UNIVERSITY OF CALGARY
DEPARTMENT OF BIOLOGICAL SCIENCES
COURSE OUTLINE

1. Course: BCEM 551 – Structural Biology

Lecture Sections:	**L01:**	MWF	10:00	SA235	Winter 2018

Course Coordinator : Dr. H.J. Vogel

Instructors:	**Dr. H.J. Vogel**	**BI 423**	**403-220-6006**	**vogel@ucalgary.ca**
	Dr. M.E. Fraser	**BI 413**	**403-220-6145**	**frasm@ucalgary.ca**

D2L course name: BCEM 551 L01 – (Winter 2018) - Structural Biology

Biological Sciences Department BI 186; 403-220-3140; biosci@ucalgary.ca

2. **PREREQUISITES:** One of Biochemistry 341 or 393, and one of Biochemistry 471 or Chemistry 371.
See section 3.5.C in the Faculty of Science section of the online Calendar
(http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html)

3. **GRADING**: The University policy on grading and related matters is described in "Academic Regulations, sections F.1 and F.2" of the online University Calendar (**http://www.ucalgary.ca/pubs/calendar/current/f-1.html** and **http://www.ucalgary.ca/pubs/calendar/current/f-2.html**) In determining the overall grade in the course the following weights will be used:

Midterm Exam (Monday, March 05, 2018)	**40%**
Assignments from Dr. Vogel	**10%**
Assignments from Dr. Fraser	**10%**
Final Exam (scheduled by the Registrar's office)	**40%**

There will be a three-hour final exam scheduled by the Registrar's office.

Letter Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Min. Percent Required	92	86	81	77	74	70	66	62	58	54	50

Each piece of work (assignments, midterm exam or final examination) submitted by the student will be assigned a percentage score. The student's average percentage score for the various components 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.

4. **Missed Components of Term Work**. The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: **http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html**. It is the student's responsibility to familiarize himself/herself with these regulations. See also **http://www.ucalgary.ca/pubs/calendar/current/e-3.html**.

5. Dates and times of class exercises held outside of class hours

Midterm Exam	Monday, March 5, 2018	6:00-9:00 pm	TBA

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **EXAMINATION POLICY**: No electronic or written aids (eg. cell phones, tablets, computers, PDAs, notes, textbooks) will be allowed during writing of any exams. Non-programmable calculators will be permitted to answer quantitative questions on exams, if applicable, and permission to do this will be clearly indicated on the examination paper. Students should also read the Calendar, Section G, on Examinations: **http://www.ucalgary.ca/pubs/calendar/current/g.html**.

7. In this course, the quality of the student's writing will be a factor in the evaluation of the student's work. See also **http://www.ucalgary.ca/pubs/calendar/current/e-2.html**.

8. Course Material: TEXT: Recommended: NMR in Biological Systems, Chary, K.V.R. and Govil, G., Springer (available from Dr. Vogel)
Required: Crystallography Made Crystal Clear, Rhodes, Gale. Academic Press. 3rd Edition (Paperback).

9. ETHICS IN THE BIOLOGICAL SCIENCES

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.

10. OTHER IMPORTANT INFORMATION FOR STUDENTS:

(a) ACADEMIC MISCONDUCT (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under K. Student Misconduct (http://www.ucalgary.ca/pubs/calendar/current/k.html) to inform yourself of definitions, processes and penalties

(b) ASSEMBLY POINTS in case of emergency during class time. Be sure to FAMILIARIZE YOURSELF with the information at http://www.ucalgary.ca/emergencyplan/assemblypoints.

(c) Student Accommodations: Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.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, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email addy@ucalgary.ca or phone 403 220-3140.

(d) SAFEWALK: Campus Security will escort individuals day or night http://www.ucalgary.ca/security/safewalk). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) FREEDOM OF INFORMATION AND PRIVACY: This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, 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 also http://www.ucalgary.ca/secretariat/privacy.

(f) Student Union Information: VP Academic Phone: 403 220-3911 Email: suvpaca@ucalgary.ca
SU Faculty Rep. Phone: 403 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca;
Student Ombuds Office: 403 220-6420 Email: ombuds@ucalgary.ca; http://ucalgary.ca/provost/students/ombuds

(g) INTERNET and ELECTRONIC COMMUNICATION DEVICE Information. You can assume that in all classes that you attend, your cell phone should be turned off. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

(h) Calculators can be used during examinations.

(i) At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI Surveys.

Department Approval: **ORIGINAL SIGNED** **Date:** _____

Associate Dean's Approval for out of regular class-time activity: **ORIGINAL SIGNED** **Date:** _____

2018 TENTATIVE LECTURE SCHEDULE

Jan 08	Introduction to Spectroscopy	HJV
10	Introduction to NMR	HJV
12	NMR nuclei	HJV
15	NMR: magnets and imaging	HJV
17	NMR chemical shifts	HJV
19	NMR: relaxation I	HJV
22	NMR: relaxation II	HJV
24	NMR of amino acids, peptides & proteins	HJV
26	NMR of amino acids, peptides & proteins	HJV
29	NMR of amino acids, peptides & proteins	HJV
31	NMR of amino acids, peptides & proteins	HJV
Feb 02	NMR structure calculations	HJV
05	NMR of carbohydrates	HJV
07	Larger NMR structures	HJV
09	NMR of ligand binding	HJV
12	NMR of ligand binding	HJV
14	NMR of drug design	HJV
16	NMR Structural Aspects Review	HJV
19	**Family Day – No Lectures**	
18-25	**Reading Week – No Lectures**	
26	Metabolomics with NMR	HJV
28	Metabolomics with NMR	HJV
Mar 02	NMR of living systems	HJV
05	Overview of protein crystallography	MEF
07	Overview of protein crystallography	MEF
09	Protein crystals	MEF
12	Geometric principles of diffraction	MEF
14	Geometric principles of diffraction	MEF
16	Symmetry Exercise	MEF
19	Collecting X-ray diffraction data	MEF
21	Collecting X-ray diffraction data	MEF
23	Mathematics. Diffraction data to electron density	MEF
26	Obtaining phases: Introduction and isomorphous replacement	MEF
28	Obtaining phases: Anomalous scattering	MEF
30	**Good Friday *** No Lectures *** **	
Apr 02	Obtaining phases: Molecular replacement	MEF
04	Table 1: How crystallographers describe their data	MEF
06	Electron density maps: Obtaining the molecular model. Refinement	MEF
09	PDB files and model validation	MEF
11	Table 2: How crystallographers describe their models	MEF
13	Review of protein crystallography Last day of classes	MEF

Final Exam Scheduled by the Registrar

Learning Outcomes

- Describe how NMR techniques are used to determine protein structures and study protein dynamics
- Outline the use of NMR as a tool for imaging and metabolomics applications
- 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