

BIOB12 H3Y

Cell and Molecular Biology Laboratory

Summer 2015

Instructor: Daman Bawa

Office: SW-563B

E-mail: bawa@utsc.utoronto.ca

Teaching Assistants: Arujun Brahmendra, Alvinder Singh

Office Hours: Tuesdays 12 PM – 3 PM
Please be prepared and consult lecture materials and online sources prior to coming to the office. Appointments outside these hours can be arranged by e-mail.

Lecture: Tuesdays 9-10 AM
Room SW-128

Textbook: **There is no textbook for the course.** However, textbook used for BIOB10/B11 does have some good background information

The best way to reach me outside the office hours is by e-mail. **Please use your UTSC or UTORONTO e-mail account** and include your course code in the subject. Emails sent from non-university accounts will not be answered.

BIOB12 is a laboratory/lecture based course. The emphasis is on the laboratory and lectures complement what is done in the laboratory each week. Assignments, term test and the final exam will be based on background material required for the laboratories and questions that directly relate to what was done in the laboratory as well as applied questions that require the background of the concepts presented in the laboratory.

Attendance in the laboratories is required. Each module in the laboratory will begin with a quiz. The questions/answers to the quizzes will be covered in the posted laboratory exercises as well as within the lecture on the related material. During lecture we will also go over specific details related to what you will do in the laboratory that week. Attendance in lecture is highly recommended to assist you in the laboratory component.

Objectives of this course: This laboratory course provides the introduction to major techniques in cell and molecular biology. Each module addresses techniques that are fundamental to carrying out laboratory based work in all types of laboratories, industry, government, clinical and research laboratories. It provides the foundation for upper year laboratory courses in biochemistry, microbiology and molecular biology. Students will be provided with hands-on experience in spectrophotometry, basic microbiology culturing techniques, DNA isolation, basic plasmid cloning, restriction endonuclease analysis, protein isolation and SDS-polyacrylamide gel analysis. Students over the course of the term will develop skills in data analysis and scientific analysis. At the completion of the course students will have a laboratory skill set that will prepare them for upper year cell and molecular biology laboratory courses and the knowledge to understand molecular biology methodology presented in upper year courses. In addition, the students will have a basic set of skills that will be useful for future employment in laboratory based careers. Moreover, the students will gain an appreciation and understanding in how to carry out work in an organized manner with attention to detail and understanding of quality control in experimentation. **Each student is encouraged to ask questions, and participate in class, in laboratories and in office hours. Often times a question can lead to an interesting discussion for all students.**

Lectures:

BIOB12 is a laboratory course. The material covered in the one hour lecture will relate to the laboratory techniques carried out throughout the course. It will include discussion of methodologies, theory behind the methodology and applications for the particular techniques used. Lecture gives you a chance to also ask questions regarding the theory behind the labs you will be conducting. Therefore come with questions. Lecture material will be posted on the intranet by the day of the lecture. I will cover material from laboratories. Attendance will help to put the laboratory material in context and prepare for the quizzes. The lectures come from a number of sources including primary technique papers, reviews and technical manuals. The lectures have been modified from lectures of Dr. Shelley Brunt.

The emphasis of the course is the laboratory, the lectures complement the laboratory.

Laboratories:

- **Attendance in labs is mandatory.** If you miss a lab you must provide a UTSC medical certificate to be excused from the lab and to be able to hand in any assignments related to that lab. The labs are full therefore you will likely not be able to makeup labs. You will lose 4% of your grade for each missed lab. You will not be allowed to hand in any assignment that relates to the missed lab or write the quiz, so the penalty may exceed the 4% state above. **Missing more than three labs with no acceptable excuse will lead to the forfeit of all laboratory related grades and the removal from the course**
- Labs run twice a week for a total of 6 hours of contact
- Laboratory exercises will be posted on the intranet at least a week prior to the date of the scheduled laboratory.
- **It is your responsibility** to come prepared each week to carry out your laboratory. The following preparation will be required:

- To have completed **an introduction** to each lab (a paragraph) explaining the purpose
- To have written out your own **flow chart** (this is what you should refer to when doing the lab). Your flowchart should be written such that you should not have to refer back to your lab notes during the lab.
- When carrying out experiments you must take complete notes. Therefore, as you do the experiment you will “**log it**”. This means writing down in detail what you did, what you observed, times of incubations. You will have **data analysis** (including standard curve construction) **summary / conclusion**, where you analyze the data, do any graphs etc that are required. Your TA will initial this book on a regular basis and collect your books for a final grade.
- To ensure you are prepared for the lab there will also be **quizzes** on each lab topic (see schedule) which will test whether you have adequately prepared for the lab. Attendance at lectures will help you with the material
- Equipment in the lab is expensive. You are responsible for your equipment. Accidents can happen but most “accidents” are avoidable with proper preparation and attention to the task at hand.

For laboratory, the students will require:

1. Lab coat and closed toed shoes (no exceptions)
2. Safety glasses
3. A permanent black marker
4. A book for recording your work (your log book). This book can be hard or soft cover, or a binder.
5. **Absolutely no food, drink, or gum chewing is permitted in the laboratory.** Students will required to leave the laboratory if they eat or drink in the laboratory

Accessibility: Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca.

