



UNIVERSITY OF CALGARY
 FACULTY OF SCIENCE
 DEPARTMENT OF GEOSCIENCE
 COURSE OUTLINE
 FALL 2017

1. **Course:** Geophysics 669.20, Geophysical Programming

Lecture Sections:

L01: WeFr, 12:00-13:30, ES254

Labs: WeFr 15:00-16:30 ES254

For a listing of all lab sections corresponding with this course, please see the following link:

http://geoscience.ucalgary.ca/geoscience_info/courses/f17

Instructor: Dr. D. Trad, Office: ES 210, Ph. 403-220-7375, email: daniel.trad@ucalgary.ca,

Office Hours: WF 14:00-15:00

Geoscience Department ES 118, 403-220-5184, geoscience.ucalgary.ca, geoscience@ucalgary.ca

2. **Prerequisites:** C or C++, some familiarity with linux and command line bash.

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

| Grading Schedule | Percent |
|------------------|-------------|
| Lab Projects | 50% |
| Final Project | 50% |
| Total | 100% |
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A student's score for the two components 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 course percentage and letter grade is given below.

| Letter Grade | Percent | Letter Grade | Percent |
|--------------|---------|--------------|---------|
| A+ | 96-100 | C+ | 60-64.9 |
| A | 90-95.9 | C | 50-59.9 |
| A- | 85-89.9 | C- | 45-49.9 |
| B+ | 80-84.9 | D+ | 44-44.9 |
| B | 70-79.9 | D | 40-44 |
| B- | 65-69.9 | F | 0-40 |

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar

5. **Course Materials:** The course D2L site contains all of the handouts for labs, as well as other resource material that you might find useful.

6. **Examination Policy:** N/A

7. **Writing across the curriculum statement:** N/A

8. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **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
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: Students with Disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html> and Student Accessibility Services: <http://www.ucalgary.ca/access/>
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). As one consequence, 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 also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: suvpaca@ucalgary.ca
SU Faculty Rep. Phone: 403-220-3913, Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca
Student Ombuds Office: 403-220-6420 Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI Surveys.

Department Approval: ORIGINAL SIGNED

Date: August 4, 2017

Associate Dean's Approval for
Alternate final examination arrangements: ORIGINAL SIGNED

Date: August 14, 2017

Tentative Lecture and Lab Schedule

| Date | Lecture Topic (ENA 03) | Labs (ES 0254) | |
|--------------|---|------------------------|--|
| September 13 | Course introduction, schedule | Linux | Introduction to linux |
| September 15 | Introduction to Seismic Unix Bash shell programming | Bash | Bash command line |
| September 20 | Project building I: make and makefiles | Seismic Unix | Installing SU, makefile examples |
| September 22 | Seismic unix programming: picking tool | Seismic Unix | Single channel module |
| September 27 | Seismic unix programming: synthetic data | Seismic Unix | Modeling tool by convolutional model. |
| September 29 | Seismic unix programming: Libraries | Seismic Unix | Create static and dynamic libraries |
| October 4 | Seismic unix programming adaptive subtraction. | Seismic Unix | Multichannel module to match data sets with different amplitudes |
| October 6 | Seismic unix programming: Radon Transform | Seismic Unix | Least Squares Radon transform in frequency and/or time domain |
| October 11 | Project building II with Python: Scons | Scons | Scons examples and comparison with make |
| October 13 | Madagascar programming: finite difference modeling for synthetic modeling | Madagascar | Create synthetic modeling tool in Madagascar |
| October 18 | Madagascar programming: finite difference modeling with different orders | Madagascar | Continuation |
| October 20 | Madagascar programming: Post-stack Reverse Time Migration | Madagascar | Post-stack RTM module |
| October 25 | Madagascar programming: Prestack Reverse Time Migration | Madagascar | Prestack RTM module |
| October 27 | Madagascar programming: Conjugate gradients and LSRTM | Madagascar | Implementation of LS RTM |
| November 1 | Parallel Programming: OpenMp | OPENMP | Introduction to OPENMP |
| November 8 | Parallel Programming: OpenMp | OPENMP | Introduction to OPENMP |
| November 15 | Standalone programming: 5D interpolation | Standalone programming | basic Fourier interpolation module |
| November 22 | Standalone programming: Least Squares Kirchhoff. | Standalone programming | Basic LS Kirchhoff migration (time) |
| November 29 | Standalone programming: Least Squares Kirchhoff | Standalone programming | Basic LS Kirchhoff migration (time) |
| December 1 | Parallel Programming: OpenMPI | OPENMPI | Introduction to OPENMPI |
| December 6 | Parallel Programming: OpenMPI | OPENMPI | Introduction to OPENMPI |
| December 8 | Final project discussions. | Final project | Discussion for final projects |
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