

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Winter 2017	
<b>Course Name</b>	Biochemistry	
<b>Course Code</b>	BIOTECH 2BC3	
<b>Date(s) and Time(s) of lectures</b>	Tu 12:30PM - 1:20PM Fr 1:30PM - 2:30PM	
<b>Program Name</b>	Biotechnology	
<b>Calendar Description</b>	Biochemistry and biotechnology; amino acids, proteins, peptides, enzymes, carbohydrates, lipids, membranes and their functions and metabolism.	
<b>Instructor(s)</b>	Dr. Fei Geng	Phone: (905) 525-9140 x20285 E-Mail: gengf@mcmaster.ca Office Hours: ETB 203 Th 11:30 AM-12:20 PM Fr 12:30 PM-1:20 PM

### 2. COURSE SPECIFICS

<b>Course Description</b>	In this course, students will learn the biochemistry of biologically important macromolecules including carbohydrates, lipids, nucleic acids and especially proteins; and receive an introduction to metabolic pathways.		
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	34
	L	Laboratory, workshop or fieldwork	15
	T	Tutorial	
	DE	Distance education	
	<b>Total Hours</b>		49
<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	0-13-145306-8	Principles of Biochemistry, 4th edition, c2006	Authors: Horton, Moran, Scrimgeour, Perry, Rawn Publisher: Pearson Prentice Hall
	<b>Other Supplies</b>	<b>Source</b>	
	Lab goggles	Titles bookstore	
	Lab coat	Titles bookstore	
	Lab notebook	Discussed during the first lab	
<b>Prerequisite(s)</b>	BIOTECH 2OC3		
<b>Corequisite(s)</b>	N/A		
<b>Antirequisite(s)</b>	N/A		
<b>Course Specific Policies</b>	<p><b>Electronic Resources</b> This course will be using a range of software. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor. The instructor may also use other software including: e-mail, Avenue, LearnLink,</p>		

web pages, capa, Moodle, Thinking Cap, etc.

### **Assignments**

All assignments must be submitted to the instructor, online or in person depending on the assignment and as outlined in the assignment instructions, on the stated deadline dates at the stated deadline times. Late assignments submitted within 1 hour of the deadline will receive a deduction of 10% but assignments submitted after that will not be accepted and will receive a mark of 0. Note that this is the default situation. In some cases, an assignment may be designated by the instructor as a major assignment. Only in these cases, late assignments submitted within 1, 24, 48, or 72 hours of the deadline (including weekends) will receive deductions of 5%, 20%, 35% or 50% respectively but assignments handed in more than 72 hours late will not be accepted and will receive a mark of 0.

### **Attendance**

Attendance at lectures is mandatory and students will be expected to sign in for each lecture. Students may miss four lectures during the term without penalty and without the need for a McMaster Student Absence Form (MSAF) after which they will receive a deduction of 2%, 8%, 20% and 20% from the course mark for each subsequent lecture that is missed without adequate justification (i.e. an MSAF for the first absence and documentation provided from the Associate Dean's office for subsequent absences).

### **Lab**

A three-hour lab will be performed every week in the Engineering Technology Building, room B121. Students are expected to attend all labs and to submit lab reports one week after the lab is completed. Failure to attend labs and/or submit a lab evaluation without a suitable explanation will result in a grade of zero. Late submissions of lab assignments and reports without a suitable explanation will incur a penalty of 20% per school day. Students must provide their own lab coat and lab notebook as instructed.

### **Tests**

There will be two tests administered in the lecture period during the term. The majority of each test will be based on course material either from the beginning of the term (for test 1) or from after the previous test (for test 2) up until the current test, but may also be partly based on earlier material. The content of the tests will be based on all course material, including lectures, assignments, online postings, readings, labs, etc.

All tests must be written at the times announced, unless alternative arrangements have been made previously between the student and the professor to cover exceptional circumstances. Students with special needs must inform the professor through Student Accessibility Services (SAS) of their requirements five days prior to the test date so that alternative arrangements can be made.

If you miss a test because of an emergency, you must follow university policy with respect to reporting absences on the online McMaster Student Absence Form (see below). In the event of an allowable absence, it is the student's responsibility to make arrangements with the instructor with respect to scheduling a make-up test or redistributing the weighting of evaluations over the term.

