

Course Outline

1. COURSE INFORMATION

Session Offered	Winter 2024	
Course Name	Biotechnology Concepts	
Course Code	BIOTECH 2B03	
Date(s) and Time(s) of lectures	Tuesday 12:30-1:20 Wednesday 12:30-2:20	
Program Name	Biotechnology	
Calendar Description	Basic elements of biotechnology. Proteins, enzymes, nucleic acids, DNA manipulation, cloning and recombinant technology, with applications in genetics, medicine and industry. Three lectures, one lab (three hours); one term	
Instructor(s)	Dr. Faiez Alani Dr. Asif Mohammad (Lab Instructor)	E -Mail: alanif@mcmaster.ca Office Hours & Location: Monday: 1:30-2:30 pm, or by appointment, ETB 205. Email: amohamm@mcmaster.ca Office Hours & Location: Tuesday 1:30-2:30 pm or by appointment, ETB 311

2. COURSE SPECIFICS

Course Description	Types of Biotechnology, Gene, genome and protein synthesis. Mutation, causes, types and mutation mechanisms, human genetic diseases. Recombinant DNA technology and DNA manipulation and genetic engineering. Types of vectors and cloning techniques, identification and cloning of genes. Protein as biotechnology products, production, purification and scale-up. Microbial biotechnology, microbial enzymes, bacterial transformation and cloning, industrial applications. Plant biotechnology, animal biotechnology, cloning in animal and plant systems, protoplast fusion and Applications. Aquatic biotechnology, medical, nonmedical and environmental applications.		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	39
	L	Laboratory, workshop or fieldwork	36
	T	Tutorial	0
	DE	Distance education	0
	Total Hours		75
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN: 780321766113	Introduction to Biotechnology, Third or Fourth edition	William, J. Thieman and Michael A. Palladino. PEARSON
	Other Supplies	Source	
	Lectures	http://avenue.mcmaster.ca	
Prerequisite(s)	BIOTECH 2CB3, 2M03		
Corequisite(s)	n/a		

Antirequisite(s)	n/a	
Course Specific Policies	<p>The attendance of lectures is strongly encouraged and there are many quizzes and discussions in lectures. Students should attend all laboratory sessions and submit lab report. Absence from lab with no well documented excuse or failure to submit the report in time result with F grade in that lab. It is the responsibility of the student to download Lab. procedures from lab manual on-line (Avenue learning). Students must pass both components of the course –labs and lectures - to pass the course. 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. The communications via email is strictly by Official McMaster University Account, no reply to the commercial emails and/or nick names. Late submission of assignments and Lab report will be penalized 10% day within one week.</p>	
Departmental Policies	<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>	
3. SUB TOPIC(S)		
Week 1	Introduction: Definition, types of biotechnology, biotechnology workforce.	Ch1
Week 2	Gene and Genome: review of cell structure, chromosome structure, Genome, protein synthesis. Quiz 1 Case study 1	Ch2
Week 3	Mutations: causes and consequences, types of mutations, mutations and human genetic diseases. Quiz 2 Case study 2	Ch2
Week 4	Recombinant DNA Technology: Restriction enzymes, cloning and vectors.	Ch3

	Quiz 3 Case study 3	
Week 5	Identify and clone gene, applications of rDNA technology, genomics and bioinformatics. style="text-align: center;"> Quiz 4 Case study 4	Ch3
Week 6	Proteins as products: protein as biotechnology products, Protein production. style="text-align: center;"> Quiz 5 Case study 5	Ch4
Mid-term recess Monday, February 19 to Sunday, February 25		
Week 7	Protein purification methods and scale-up, verification, proteomic. style="text-align: center;"> Quiz 6 Case study 6 Midterm Test	Ch4
Week 8	Microbial biotechnology: Microbial enzymes, bacterial transformation, cloning and expression techniques. style="text-align: center;"> Quiz 7 Case study 7	Ch5
Week 9	Microbial biotechnology: Industrial applications, Food products and therapeutic proteins, vaccines, and Microbial diagnostic. style="text-align: center;"> Quiz 8 Case study 8	Ch5
Week 10	Plant Biotechnology: Plant transgenesis, breeding, cloning and protoplast fusion, practical applications in the field. style="text-align: center;"> Quiz 9 Case study 9	Ch6
Week 11	Animal Biotechnology: Clones, transgenic animals, producing human antibodies in animals. style="text-align: center;"> Quiz 10 Case study 10	Ch7
Week 12	Aquatic biotechnology: Aquaculture, molecular genetics of aquatic organisms, Medical, nonmedical and environmental applications.	Ch10
Week 13	Review	
Midterm Recess: Monday, February 19 to Sunday, February 25 Test and Examination Restriction Period: Thursday, April 4 to Thursday, April 11 Classes end: Wednesday, April 10 Final examination period: Friday, April 12 to Thursday, April 25 All examinations MUST be written during the scheduled examination period		
List of experiments		
Lab 1	Check-in & introduction	
Lab 2	Synthesis of acetaminophen	
Lab 3	Analysis of vitamin C	
Lab 4	Identification of GM foods by PCR	
Lab 5	Enzymes and proteins in the food industry	

Lab 6	Anaerobic fermentation by yeast
Lab 7	Plant tissue culture techniques
Lab 8	Oil degrading properties of marine bacteria
Lab 9	DNA profile analysis using PCR amplification and agarose gel electrophoresis
Lab 10	Biodiesel synthesis
Lab 11	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 & Case studies	20
Participation	05
Mid-term test	15
Team Project	10
Labs	25
Final examination (tests cumulative knowledge)	25
TOTAL	100%

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

5. LEARNING OUTCOMES

1. Evaluate different types of mutation and their role in human genetic diseases
2. Identify the role of mutation and application in industry
3. Distinguish between recombinant DNA technology in different systems such as microbial and plant systems
4. Recognize protein as biotechnology products and their production, purification and scale-up.
5. Apply biotechnology concepts and methods in medicine and industry
6. Perform safely the different recombinant DNA technology and biotechnology techniques in laboratory.

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

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.