Academic integrity/plagiarism: Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student’s individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto’s Code of Behaviour on Academic

Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments: Using someone else's ideas or words without appropriate acknowledgement. Submitting your own work in more than one course without the permission of the instructor. Making up sources or facts. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams: Using or possessing unauthorized aids. Looking at someone else's answers during an exam or test. Misrepresenting your identity.

In academic work: Falsifying institutional documents or grades. Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (refer to: <http://www.utoronto.ca/academicintegrity/resourcesforstudents.html>).

Use of Turnitin.com:

"Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site".

If you wish to opt out of turnitin you must send me an email and then submit an electronic copy to me.

Grade Breakdown:

Midterm (lab and lecture material): 19% (multiple choice, short answer, calculations, short essay). **Date: TBA**

- **You must contact me within 48 Hours of missing the midterm and provide me with the UTSC medical certificate filled in by your physician to be able to write the makeup exam**

Final exam (lab and lecture material): 34% (multiple choice, short answer, calculations, and short essay). The final exam will be cumulative as it relates to overlapping concepts through the course. **Date: TBA; during final exam period**

Modified from Brunt, 2011

Quizzes: (8 X 1.75%) **14%**

- Quiz 1:** May 12 - Spectrophotometry and protein assays
- Quiz 2:** May 19 - Bacterial growth and enumeration
- Quiz 3:** May 26 - Preparation of competent cells/ transformation/ plasmid prep
- Quiz 4:** June 2 - Restriction enzyme analysis and gel electrophoresis
- Quiz 5:** June 23 - Gene regulation
- Quiz 6:** July 8 - Biochemistry module: bacterial homogenate
- Quiz 7:** July 14 - Biochemistry module: protein assay, SDS PAGE
- Quiz 8:** July 28 - Microscopy

Lab performance: 10%

- Preparation / flowchart 2%
 - Technical performance 2%
 - Laboratory log/ summary/data analysis 4%
 - Pass/fail in lab assignments/ one minute writes 2%
- Lab notebooks will be initialed each week and TAs will keep a record throughout term, the books will be handed in on August 4, 2015 for the final grade. If you have not kept up to date each week your marks will reflect your work

Lab assignments: 23% (The content required for each assignment will be explained during the appropriate lecture and laboratory class.)

- 1. Restriction mapping (5%) – In lab, on July 7**
- 2. Formal report gene regulation (8.5 %) – Due on July 14**
- 3. Formal report on Biochemistry module (9.5 %) – Due on Aug 4**

LAB SCHEDULE: The labs will run according to the following schedule. If any changes need to be made due to unforeseen circumstances, it will be posted on Blackboard.

A: designates the first lab of the week (Tuesday)

B: designates the second lab of the week (Wednesday)

Week of	Lab Week	Lab Exercise
May 4	1A	No lab
	1B	Chemistry problems
May 11	2A	Spectrophotometry and protein assays (Quiz 1)
	2B	Preparation of bacterial media and plates
May 18	3A	Growth and enumeration of bacteria (Quiz 2)
	3B	Analysis of growth data, pouring of LB/AMP plates
May 25	4A	Preparation of competent cells, transformation with plasmids (Quiz 3)
	4B	Plasmid DNA preparation
June 1	5A	Restriction enzyme analysis, comparison of restricted and native plasmid DNA/gel electrophoresis (Quiz 4)
	5B	Data analysis of gel electrophoresis in 5A and set up of multiple restriction endonuclease enzyme analysis of plasmid DNA
June 8	6A	Agarose gel analysis of restriction endonuclease analysis in 5A. Theory of restriction mapping
	6B	Data analysis of 6A and construction of restriction map of plasmid DNA

June 15	READING WEEK	
June 22	7A	Lac operon Gene regulation experiment 1 using wild type and mutant strains of <i>E.coli</i> (Quiz 5)
	7B	Plan your experiment (dry lab: you will analyze results from 7A and plan your own experiment for next week)
June 29	8A	Student experiments in gene regulation using the Lac operon
	8B	Canada day – University closed
July 6	9A	Analysis and discussion of results; discussion of requirements for lab reports. <i>Restriction mapping assignment in class (last hour)</i>
	9B	Biochemistry module: Making a bacterial homogenate using wild type, mutant strains, recombinant strain of <i>E coli</i> (Quiz 6)
July 13	10A	Biochemistry module: SDS polyacrylamide gel electrophoresis (Quiz 7) . <i>Gene regulation lab report is due</i>
	10B	Data analysis of SDS-PAGE and outline of report requirements
July 20	11A	TAs will return reports and be available for 1 hour for assistance on biochemistry module report / presentations
	11B	Presentation on results from biochemistry module
July 27	12A	Microscopy module (Quiz 8)
	12B	No lab
Aug 4	Lab report and lab books due in lab (1hr)	

LECTURE SCHEDULE:

More than one topic may be covered in one week and some of the other topics will be covered over more than one lectures

Topic 1: Overview of the course; scientific calculations/methodologies

Topic 2: Spectrophotometry/protein assay

Topic 3: Microorganisms used in molecular biology/growth, enumeration

Topic 4: Recombinant DNA techniques: plasmid preparation, restriction digests, gel electrophoresis, restriction mapping, cloning, use of polymerases, ligases etc.

Topic 5: Gene Regulation, use of colorimetric assays

Topic 6: Biochemistry techniques: protein isolation, chromatography, dialysis, gel electrophoresis

Topic 7: Microscopy

Topic 8: Other molecular biology techniques
