

## Course Outline

### 1. COURSE INFORMATION

<b>Session Offered</b>	Fall 2017	
<b>Course Name</b>	Biotechnology III/Advanced Biotechnology	
<b>Course Code</b>	BIO TECH 4TB3/ SEP 6TB3	
<b>Date(s) and Time(s) of lectures</b>	Monday 3:30-5:30 PM Thursday 1:30-2:30 PM	
<b>Program Name</b>	Biotechnology	
<b>Calendar Description</b>	This advanced course examines select topics of interest that reflect current methods utilized to produce new products and processes in the field of biotechnology. The course invites subject experts from various sectors of the biotech industry as guest lecturers.	
<b>Instructor(s)</b>	Dr. Faiez Alani	E-Mail: alanif@mcmaster.ca Office Hours & Location: Monday 1:30-2:30pm Tue 1:30-2:30pm or by appointment, ETB A121

### 2. COURSE SPECIFICS

<b>Course Description</b>	The course covers many recent topics in biotechnology such as the role of secondary metabolites and the application of metabolic engineering and synthetic biology in the design and development of biocatalysts. The merging between nanotechnology and biotechnology in nanobiotechnology and applications in industry and nanomedicine. The course will also cover the new generation of biofuel and the recent development in tissue engineering and stem cell technology. Recent developments in gene therapy and biological control such as bioinsecticide and biofertilizer.		
<b>Instruction Type</b>	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Classroom instruction	37
	L	Laboratory, workshop or fieldwork	0
	T	Tutorial	0
	DE	Distance education	n/a
	<b>Total Hours</b>		37
<b>Resources</b>	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	ISBN: 978-0080885049	Comprehensive Biotechnology, 2nd edition 2011	Murray Moo-Young, Editor, Elsevier
	<b>Other Supplies</b>	<b>Source</b>	
	Avenue to Learn	<a href="http://avenue.mcmaster.ca">http://avenue.mcmaster.ca</a>	
<b>Prerequisite(s)</b>	BIOTECH 3B03, 4GP3		
<b>Corequisite(s)</b>	n/a		
<b>Antirequisite(s)</b>	n/a		
<b>Course Specific Policies</b>	The attendance of lectures is strongly encouraged and there are many non-announced quizzes and case studies. There is no make-up policy in the term tests and quizzes for this course. If the student missed any midterm then the percentage of the final will be increased to compensate the missing midterms if the student has well documented and approved report for the absence (See MSAF information below). Students should be aware that, when they access the electronic components of this		

	<p>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 submissions of assignments will be penalized 10% per day within one week</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. 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.</p>	
<b>3. SUB TOPIC(S)</b>		
Week 1	<p>Secondary Metabolites: Definition, differences between primary and secondary metabolites, examples of secondary metabolites in biotechnology industry</p>	Ch. 1.12
Week 2	<p>Design of culture Media: General and specific requirements, Methods of design, manufacturing designed media.</p> <p style="text-align: center;"><b>Quiz 1</b></p>	Ch. 1.16
Week 3	<p>Bioprocessing Techniques: Strain development and inoculum preparation, process validation.</p> <p style="text-align: center;"><b>Case study 1</b></p>	Ch. 1.51
Week 4	<p>Immobilized biocatalyst: Immobilized enzymes, immobilized cells, methods of immobilization, Evaluation of enzyme immobilization.</p> <p style="text-align: center;"><b>Quiz 2</b></p>	Ch. 1.04
Week 5	<p>Nanobiotechnology: Second generation of nanoparticles, application of nanobiotechnology in nanomedicine and industry.</p> <p style="text-align: center;"><b>Case study 2</b></p>	Ch. 1.45
Mid-term Recess: Monday, October 9 to Sunday, October 15, 2017		
Week 7	<p>Solid state fermentation: Definition, types of SSF, inter and intraparticles, mass transfer, recent development in SSF bioreactors.</p> <p style="text-align: center;"><b>Quiz 3</b> <b>Project presentation</b></p>	Ch. 2.25
Week 8	<p>Second generation (G2) of Biofuel: Biofuels from cellulosic feed stocks: cellulosic biomass, pretreatment, strain development.</p>	Ch. 3.06

	<b>Case study 3 Project presentation</b>	
Week 9	Gene Therapies: Current status, Manufacturing of gene therapy products, Product characterization and validation. <b>Quiz 4 Project presentation</b>	Ch. 3.27
Week 10	Metabolic Engineering: Evolution of metabolic engineering, desired products, metabolic engineering strategies, process optimization. <b>Case study 4 Mid-term Test</b>	Ch. 3.52
Week 11	Synthetic Biology: Genome synthesis, assembly, and transplantation, gene/genome design and modelling, Industrial synthetic biology. <b>Quiz 5 Project presentation</b>	Ch. 3.53
Week 12	Biological Control: Biocontrol of weeds, insects and plant pathogens, biocontrol and genetic engineering. <b>Case study 5 Project final report due</b>	Ch. 3.61
Week 13	Emerging trends in tissue engineering: Tissue -Engineering Strategies, Microscale & Macro scale Technologies, Clinical Applications. <b>Review</b>	Ch. 5.20

Classes end: Wednesday, December 6, 2017

Final examination period: Friday, December 8 to Thursday, December 21, 2017

All examinations MUST be written during the scheduled examination period.

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.

<b>4. ASSESSMENT OF LEARNING *including dates*</b>	<b>Weight</b>
Case studies & Quizzes	15
Mid-term test	25
Team Project	20
Participation	05
Final examination (tests cumulative knowledge)	35
<b>TOTAL</b>	<b>100%</b>

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

#### **5. LEARNING OUTCOMES**

1. Define the role of cell metabolism such as secondary metabolism in industrial applications
2. Identify the role of nanotechnology in biotechnology and applications in industry and biomedicine
3. Design of culture media and application in biotechnology processes
4. Solve different bioprocessing techniques problems particularly aqueous versus solid bioprocess
5. Design different metabolic engineering and synthetic biology systems and development of biocatalysts
6. Evaluate methods of biocatalyst immobilization versus free biocatalyst and application

#### **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://judicialaffairs.mcmaster.ca/pdf/SCC.pdf> and <http://www.mcmaster.ca/policy/Students-AcademicStudies/StudentCode.pdf>