



- Evaluate the requirements for materials to be used in a specific application and perform selection of materials with required properties
- Select the most appropriate analytical techniques for testing the properties of materials in specific applications.

CHEMISTRY 3364B
PRELIMINARY LECTURE SEQUENCE 2023-2024

- 1. Introduction--Classification of Materials:** Metals and alloys, semiconductors, polymers, molecular solids. (1 Lecture)
- 2. Structure of Materials:** Lattices; Translation vectors and unit Cells; lattice axes, planes and directions. Miller Indices, reciprocal Lattice, vacancies and dislocations, amorphous materials. (7 Lectures)
- 3. Bonding in Materials:** Covalent, Ionic, Metallic, Van-der-Waals; Hydrogen Bonding. Bonding in Molecular Solids. π -Conjugation and π -Stacking. (5 Lectures)
- 4. Metals:** Free electron behavior in metal, Fermi level, reciprocal lattice. (5 Lectures)
- 5. Semiconductors:** Electronic properties, intrinsic, p type and n-type semiconductors, p-n junctions, LED. Solar cells. (8 Lecture)
- 6. Nanomaterials:** Zero-dimensional nanomaterials, one-dimensional nanomaterials-nanorods, nanowires, two- dimensional nanomaterials—graphene etc. (4 Lecture)
- 7. Physical methods for materials chemistry: Diffraction and imaging:** XRD, SEM, TEM, EDX; **X-ray spectroscopy:** XPS, UPS, X-ray absorption spectroscopy (6 Lecture)

Classes begin: January 8, 2024
Winter Reading Week: February 17 – 25, 2024
Classes end: April 8, 2024
Exam period: April 11 – 30, 2024

Contingency plan

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

4. Course Materials

The lectures will be delivered as power point presentations. Lecture notes will be posted on the OWL site under resources prior to the scheduled time of the class, as will be the assignments, and announcements about the course.

https://www.ocul.uwo.ca/default?lang=en&search_scope=OCULDiscoveryNetwork&adaptor=Local%20Search%20Engine&tab=OCULDiscoveryNetwork&query=any,contains,Bradley%20D.%20Fahlman%20Materials%20Chemistry&offset=0

- Bradley D. Fahlman, Materials Chemistry, Springer; 2nd edition 2011, which will be provided also on the OWL site under resources for free.
2. Please install VESTA, software for free, which we will use very often from the first class on Monday, Jan 8.
Please go to <https://jp-minerals.org/vesta/en/download.html>
Please download the version for Windows or MAC OS. Unzip the file and copy the folder as you want on your computer hard drive.
 3. The following textbook may be useful but is not required:
 - Joel I. Gersten and Frederick W. Smith, The Physics and Chemistry of Minerals, Wiley, 1999, ISBN 0-471-97523-1

6. Accommodation and Accessibility

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found

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.

To connect with a case manager or set up an appointment, please contact 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

if you have any questions regarding accommodations.