All make-up tests are to be written at a pre-arranged date, time and place. Test questions and the method of grading may be changed, but the weight

	<p>of the test will be identical to the original test.</p> <p><b>Quizzes</b> Unannounced quizzes will be given periodically throughout the term during the lecture period on all recently covered course material, including lectures, assignments, online postings, readings, labs, etc. The lowest single quiz mark will be dropped from the final marks. No make-up quizzes will be allowed. Unexcused absences will result in a mark of zero for that quiz. Quizzes may involve written evaluations but may also take other formats.</p> <p><b>Final Exam</b> The final exam will be cumulative and will cover all course material, including the lectures, reading, assignments, material posted online, laboratory theory and student presentations. The exam will be two hours and a half in length. Students must pass the final exam to pass the course. Students must pass both components of the course – labs and lectures to pass the course.</p>	
<b>Departmental Policies</b>	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>	
<b>3. SUB TOPIC(S)</b>		
Week 1	Introduction to Biochemistry This chapter summarizes the key concepts in Biochemistry.	Chapter 1
Week 2	Buffers and Isoelectric Point This chapter covers the ionization of acids/bases and buffer system.	Chapter 2
Week 3	Amino Acids This part of the chapter covers the ionization of 20 amino acids as well as proteins.	Chapter 3
Week 4	Protein Primary Structure This part of the chapter covers the structural information and the properties of 20 amino acids as well as proteins.	Chapter 4
Week 5	Proteins: Three-Dimensional Structure This part of the chapter covers the secondary structure, tertiary structure and quaternary structure of proteins.	Chapter 4
Week 6	Proteins: Function This part of the chapter covers the function and regulations of proteins.	Chapter 5
Mid-term Recess: Monday, February 20 to Sunday, February 26, 2017		

Week 7	Properties of Enzymes This part of the chapter covers the properties of all categories of enzymes.	Chapter 5
Week 8	Properties of Enzymes (cont'd) This part of the chapter covers the enzymatic kinetics and regulations.	Chapter 5
Week 9	Structure and Biological Significance of Carbohydrates This chapter covers the biochemical basis (structure and function) of carbohydrates.	Chapter 8
Week 10	Structure and Function of Lipids and Membranes This chapter covers the biochemical basis (structure and function) of lipids and membranes.	Chapter 9
Week 11-12	Introduction to Metabolism This chapter covers the basics of metabolism including the key concepts, the regulation and Metabolic Pathways.	Chapter 10
Week 13	Review	

Classes end: Thursday, April 6, 2017

Final examination period: Tuesday, April 11 to Thursday, April 27, 2017

All examinations MUST be written during the scheduled examination period.

#### List of experiments

Lab 1	The Measurement of Isoelectric Point for Amino Acids
Lab 2	The extraction of lipids from biological membranes
Lab 3	Using Ion Exchange Chromatography to Separate Proteins
Mid-term Recess: Monday, February 20 to Sunday, February 26, 2017	
Lab 4	Factors Affecting Enzyme Function
Lab 5	Carbohydrate Analysis using Biochemical Detection
Lab 6	Lab Test

Note that this structure represents a plan and is subject to adjustment term by term.

The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

4. ASSESSMENT OF LEARNING	Weight
Participation	5%
Quizzes and Case studies	5%
Labs	25%
Presentation (oral presentation for 4%, a written report to be submitted after the presentation for 1%)	5%
Term Test 1	15%
Term Test 2	15%
Final Examination	30%
<b>TOTAL</b>	<b>100%</b>

Percentage grades will be converted to letter grades and grade points per the University calendar.

#### 5. LEARNING OUTCOMES

- Describe the underlying principles of chemistry underlying biochemistry, including:
  - Bonding pH
  - Hydrophobicity / hydrophilicity
- Recognize and draw general formulas and specific variations of, and explain the important

characteristics of, the following major classes of biological macromolecules:

- Proteins
- Carbohydrates
- Lipids
- Nucleic acids

3. Classify, recognize, and explain the different levels of hierarchy of protein structure:

- Primary sequence / structure
- Secondary structure
- Tertiary structure
- Quaternary structure

4. Manipulate and present three-dimensional graphical representations of molecules. Diagram and explain the chemical logic of some key metabolic pathways.

5. Perform several important laboratory techniques relevant to biochemical analysis of amino acids, proteins, carbohydrates and enzymes. Conduct the extraction of lipids from biological membranes and perform the quantitative analysis.

## 6. POLICIES

### Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

[http://www.mcmaster.ca/policy/General/HR/Discrimination\\_Harassment\\_Sexual\\_Harassment-Prevention&Response.pdf](http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf)

### Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

### Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is an on-line self-reporting tool for **Undergraduate Students** to report absences for:

- 1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
  - Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF.
  - MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent.

- 2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has not been used previously in that term:

Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

### **E-Learning Policy**

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

### **Communications**

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

### **Turnitin (Optional)**

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/turnitin/students/>

### **Protection of Privacy Act (FIPPA)**

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

### **Academic Accommodation of Students with Disabilities Policy**

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation->

[StudentsWithDisabilities.pdf](#)

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

### **Student Code of Conduct**

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

[http://studentconduct.mcmaster.ca/student\\_code\\_of\\_conduct.html](http://studentconduct.mcmaster.ca/student_code_of_conduct.html)