



## COURSE OUTLINE

### 1. **Course:** BCEM 551, Structural Biology - Fall 2021

#### **Coordinator(s)**

<b>Name</b>	<b>Email</b>	<b>Phone</b>	<b>Office</b>	<b>Hours</b>
Dr. Marie Fraser	frasm@ucalgary.ca	403 220-6145	BI 413	Meetings by Zoom

#### **Section(s)**

Lecture 01: MWF 13:00 - 13:50 in SA 107

<b>Instructor</b>	<b>Email</b>	<b>Phone</b>	<b>Office</b>	<b>Hours</b>
Dr. Marie Fraser	frasm@ucalgary.ca	403 220-6145	BI 413	Meetings by Zoom
Dr Ian Lewis	ian.lewis2@ucalgary.ca	403 220-4366	BI 472	Tuesday and Wednesday 4:00-5:00 PM

#### **In Person Delivery Details:**

*Please see the tentative course schedule. Dr. Fraser's classes will be in person, either in the assigned classroom or in the computer room BI 190. Dr. Lewis will be pre-recording lectures for students to view in advance (will be available on D2L), and in-person class time will be used for discussions.*

#### **Re-Entry Protocol for Labs and Classrooms:**

To limit the spread of COVID-19 on campus, the University of Calgary has implemented safety measures to ensure the campus is a safe and welcoming space for students, faculty and staff. The most current safety information for campus can be found [here](#).

#### **Course Site:**

D2L: BCEM 551 L01-(Fall 2021)-Structural Biology

**Note:** Students must use their U of C account for all course correspondence.

### 2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

#### **Prerequisite(s):**

Biochemistry 341 or 393; and Biochemistry 471 or Chemistry 371.

### 3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

Component	Weight	Date
Two midterm tests	40%	Oct. 15 and Nov. 17
Dr. Fraser's assignments (6 - 2.5% each)	15%	Sept 20, Sept 22, Oct 1, Oct 8, Oct 20, Nov 3
Poster presentation	15%	Nov 1 - Nov 15
Dr. Lewis's assignment (1)	5%	Dec 8
Final exam	25%	Scheduled by the Registrar's Office

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	92 %	86 %	82 %	78%	74%	70 %	66 %	62%	58%	54 %	50 %

This course will have a final exam that will be scheduled by the Registrar. [The Final Examination Schedule](#) will be published by the Registrar's Office approximately one month after the start of the term. The final exam for this course will be designed to be completed within 2 hours.

The University of Calgary offers a [flexible grade option](#), Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: <https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade>

#### 4. **Missed Components Of Term Work:**

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, one possible arrangement is that the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

#### 5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

#### 6. **Course Materials:**

Required Textbook(s):

Gale Rhodes, *Crystallography Made Crystal Clear : A Guide for Users of Macromolecular Models* Elsevier Science & Technology.

The textbook is available from the library:

<https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?pq-origsite=primo&docID=269943>

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

#### 7. **Examination Policy:**

*Non-programmable calculators, rulers, protractors, and compasses are allowed on tests or examinations.*

Students should also read the Calendar, [Section G](#), on Examinations.

#### 8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

## 9. Writing Across The Curriculum Statement:

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

## 10. Human & Living Organism Studies Statements:

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

**STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS.** Students taking laboratory and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with [Section SC.4.1](#) of the University Calendar.

## 11. Reappraisal Of Grades:

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

## 12. Other Important Information For Students:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Services:** For more information, see [www.ucalgary.ca/wellnesscentre](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email ([svsa@ucalgary.ca](mailto:svsa@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Sexual-and-Gender-Based-Violence-Policy.pdf>)
- d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional [Code of Conduct](#) and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without

the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

[Student Handbook on Academic Integrity](#)  
 Student Academic Misconduct [Policy](#) and [Procedure](#)  
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

**e. Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the [Request for Academic Accommodation Form](#) and sending it to Lisa Gieg by email [mgieg@ucalgary.ca](mailto:mgieg@ucalgary.ca) preferably 10 business days before the due date of an assessment or scheduled absence.

**f. Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.

**g. Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca).

**h. Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

**i. Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

2021 TENTATIVE SCHEDULE

Sept. 8	Introduction to Structural Biology	MEF1
10	Overview of protein crystallography	MEF2
13	Protein crystals (1st assignment due Sept. 20)	MEF3
15	Geometric principles of diffraction (to slide 16) (2nd assignment due Sept. 22)	MEF4
17	Geometric principles of diffraction (exercise with orthogonal and hexagonal nets)	MEF
20	Geometric principles of diffraction (Ewald sphere, symmetry)	MEF5
22	Symmetry exercise	MEF
24	Collecting X-ray diffraction data (3rd assignment due Oct. 1)	MEF6

27	Mathematics. Diffraction data to electron density	MEF7
29	Mathematics. Diffraction data to electron density	MEF8
Oct. 1	Obtaining phases: Introduction and isomorphous replacement (4th assignment due Oct. 8)	MEF9
4	Obtaining phases: Anomalous scattering	MEF10
6	Obtaining phases: Molecular replacement	MEF11
8	Table 1: How crystallographers describe their data	MEF12
11	Thanksgiving - No lecture	
13	Table 1: How crystallographers describe their data (5th assignment due Oct. 20)	MEF
15	Midterm 1	MEF
18	Electron density maps: Obtaining the molecular model	MEF13
20	Fitting a model in the electron density map	MEF
22	PDB files and model validation	MEF14
25	Table 2: How crystallographers describe their models	MEF15
27	Table 2: How crystallographers describe their models (6th assignment due Nov. 3)	MEF
29	Presenting a poster	MEF16
Nov. 1	Posters	MEF
3	Poster session 1	MEF
5	Poster session 2	MEF
Nov. 7-13	Term Break	
15	Poster session 3	MEF
17	Midterm 2	MEF
19	Introduction to NMR	IL
22	NMR nuclei, chemical shifts and relaxation	IL
24	NMR of amino acids, peptides & proteins 1	IL
26	NMR of amino acids, peptides & proteins 2	IL
Nov. 29	NMR of amino acids, peptides & proteins 3	IL
Dec. 1	NMR of ligand binding	IL
3	Introduction to mass spectrometry	IL
Dec. 6	Structural MS 1	IL
8	Structural MS 2	IL

### Final Exam Scheduled by the Registrar's Office

#### Course Outcomes:

- Describe how NMR techniques are used to determine protein structures and study protein dynamics
- Recognize the safety issues involved in NMR experiments
- Explain how crystallography is used to determine structures of macromolecules
- Compare the roles of crystallography and NMR techniques in studying ligand and drug binding
- Master vocabulary, concepts, and skills required to pursue in-depth study in structural biology methods
- Critically analyze a structural biology paper taken from the recent peer-reviewed literature based on the technique of NMR or crystallography

Electronically Approved - Sep 07 2021 17:08

---

#### Department Approval

Electronically Approved - Sep 14 2021 12:17

---

**Associate Dean's Approval**