

UNIVERSITY OF CALGARY  
DEPARTMENT OF GEOSCIENCE  
COURSE OUTLINE

**1. Course: Geology 698 (Chemical Engineering 698) – Reservoir Characterization for Field Development**

A team-based, integrated reservoir description experience working with geophysical, geological, petrophysical, and engineering data to produce a field development plan.

Lecture Section: L01 Tu Th TBA EEE127 Winter 2014

Instructor(s): Dr. Christopher Clarkson ES 254A 220-6445 [clarksoc@ucalgary.ca](mailto:clarksoc@ucalgary.ca)

Geoscience Department ES 118; (403) 220-5841; [geoscience.ucalgary.ca](http://geoscience.ucalgary.ca)

**2. PREREQUISITE(S):** Chemical Engineering 621 and Geology 697 and Human Resources and Organizational Dynamics 798 or equivalent

**Note:** This course is intended for graduate students in the Masters of Reservoir Characterization program (RSCH).

See section 3.5.C in the Faculty of Science section of the online Calendar (<http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html>)

**3. GRADING:** The University policy on grading and related matters is described in “Academic Regulations, sections F.1 and F.2” of the online University Calendar (<http://www.ucalgary.ca/pubs/calendar/current/f-1.html> and <http://www.ucalgary.ca/pubs/calendar/current/f-2.html>). In determining the overall grade in the course the following weights will be used:

Weekly presentations	70%
Final Examination	30% (To be scheduled by the Registrar)

**Notes:** Each component must be passed to pass the course.

Each piece of work (weekly presentations and final examination) submitted by the student will be assigned a percentage score. The student’s average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course that will be used to determine the course letter grade using the conversion scale provided below:

Letter Grade	Percent	Letter Grade	Percent
A+	95-100	C+	64-67
A	89-94	C	60-63
A-	84-88	C-	56-59
B+	78-83	D	50-55
B	73-77	F	0-49
B-	68-72		

**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: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>.

**5. Dates and times of class exercises held outside of class hours:** NIL

Department Approval: ORIGINAL SIGNED Date: January 9 2014

**6. EXAMINATION POLICY:** N/A

**7. 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 K. Student Misconduct (<http://www.ucalgary.ca/pubs/calendar/current/k.html>) 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 at <http://www.ucalgary.ca/emergencyplan/assemblypoints>.
- (c) **ACADEMIC ACCOMMODATION POLICY.** Students with documentable disabilities are referred to the following links: Calendar entry on students with disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html>  
Student Accessibility Services: [www.ucalgary.ca/access](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:** 220-3911 **Email:** [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca).  
SU Faculty Rep. **Phone:** 220-3913 **Email:** [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca) Website <http://www.su.ucalgary.ca/home/contact.html>.  
Student Ombudsman: [www.ucalgary.ca/provost/students/ombuds](http://www.ucalgary.ca/provost/students/ombuds); [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca) 220-6420
- (g) **INTERNET and ELECTRONIC COMMUNICATION DEVICE Information.** You can assume that in all classes that you attend, **your cell phone should be turned off.** 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.

UNIVERSITY OF CALGARY  
DEPARTMENT OF GEOSCIENCE  
COURSE OUTLINE

GEOLOGY 698: RESERVOIR CHARACTERIZATION FOR FIELD DEVELOPMENT

**Instructor(s):** Dr. Christopher Clarkson      ES 254A      220-6445      clarksoc@ucalgary.ca

**Lecture:** L01      Tu Th      TBA      EEEL127

**Textbook:** No textbook is required for this course

**Reserve Reading Room:** N/A

**Examinations:**

The following examination will be held in this course:

- Individual oral exam (~2 hours, date TBA) covering reservoir characterization procedures and all aspects of the work done by the team to characterize the field studied.
- The exam will be assessing the individual for the following:
  - i. Detailed, in-depth understanding in one area (geology, geophysics, petrophysics, reservoir engineering) and its importance to the other areas
  - ii. Detailed understanding of another area and its importance
  - iii. Overview understanding of the other two areas and their importance

**Additional Course Information:**

Each team is assigned a field with the objective of developing a model which will accurately predict reserves and production performance on a well or sector basis. Each field is unique in terms of its characteristics, data, and flow process. One field may require considerable resources to develop the geological model, while another field may need more effort in obtaining a history match. Consequently, evaluation will focus primarily on the processes employed and their quality to achieve a result, rather than the result itself. Teams will be evaluated on the processes employed and results achieved to produce the following models:

1. Geologic description and interpretation
  - a. core review and description
  - b. facies description and distribution
  - c. interpretation of depositional environment
  - d. identification of major uncertainties
2. Reservoir characterization
  - a. review and interpret routine core data
  - b. gather additional data (time/lab permitting)
  - c. petrophysical log interpretation and calibration to core
  - d. seismic/microseismic interpretation (pending data availability)
  - e. production data analysis
3. Static model and uncertainties
  - a. create 3-D geocellular model using petrophysical, geophysical, and geological data
  - b. generate static property distributions
  - c. generate dynamic property distributions
4. Simulation (flow) model and uncertainties
  - a. Single-well (as appropriate)
    - i. construct single-well models (vertical and horizontal)
    - ii. initialize
    - iii. incorporate dynamic (flowing and pressure) data
    - iv. perform history-match
    - v. generate forecast
  - b. Field model (as appropriate)
    - i. initialize model using geological model from step 3
    - ii. incorporate dynamic (flowing and pressure) data
    - iii. perform history-match of multiple wells

- iv. generate forecast
  - v. evaluate interwell connectivity
5. Field development planning. Using models above, construct a development plan including:
  - a. Data acquisition strategy
  - b. Well spacing and architecture
  - c. Completion (cased or openhole) and stimulation method (hydraulic fracture size and spacing)

At the start of the semester a schedule will be established for the team presentation of each of the models or parts thereof. The ongoing work will be graded following each of the corresponding presentations (each week counting as approximately 7% and ultimately adding up to 70% of the course grade). A final exam (30%) will form the remaining part of the evaluation. Each part must be passed in order to receive a passing grade for the class.

An expectation of this course is that **each** student demonstrates mastery of the integrated processes of geology, geophysics, and reservoir engineering, applied to reservoir characterization at each stage of their course project, and that all students contribute equally within their respective team.

#### **TENTATIVE LECTURE SCHEDULE**

Teams will be assigned at a meeting during first week of classes in January 2014 – this meeting will be scheduled by the instructor in mid-December 2013. At this first meeting, each team will be assigned a presentation slot that will take place each week during the term for 1.5 hours/slot. There will be a total of 10 presentation slots throughout the term.

The final exam for each will take place during the final two weeks in April 2014.