



**COURSE OUTLINE**

**CHEM 111**

**CHEMICAL ENERGETICS AND DYNAMICS**

**3 CREDITS**

PREPARED BY: Ernie Prokopchuk, Instructor      DATE: November 15, 2017

APPROVED BY: Margaret Dumkee, Dean      DATE:

APPROVED BY ACADEMIC COUNCIL: (date)

RENEWED BY ACADEMIC COUNCIL: (date)



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DIVISION OF APPLIED SCIENCE AND MANAGEMENT  
Chemical Energetics and Dynamics  
Credit Course  
Winter, 2018

CHEMICAL ENERGETICS AND DYNAMICS

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INSTRUCTOR: Ernie Prokopchuk, PhD

OFFICE HOURS: Wed 10 am - 1 pm  
*\*Open door policy is in effect*

OFFICE LOCATION: A2513

CLASSROOM: A2601

E-MAIL: [eprokopchuk@yukoncollege.yk.ca](mailto:eprokopchuk@yukoncollege.yk.ca)

TIME: Tues & Thurs 10:00-11:59 (class)  
Mondays 1:00 - 4:00 (lab)

TELEPHONE: (867) 668-8865

DATES: January 4 - April 25, 2017

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#### COURSE DESCRIPTION

This course is a continuation of the study of the fundamental principles of chemistry with an emphasis physical chemistry. Topics of study include chemical equilibrium, acid/base chemistry, chemical kinetics, nuclear chemistry, thermodynamics and electrochemistry. The course also includes some descriptive chemistry of a selection of main group elements and transition metals. The mandatory laboratory component of the course will illustrate and reinforce most of the topics presented in the lectures.

Successful completion of this course and its companion CHEM 110 will satisfy the requirement for 6 credits of first year chemistry in the science and engineering degree programs at most Canadian and US universities.

#### PREREQUISITES

Chemistry 110, or permission of the instructor.

Students are expected to come to this course with an understanding of the topics covered in Chemistry 110 as many of these basic concepts will serve as the foundation for this course.

## EQUIVALENCY OR TRANSFERABILITY

|      |                                                             |
|------|-------------------------------------------------------------|
| UBC  | With CHEM 110 = CHEM 111 (4) + CHEM 123 (4)                 |
| UBCO | With CHEM 110 = CHEM 111 (3) + CHEM 113 (3)                 |
| UVIC | With CHEM 110 = CHEM 101 (1.5 units) + CHEM 102 (1.5 units) |
| UNBC | CHEM 101 (3) + CHEM 121 (1)                                 |
| SFU  | CHEM 122 (2) - Q + CHEM 126 (1) - Q                         |
| TRU  | CHEM 1200 (3)                                               |

See the <http://bctransferguide.ca/> for a complete list of transfers in British Columbia and <http://alis.alberta.ca/ps/tsp/ta/tbi/onlineSearch.html> for a complete list of transfers in Alberta.

## LEARNING OUTCOMES

Upon successful completion of this course, students will:

- be able to understand and apply fundamental chemistry concepts.
- have developed critical thinking skills.
- have developed basic laboratory skills.

## COURSE FORMAT:

**Lectures:** Three hours per week

**Labs:** Three hours per week

**Tutorials:** One hour per week incorporated into the lecture times

Classes are a blend of lecture and tutorial allowing for an opportunity to practice solving calculation-based problems related to the material being covered in class.

Classes will be recorded with the intent to provide students with a way to revisit material covered in class. This may be helpful while studying or to review a topic covered in class. This will provide greater flexibility to students who are unable to make classes due to work commitments (or any other reason for absence that comes up).

Links to these videos will be posted online but the videos will only be viewable by people with the password which will only be provided to students enrolled in the class. Portions of the videos may be used for professional development purposes, meaning that they may be shown to staff and faculty within the College for the purposes of workshops and demonstrations, and possibly to instructors outside of the College as part of a conference presentation.

Most students in the class will not be visible on the videos, but voices may be heard during class discussions. Seats that are visible will be indicated the first day of class.

Material is regularly posted on the course LMS, Moodle. This material will include links to lecture capture videos, assignments, course announcements, links to content on LibreText ([chem.libretexts.org](http://chem.libretexts.org)), suggested practice problems, an exact copy of everything written on the screen during class, and other useful or interesting material related to the course. Please be aware that any notifications generated by Moodle are sent to your Yukon College email address. It is essential that you regularly check this email account, or set it up to automatically forward to your preferred email account.

