



REVISED COURSE OUTLINE FOR REMOTE LEARNING

To account for the necessary transition to remote learning from March 13 onward, adjustments have been made to assessment deadlines and requirements so that all coursework tasks are in line with the necessary and evolving health precautions for all involved (students and staff). If you are unable to meet the deadlines or requirements specified, please connect with your course instructor to work out alternative dates/assessments.

1. **Course:** GOPH 619, Advanced Computational Methods for Geophysicists - Winter 2020

Lecture 01: MWF 11:00 - 11:50 - Remote Learning (check with your instructor or coordinator for details)

Instructor	Email	Phone	Office	Hours
Dr Brandon Karchewski	brandon.karchewski@ucalgary.ca	403 220-6678	ES 108	By Appointment

Lab 01: Thu 8:00-11:00 in ES 924

Calendar Description:

Review of important mathematical models in geophysics (Poisson equation, acoustic wave equation, elastic wave equation) and typical boundary conditions for elliptic and parabolic partial differential equations. Numerical solutions using finite difference, finite volume and finite element approaches. Algorithms for nonlinear constitutive behaviour and introduction to nonlinear optimization/inversion algorithms. Course includes an independent term project.

Learning Objectives:

By the end of this course, students should be able to:

1. *Explain* and *implement* numerical solution algorithms for ODEs/PDEs, applied within a geophysics context.
2. *Explain* and *apply* appropriate boundary conditions for a problem of interest; *implement* a consistent boundary condition within a numerical solution scheme.
3. *Perform* error analyses of approximate numerical solutions and *discuss* whether the solutions are acceptable.
4. *Explain* the advantages and limitations of the numerical techniques examined in the course.
5. *Distinguish* between and select the most applicable of available numerical techniques for an analysis task in geophysics.
6. *Use* software packages (spreadsheet tools such as MS Excel and/or programming languages such as Matlab) to *compute* numerical solutions.
7. *Communicate* the results of numerical analysis to peers in the scientific community and *critically evaluate* the work of peers.

Course Site:

D2L: GOPH 619 L01-(Winter 2020)-Advanced Computational Methods for Geophysicists

Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Consent of the Department.

Antirequisite(s):

Credit for Geophysics 619 and Geophysics 699.09 will not be allowed.

3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Date
Lab Assignments/Quizzes	10%	6 given in lab (4 assignments)
Paper Reviews/Presentations	10%	2x over term (or 1x, if needed)
Project Proposal	10%	Fri. Feb. 7
Project Report	50%	Wed. Apr. 15 Thu. Apr. 30
Project Presentation	20%	Thu. Apr. 9 TBD in April (Zoom)

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	67 %	63%	60%	55 %	50 %

Quizzes and assignments will be given during the lab period approximately every other week. Some will be given to be completed during the lab period and others will be given as homework assignments due at the beginning of the following lab, depending on the topic. There will be approximately 6 of these over the course of the semester. At the end of the semester, the lowest quiz/assignment grade will be dropped in evaluating this grade component and the average percentage grade of the remaining quizzes/assignments will be taken as the overall grade for this component.

You will also be responsible for leading the group through two paper reviews/discussions of about 30 minutes each. These will also take place during the lab period. The paper topics should be related to the course topics (errors, approximation, ODE solvers, finite differences, finite elements) and applied to some problem in geoscience/geophysics/physics. One of your papers should be a technical paper and one should be a literature review. Your paper selection should be sent to the course instructor for approval at least 2 weeks prior to the lab in which you will lead the discussion. Your presentation/discussion will be evaluated using a rubric posted on D2L.

You will also complete a term project involving application of the course topics to a problem of interest, ideally related to your research project (for thesis-based M.Sc. and Ph.D. students). You are encouraged to discuss potential topics with the course instructor and your research supervisor early in the term, as they should be able to support you in arriving at a topic and scope that are appropriate. Evaluation will be divided into three components: a brief proposal (due early Feb), a project report (due at the end of classes in April) and a presentation (completed in the last lab in early April). All of these will be evaluated using rubrics posted on D2L.

There will be no midterm or final exam for this course.

At the end of the semester, your weighted grade will be rounded to the nearest integer percentage point and converted to a letter according to the table above.

COVID-19 UPDATE: Adapting to changing course delivery in online format, and to the classes lost due to the developing COVID response, the quantity and due date for the assignments and project have been modified (see table above). Since there is no final exam for this course, no adjustment has been made to the grading scheme. For the paper presentations, if it is not possible to complete 2 as originally planned, this grade component will be based on the 1 presentation only. If it is not possible to arrange final project presentations during the final exam period in April, the 20% weight for the project presentation will be re-assigned as follows: an additional 5% on the paper presentations and an additional 15% on the project report. Please feel free to contact the course instructor with any questions/comments about the modifications. Individual circumstances can be accommodated in terms of adjustments to deadlines or weights at the instructor's discretion. The University of Calgary wants to ensure that no student is academically disadvantaged by the COVID situation.

4. Missed Components Of Term Work:

The University has suspended requirements for students to provide evidence for reasons for absences so please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations. Please let your instructor know immediately if you are ill and cannot meet the deadlines specified.

5. Scheduled Out-of-Class Activities:

There are no scheduled out of class activities for this course.

6. Course Materials:

Recommended Textbook(s):

Steven Chapra and Raymond Canale, *Numerical Methods for Engineers, 7th Ed. (5th or 6th are also OK)* McGraw-Hill.

Olek Zienkiewicz Robert Taylor J.Z. Zhu, *The Finite Element Method: Its Basis and Fundamentals 7th Edition (5th or 6th also OK)*: Elsevier, Butterworth-Heinemann.

There are no required texts for this course. Students are encouraged to discuss recommended texts and/or papers with the course instructor. The instructor will post supplemental notes on D2L (<https://d2l.ucalgary.ca/login.asp>), as applicable. You will be expected to stay up-to-date with the online content of the course on a weekly basis.

You can obtain a student license for Matlab for your personal computer by visiting the University of Calgary IT Software Distribution website (<https://iac01.ucalgary.ca/SDSWeb/>) and following the instructions provided.

7. Examination Policy:

All lab quizzes/assignments are open book/notes with web access and use of any calculator (including Excel and Matlab) permitted and encouraged.

Students should also read the Calendar, [Section G](#), on Examinations.

8. Approved Mandatory And Optional Course Supplemental Fees:

There are no mandatory or optional course supplemental fees for this course.

9. Writing Across The Curriculum Statement:

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also [Section E.2](#) of the University Calendar.

10. Human Studies Statement:

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

11. Reappraisal Of Grades:

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

12. Other Important Information For Students:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more

information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).

- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at [403-220-2208](tel:403-220-2208).
- d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**
- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Sr. Instructor of the Department of Geoscience, Dr. Rudi Meyer by email rmeyer@ucalgary.ca or phone 403-210-7848. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.

- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel:403-220-5333) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. [Student Ombudsman](#), Email: ombuds@ucalgary.ca.
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- l. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions

governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

Electronically Approved - Mar 23 2020 14:36

Department Approval

Electronically Approved - Mar 23 2020 17:25

Associate Dean's Approval for alternate final examination arrangements or remote learning