

University of Calgary
Department of Chemistry
Course Syllabus
Winter 2020

Course: CHEM 379 - Materials Chemistry for Engineers

CONTACT INFORMATION

LEC	DAY & TIME	ROOM	INSTRUCTOR	OFFICE	EMAIL	OFFICE HOURS
L01	MWF 11:00 - 11:50	ENG 60	Dr. Amanda Musgrove	SA 144F	amanda.musgrove@ucalgary.ca	TBA (see D2L)

Drop-in office hours will be posted on D2L; appointments may also be requested by email or online via <https://amandamusgrove.youcanbook.me>

You can also ask and answer questions on the class Piazza site:

<https://piazza.com/ucalgary.ca/winter2020/chem379>

To get a correct response, please put “CHEM 379” in the subject line of any email correspondence.

COURSE CALENDAR DESCRIPTION

An introduction to materials chemistry with industrial applications. Theories of chemical bonding and the relationship between chemical structure and observable properties. Chemical and physical properties of mixtures and interfaces. Structure and applications of polymers and soft materials.

TEXTBOOK AND COURSE MATERIALS

There is **no official textbook** for this course. References / bibliography will be provided within each note set for further reading.

You may find some or all of the following resources helpful in your study:

Chemistry: The Molecular Nature of Matter and Change, 2nd Canadian Ed.; Silberberg M, Amateis P, Lavieri S, Venkateswaran R, 2016, McGraw-Hill Ryerson (*this is the CHEM 209 textbook*)

CHEM 209 OER online textbook resource (linked on our course D2L)

Organic Chemistry online textbook (for nomenclature, structures):

<http://www.chem.ucalgary.ca/courses/351/Carey5th/Carey.html>

TUTORIALS

Tutorials will run weekly in EEEL 445. Tutorials include a mix of review/application of lecture topics, and introduction of some new methods. **All topics introduced or reviewed in tutorial are “testable material”** - whether or not they were directly addressed in lectures.

There will generally be a graded activity each week:

- Review activities: graded based on participation
- Group activities: completed collaboratively and graded based on correctness
- Individual quizzes: done individually and graded based on correctness

A schedule of tutorial activities will be posted to the course D2L site. Generally, tutorial activities will explore topics introduced in lecture over the past week. **Most activities are “closed-book”**. Check your activity sheet or ask your instructor if you are unsure what resources are allowed for an activity.

COURSE TOPICS

The following topics will be discussed in lectures and/or tutorials, time permitting:

- Nomenclature of organic and inorganic molecules
- Atomic structure and theories of bonding
- Intermolecular forces and their effects on properties of substances
- Crystallinity, molecular crystals, and liquid crystals
- Electronic structure of atoms and molecules
- Molecular sources of color and conductivity
- Structure and Function of Polymers:
 - Polymerization reactions
 - Types of polymers
 - Influence of molecular structure on T_m , T_g , and brittleness/Young's modulus
 - Elastomers and rubbers
 - Colored and conductive polymers
 - LEDs and semiconducting polymers
 - Environmental considerations
- Nano-scale materials
- Bio-mimicry
- Techniques for visualization and testing of materials

CHEM 379 focuses on “soft” materials - metals and ceramics are covered extensively in ENME 421.

TOP HAT

The **in-class Top Hat** practice questions will be graded based on a combination of participation and correctness. If you choose to participate, your average Top Hat score for the semester can *replace your lowest non-zero tutorial activity score*, if doing so benefits your grade.

This will be done automatically for all students who have participated in Top Hat - make sure your UCID and @ucalgary.ca email are updated in your Top Hat account profile so your grades can be linked.

*All Top Hat grades will be pro-rated to allow for ~1 week “free/excused” - if you are ill, unable to attend, or have a tech failure for a couple days, these be covered in the “free” days and balanced out at the end of term. **No need to give notification for a day or two of TopHat missed during term.** If you are unable to participate for longer, contact your instructor to make alternate arrangements.*

Department Approval _____ Electronically Approved _____ Date _____ January 6, 2020 _____

LECTURE & TUTORIAL SCHEDULE

Week Starting:	Tentative Schedule for Lecture Topics	Tutorial Topic (Tentative - See D2L for details & updates)
January 13	Introduction Bonding & Shapes	<i>No tutorials</i>
January 20	Bonding & Shapes Intermolecular Forces	Nomenclature & Functional Groups
January 27	Intermolecular Forces	Nomenclature & Functional Groups
February 3	Molecular Solids	Intermolecular Forces
February 10	Molecular Solids	Liquid Crystalline Materials
February 17	Winter Break: No classes or tutorials.	
February 24	Polymers & Polymerization	Polymer Structure & Function <i>*Deadline to choose project group: Feb 28</i>
March 2	Physical properties of Polymers	Polymer Structure & Function
March 9	Advanced Molecular Bonding Midterm: Mon Mar 9, in class	Infographic Development <i>*Deadline to choose project topic: Mar 13</i>
March 16	Electronic & Colour Properties	Designing a Material I
March 23	Polymer Recycling & Decomposition	Designing a Material II
March 30	Biomimicry & Nanomaterials	Presentations
April 6 *	Biomimicry & Nanomaterials	Presentations
April 13*	Final Topics / Review	<i>No tutorials</i>
Last day of classes: April 15. Final exam period: April 18 - 29.		

* April 6: Good Friday holiday: University closed. April 13: Easter Monday holiday: No classes.