Labs are a mandatory component of the course. In order to receive a passing grade in the lab, a student must complete the experiments and submit the required reports. If a lab period is missed, the report for that experiment cannot be submitted unless arrangements are made with the instructor. Expectations for the labs are outlined in the lab manual.

## **ASSESSMENTS**

### **Assignments**

There will be at least 8 assignments due on an approximately weekly basis. Assignments as a whole are worth 10% of the final grade which is determined based on the total mark obtained on all assignments. Assignments will involve a number of questions or problems related to the course material. You will have at least one week to complete each assignment. Late assignments will not be accepted (receiving a mark of 0) once graded assignments have been returned to the class, which usually happens at the next class.

### **Tests and Examinations**

There will be two 60-minute term tests (February 1 and March 8, 2018) held during scheduled class time. Each test is worth 15% of the final grade. Please note that after the term tests the remaining class time will be used for a lesson. The final examination, worth 30% of the final grade, will take place during Final Exam period (April 16 - April 25). The exam date will be announced as soon as it is known.

### **Laboratory component**

As a whole, the laboratory component is worth 30% of the final grade. This will be based on lab performance (10%), pre-lab questions (10%), and lab reports (80%) The specific evaluation criteria for the lab are detailed in the lab manual.

## EVALUATION

|             |      |
|-------------|------|
| Assignments | 10%  |
| Term Test 1 | 15%  |
| Term Test 2 | 15%  |
| Final Exam  | 30%  |
| Laboratory  | 30%  |
| Total       | 100% |

Students must pass (get at least 50%) both the laboratory and the lecture component in order to pass the course.

## REQUIRED TEXTBOOKS AND MATERIALS

As a step to making education more affordable, we will be using LibreText as our textbook. Some copies of textbooks will be placed on reserve in the library. If you wish to purchase a textbook for your own reference, I can suggest some good options.

Laboratory Manual for Chemistry 111 (available at the first lab session)

## ACADEMIC AND STUDENT CONDUCT

While attendance is not graded, it is strongly recommended. There is usually a strong correlation between regular attendance and academic performance.

Information on academic standing and student rights and responsibilities can be found in the Academic Regulations:

<https://www.yukoncollege.yk.ca/admissions/resources>

## PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when students present the words of someone else as their own. Plagiarism can be the deliberate use of a whole piece of another person's writing, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material. Whenever the words, research or ideas of others are directly quoted or paraphrased, they must be documented according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Resubmitting a paper which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the College.

## YUKON FIRST NATIONS CORE COMPETENCY

Yukon College recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see [www.yukoncollege.yk.ca/yfnccr](http://www.yukoncollege.yk.ca/yfnccr).

## ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon College Academic Regulations (available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC) at [lassist@yukoncollege.yk.ca](mailto:lassist@yukoncollege.yk.ca).

## TOPIC OUTLINE

| Week    | Unit | Topic                                                                                                                                                                                         |
|---------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.5, 1  | 1    | Chemical Equilibria - equilibrium condition, equilibrium constant, applications, Le Chatelier's Principle                                                                                     |
| 2, 3    | 2    | Acid-Base Equilibria - definitions, strength, pH, polyprotic acids, ionic acids and bases, Lewis acids and bases                                                                              |
| 3 - 5   | 3    | Applications of Aqueous Equilibria - buffers, titrations and pH curves, solubility, complexation                                                                                              |
| 6       | 4    | Chemical Kinetics - rates, rate laws, reaction mechanism, catalysis                                                                                                                           |
| 7, 8    | 5    | Thermochemistry - energy, thermodynamics, enthalpy, Hess' Law enthalpies, energy sources<br>Bond energy<br>Phase changes                                                                      |
| 9, 10   | 6    | Spontaneity, Entropy and Free Energy - spontaneous processes, 2 <sup>nd</sup> law of thermodynamics, entropy changes in reaction, free energy and reactions<br>Thermodynamics and equilibrium |
| 11, 12  | 7    | Electron-transfer Reactions - balancing redox reactions, galvanic cells, standard reduction potentials, cell potential, applications                                                          |
| 12,12.5 | 8    | Descriptive main group chemistry                                                                                                                                                              |

*\*Specific dates of topic coverage may be subject to change. Some topics may not be covered depending on time constraints.*