wp-content/uploads/COM-15-416_LockdownProcedure_Signage_FVR3_print.pdf)
- Lockdown Model – Get Out, Hide, Fight: Lockdown Tools and Tactics and FAQs.

Unscheduled Campus Closure <https://content.georgiancollege.ca/wp-content/uploads/Unscheduled-Campus-Closure.pdf>

Resources:

- [How to find out if your campus is closed](https://www.georgiancollege.ca/about-georgian/campus-safety-services/emergency-management/#closure) (<https://www.georgiancollege.ca/about-georgian/campus-safety-services/emergency-management/#closure>)
- [Unscheduled Campus Closure Procedure](https://www.georgiancollege.ca/wp-content/uploads/2-102Unscheduled-college-closure-2018.02.10.pdf) (<https://www.georgiancollege.ca/wp-content/uploads/2-102Unscheduled-college-closure-2018.02.10.pdf>)

Timing of Closures/Notification:

Closure	Decision	Communication / Notification*	Notes
College has made the decision to close a campus or location <u>in the morning</u> :	6:00 a.m.	By 6:30 a.m.	If re-opening for noon or evening classes is being considered, this will be mentioned in the message
College closes a campus(s) in the morning and <u>expects to re-open by 12:00 noon</u>	9:30 a.m.	By 10:00 a.m.	Only affects classes beginning at 12 noon or later
Closure expected to continue <u>past 12:00 noon</u>	9:30 a.m.	By 10:00 a.m.	
College intends to <u>re-open for evening classes</u> which commence at 5 p.m. or later	2:30 p.m.	By 3:00 p.m.	
College intends to <u>NOT re-open for evening classes</u> :	2:30 p.m.	By 3:00 p.m.	

***Notification will be made via:**

- Georgian social media (Facebook, Twitter)

- Safe@Georgian app
- Georgian website (homepage)
- Recorded message when you call into Barrie campus at 705-728-1968
- Student or employee portal
- Georgian email account
- Radio and television announcements through local and regional media

Note: We only announce the names of campuses that are closed. If your campus is not named in a closure, it's open.