ENGINEERING
McMaster-Mohawk
Bachelor of Technology
Partnership

McMaster University

Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2022	
Course Name	Biochemistry	
Course Code	BIOTECH 2BC3	
Date(s) and Time(s) of lectures	Wednesday 10:30 - 11:20 AM Friday 9:30 - 11:20 AM	
Program Name	Biotechnology	
Calendar Description	Biochemistry and biotechnology; amino acids, proteins, peptides, enzymes, carbohydrates, lipids, membranes and their functions and metabolism.	
Instructor(s)	Dr. Fei Geng Dr. Fawwaz Al Joudi	Phone: (905) 525-9140 x20285 E-Mail: gengf@mcmaster.ca Office Hours: MS Teams Tuesday 11:30 AM-12:20 PM Thursday 1:30 PM-2:20 PM

2. COURSE SPECIFICS

Course Description	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.		
Instruction Type	**Code**	**Type**	**Hours per term**
	C	Classroom instruction	34
	L	Laboratory, workshop or fieldwork	15
	T	Tutorial	
	DE	Distance education	
		Total Hours	49
Resources	**ISBN**	**Textbook Title & Edition**	**Author & Publisher**
	0-13-145306-8	Principles of Biochemistry, 4th edition, c2006	Authors: Horton, Moran, Scrimgeour, Perry, Rawn Publisher: Pearson Prentice Hall
	Other Supplies	**Source**	
	Lab goggles	Titles bookstore	
	Lab coat	Titles bookstore	
	Lab notebook	Discussed during the first lab	
Prerequisite(s)	BIOTECH 2OC3		
Corequisite(s)	N/A		
Antirequisite(s)	N/A		
Course Specific Policies	**Electronic Resources** 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, 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 of the test will be identical to the original test. **Quizzes** 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. **Final Exam** 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.
Departmental Policies	Students must maintain a GPA of 3.5/12 to continue in the program. 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. Where group work is indicated in the course outline, such collaborative work is mandatory. 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. 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. Instructor has the right to submit work to software to identify plagiarism.
3. SUB TOPIC(S)	

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	Chapter 2

	buffer system.	
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
Midterm Recess: Monday, February 21 to Sunday, February 27		
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: Tuesday, April 12th 2022 Final Examination Period: Thursday, April 14 to Friday, April 29 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	
Midterm Recess: Monday, February 21 to Sunday, February 27		
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 *including dates*	Weight
Quizzes	8%
Case studies	2%
Labs	25%
Presentation	5%
Term Test 1	15%
Term Test 2	15%
Final Examination (tests cumulative knowledge)	30%
TOTAL	**100%**

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

5. LEARNING OUTCOMES

1. Describe the underlying principles of chemistry underlying biochemistry, including:
   - Bonding pH
   - Hydrophobicity / hydrophilicity
2. 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. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

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

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process.

Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

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. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, 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 a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

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.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.
http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

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The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.