

**Chemistry 4481B**  
**Solid-state Inorganic Chemistry and Materials (Winter 2023 Course Outline)**

## 1. Course Information

### Course information

- Instructor: Dr. Yining Huang
- Chemistry Building 17, ext. 86384
- E-mail: [yhuang@uwo.ca](mailto:yhuang@uwo.ca)
- For e-mail contact, your e-mail messages must be from your @uwo.ca account. Please put Chem 4481B in the subject line
- Course delivery mode: *In-person*
- Lecture: Tu 11:30 am -12:30 pm; Th 10:30 am – 12:30 pm; ChB-9
- Two in-class tests: Feb 7<sup>th</sup> and Mar 9<sup>th</sup> 11:30 am – 12:30 pm
- All assignments, tests and final exam: in-person
- Office hours: by appointment
- Classes begin: January 9th; Reading Week: February 18-26th; Classes end: April 10th

### List of prerequisites: 3371F

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

## 2. Course Description/Contents/Learning Outcomes

### Course description

The structures and bonding in inorganic solids as well as of their physical and chemical properties will be discussed. Links to practically important inorganic materials and solid-state devices will be emphasized. The course also covers synthesis methods and characterization techniques.

### Course contents

- Introduction: why do we study solids?
- Packing and simple crystal structures
- Preparation of solid-state materials
- Characterization
  - powder X-ray diffraction
  - solid-state NMR
  - electron microscopy
- Porous materials (molecular sieves and metal-organic frameworks)
- Bonding in solids and electronic properties
- Defects and non-stoichiometry

- Optical and magnetic properties (time permits)

### Learning outcomes

- Recognize and describe the packing and crystal structures, bonding and electronic properties of inorganic solids.
- Recognize the common synthetic methods of inorganic solids, and describe the characterization methods of these inorganic materials.
- Be able to discuss the relationship between the chemical characteristics and physical properties of various inorganic solids

### 3. Course Materials

This course has no required textbook.

There are lecture handouts.

#### Reading and References List

- *Reactions and Characterization of Solid*, by Sandra E. Dann; Wiley-Interscience, 2002. QD478.D36 2002
- *Solid State Chemistry, An introduction*, by Lesley Smart and Elaine Moore, 4<sup>th</sup> edition - QD478.S53 2012 (e-book)
- Basic solid state chemistry, by West, Anthony R., John Wiley & Sons, 1999 QD478.W47 1999

### 4. Methods of Evaluation

#### Problem sets and tests:

- Four problem sets will be given during the course.
- The problem sets will be discussed at an ensuing tutorial.

#### Evaluation:

- |                                       |                |
|---------------------------------------|----------------|
| • Two in-class tests                  | 50% (25% each) |
| • Handing in four assignments on time | 4% (1% each)   |
| • Final examination                   | 46%            |

**Use of electronic devices:** Only basic scientific calculators are permitted on all tests and exams. All other electronic devices (cell phones, laptops, tablets, cameras, etc.) are prohibited.

**Course attendance:** Course attendance is mandatory for Chem 4481B. Information missed during unexcused absences will not be the grounds for academic appeal.

### 5. Missed Work

If you miss in-class tests and final exam due to illness or other serious circumstances and wish to be excused, you must provide valid medical or supporting documentation to the Academic Counselling

Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_medical.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf)

The Student Medical Certificate is available at

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

**Assignments:** If an assignment is missed, the weighting of the assignment will be transferred to the final examination. Note that you do not need to provide medical documentation or contact the Academic Counselling Office.

**In-class Tests:** If an in-class test is missed for valid reasons, the weighting of the test will be transferred to the final examination.

**Final Exam:** If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam). You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

## 6. Accommodation and Accessibility

### Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The Academic Accommodation for Students with Disabilities policy can be found at: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

### Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

## 7. Academic Policies

**Scholastic offences** are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: [http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

## 8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

[https://www.uwo.ca/health/student\\_support/survivor\\_support/get-help.html](https://www.uwo.ca/health/student_support/survivor_support/get-help.html)

To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto:support@uwo.ca).

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

[http://academicsupport.uwo.ca/accessible\\_education/index.html](http://academicsupport.uwo.ca/accessible_education/index.html)

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>