

COURSE OUTLINES (SYLLABI) FOR UNDERGRADUATE COURSES**Chemistry 3364b Course Outline****1. Course Information****Course Information**

Physical Chemistry of Materials, Chem 3364b provides an introduction to the structure, bonding, and functionalities of materials, and synthesis and characterization techniques as well as applications.

List of Prerequisites

Chemistry 2214A/B or 2384B (formerly 2284B), or the former Chemistry 254, or the former Chemistry 224a and 234b.

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. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Dr. Zhifeng Ding	zfding@uwo.ca	MSA0203	519-6612111 x86161	By appointment (via Zoom)
TA	TBA	TBA		3 hrs/week

Students must use their Western (@uwo.ca) email addresses when contacting their instructor and TA.

Office hour: Zoom meeting preferred; in-person is an option.

3. Course Syllabus, Schedule, Delivery Mode

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)

Schedule: It is to be offered in the winter term, three lectures a week, Monday, Wednesday, and Friday; 12:30 pm at NSC (**Natural Science Centre**) 7; no laboratory, office hour to be announced in OWL.

Learning Outcomes: At the end of the course, the student will be able to

- Understand the structure, bonding, and their relationship to the properties of the materials and the jargons used in different fields of materials sciences
- Understand how materials are made and their functionality in a device
- 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.

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.

1. The following Textbook will be downloaded using your Western student ID at https://ocul-uwo.primo.exlibrisgroup.com/discovery/fulldisplay?docid=alma991044346009505163&context=L&vid=01OCUL_UWO:UWO_DEFAULT&lang=en&search_scope=OCULDiscoveryNetwork&adapter=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 on the OWL site under resources for free.

2. The following textbook may be useful but is not required:

- Joel I. Gersten and Frederick W. Smith, The Physics and Chemistry of Materials, Wiley-Interscience; 1st edition (June 25, 2001).

Students are responsible for checking the course OWL site (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

All course materials will be posted on OWL: <http://owl.uwo.ca>.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements

Should the lecture delivery be switched to online, stable internet connection, computer with working microphone and/or webcam, Microsoft Office software etc. will be required.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Assignments (4)	40 %
In-class-iclicker	5%
Midterm Test	22 %
Final Exam	33 %

There will be two assignments before the midterm and two assignments after the midterm.

Mid term is tentatively set for Friday, March 3, 2023, 6:30-8:30 pm (venue to be announced); mid term makeup will be on Friday, March 10, 2023, 6:30-8:30 pm (venue to be announced)

Final exam is set by the registrar.

“Clickers” participation will be counted 5% as above and project presentation will then be 25%. Your overall course grade, out of 100, will automatically be the higher of the two grades calculated by the two methods shown above.

	Marked on participation only. The score you receive will be based on the percentage of questions answered:
“Clickers”	80% or more = 5; 70–79% = 4; 60–69% = 3; 50–59% = 2; 40–49% = 1 Less than 40% = 0
	There is NO makeup for iClicker questions

Conditions required to pass the course: The assignments and midterm exam are essential components of the course. You must submit at least 2 of the 4 assignments, and write the midterm test and final exam. Students must pass the final examination (50%) to pass the course. Students who fail to meet any of these requirements without academic accommodation for the missed work will receive a course grade of not greater than 40%, even if the calculated grade is higher. A student who is unable to submit the required minimum number of assignments for medical or compassionate reasons, and who wishes to complete the missed work, will need to apply for Incomplete Standing (a grade of INC) by submitting a written request to the Dean of the Faculty of Registration. If Incomplete Standing is granted, the student will be able to complete the missed items the next time the course is offered. A student who is unable to write the midterm must apply for permission to write a makeup that will be one week after the midterm. A student who is unable to write the Final Exam must apply for permission to write a Special Final Examination (SPC Exam).

6. Policies

Student absences and missed work. Students who are unable to meet their academic responsibilities due to medical or compassionate reasons may submit a request for academic consideration. For each missed piece of work **worth 10% or more** of the total course grade, you must apply for such consideration by providing valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration. For each missed or late assignment (a piece of work **worth less than 10%** of the total course grade), you do not need to provide medical documentation or contact the Academic Counselling Office, but you must send a written explanation of your absence to the instructor to be excused. Note that *all* accommodations for missed work, regardless of who grants them, are subject to the *Conditions required to pass the course*.

Accommodation for students with disabilities. Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. In cases where a student misses a piece of work for reasons related to the disability on file with Accessible Education, the student should request accommodation by contacting Accessible Education instead of the Academic Counselling Office.

Missed assignments. There are no make-up assignments. If you miss an assignment and are granted

accommodation, the weight of the missed assignment will be transferred to the other assignments.

Missed midterm test. If you miss a midterm test and are granted accommodation, a make-up test will be offered. If you miss the make-up midterm test and are excused as well, the weight of the midterm will be transferred to the Final Exam.

Missed Final Exam: If you miss the Final Exam, contact the Academic Counselling office of your Faculty of Registration as soon as possible. They will assess your eligibility to write the Special Examination. 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).

Late assignments. All assignments must be submitted by the due date. Late submissions will be accepted for 24 hours after the due date without penalty, but will be rejected afterwards. Students who miss the automatically extended deadline and ask the instructor for accommodation will be excused. Students with applicable accommodations recommended by Accessible Education can request a longer one-time deadline extension. To preserve the integrity of evaluation, this extension cannot exceed 7 days after the regular due date because graded assignments will normally be returned by that time. Students with disability accommodations who ask for a longer extension will be excused instead, subject to the *Conditions required to pass the course*.

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.

Scholastic offences. The University will take all appropriate measures to promote academic integrity and deal appropriately with scholastic offences. For definitions of what constitutes a scholastic offence, see http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Support Services. Detailed information on academic considerations for absences, religious accommodation, exam conflicts, appeals, and other academic matters may be found on the Science & Basic Medical Sciences Academic Counselling webpage: <https://www.uwo.ca/sci/counselling>. Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health>) for help.