

BIOB12H: Cell & Molecular Biology Laboratory

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Course Syllabus

Winter 2015

Course description:

BIOB12 is a laboratory-based course designed to acquaint students with basic practical skills used in cell biology, molecular biology and biochemistry. Methods of data acquisition, analysis, and written presentation skills will also be covered during the course. The course is roughly divided into five sections. These are entitled basic laboratory techniques, bacteriology, molecular biology, biochemistry and microscopy (cell biology). These skills and techniques will then be utilized in upper level courses such as biochemistry, genetics, microbiology and molecular biology.

Prerequisites: CHMA10H & CHMA11H

Corequisite: BIOB10Y or BIOB11H

Textbook & Course Materials:

The course material derives from several sources including primary literature and therefore no single text will be the focus of this course. However, students may find it useful to consult the following text for some of the details of methods used in this course: *Cell and Molecular Biology: Concepts and Experiments*, 6th or 7th edition (Wiley), Gerald Karp.

Guidelines and methods for each lab as well as introductory information for the course will be **posted on the blackboard site for the course** (as PDF files). Material for a given week will be posted sufficiently ahead of time on the course intranet site in order for students to download the material, read through it thoroughly and make all necessary calculations or preparations prior to the labs. This course syllabus contains a detailed list of labs and a list alongside this tells students what materials they are required to read for each lab.

For the laboratory sessions, students will require:

1. A lab coat and closed toed shoes (no exceptions).
2. Safety glasses/goggles
3. A permanent black marker - Sanford: Sharpie (fine point) or Staedtler lunocolor permanent marker (fine point)
4. A bound (soft or hard cover) notebook for recording your work (your lab notebook). Bring this notebook to every lab session and log notes in them accurately and legibly. This book is a large part of your final grade!

Online course resources:

Go to the Portal site: <https://portal.utoronto.ca/webapps/portal/frameset.jsp>

Login and access the BIOB12H3Y Blackboard site for Winter 2015

This site will contain:

- The course syllabus – including a course description & schedule.
 - Contact information and office hours for the instructor and TAs
 - Important announcement regarding lectures, labs, exams or course content – **please check this site regularly for any such announcements.**
 - Lecture outlines** will be posted approximately 1-2 days prior to each lecture.
- Note: these outlines will not contain ALL contents of the lectures.
Students are expected to print out these lecture outlines, bring them to class and take additional notes on them during the class.
- All **lab manual style material** (procedures and background information) will also be posted on the intranet ahead of a given week's lab sessions. The detailed list of labs (above) provides a very **clear list of the relevant PDFs** that should be downloaded and studied carefully for each lab. Students are required to read through the relevant material in these PDFs, understand the content and come to each lab session with the necessary preparations completed. These preparations may involve making tables to record data in your lab notebook, performing calculations or writing out flow charts/diagrams of the lab protocol for that day.

Time and Location:

Lectures: Mondays, 9-10am, SW 309

- Lecture 1: Monday, Jan 5th - Introduction; Making solutions and adjusting pH
- Lecture 2: Monday, Jan 12th - Spectrophotometry & protein assays
- Lecture 3: Monday, Jan 19th - Microbiology: growth & enumeration of bacteria
- Lecture 4: Monday, Jan 26th - Molecular Biology: Plasmid transformation & retrieval
- Lecture 5: Monday, Feb 2nd - Restriction digestion of DNA & gel electrophoresis
- Lecture 6: Monday, Feb 9th - Gene regulation: Lac operon activity

Reading Week

- Lecture 7: Monday, Feb 23rd - Gene regulation & cloning; Writing a research paper
- Lecture 8: Monday, March 2nd – Biochemistry: cell fractionation & cell lysates; protein purification techniques
- Lecture 9: Monday, March 9th - SDS-PAGE of cell lysates; *in vivo* assays
- Lecture 10: Monday, March 16th – Microscopy: Cell culture & light microscopy
- Lecture 11: Monday, March 23rd – Immunostaining & Fluorescence microscopy
- Lecture 12: Monday, March 30th - Final exam expectations

Labs: There are 6 lab sections per week for this course. Regardless of which practical group you belong to, **you will have 6 hours of lab per week** (Tues/Wed).

Exception: Weeks 1 & 12 (1 wet lab only). The timings, locations and names of TAs directing each section are listed below.

- Practical group 1: Monday & Wednesday 10am – 1pm – SW 133; TA = Daman
- Practical group 2: Monday & Wednesday 10 am – 1pm – SW 135; TA = Carina
- Practical group 3: Monday & Wednesday 2pm – 5pm – SW 133; TA = Alex
- Practical group 4: Monday & Wednesday 2pm – 5pm – SW 135; TA = Arujun
- Practical group 5: Tuesday & Thursday 8am – 11am – SW 133; TA = Sadek
- Practical group 6: Tuesday & Thursday 8am – 11am – SW 135; TA = Allan

The specific order and goals of each lab is listed below. A = first lab of the week (Mon/Tues); B= second lab of the week (Wed/Thurs)

<u>Week of:</u>	<u>Lab name and number:</u>
Jan 5 th	1A. No Lab – Read Course Syllabus & PDF #1 1B. Chemistry problems in lab; Micropipetting– Read PDF #2
Jan 12 th	2A. Spectrophotometry & protein assays – Read PDF #3 2B. Preparing solid & liquid bacteriological media – Read PDF#4
Jan 19 th	3A. Sterile technique; bacterial growth curves– Read PDF #4 3B. Analysis of bacterial growth data – Read PDF #4
Jan 26 th	4A. Competent cells & bacterial transformation– Read PDF #5 4B. Purification of plasmid DNA from bacteria– Read PDF #5
Feb 2 nd	5A. Restriction digestion & gel electrophoresis of DNA– Read PDF #5 5B. Data analysis of plasmids identifying the unknown– Read PDF #5
Feb 9 th	6A. Gene regulation lab using ONPG assay; <u>Make your own</u> restriction mapping problems (in lab)– Read PDF #6 6B. Data analysis; design your experiment – Read PDF #6

Reading Week

Feb 23 rd	7A. Carry out your experiment)– Read PDF #6 7B. Analysis of results; re-design of experiment; Restriction mapping <u>TEST</u> (in lab)– Read PDF #6
March 2 nd	8A. Carry out repeat/modification of your experiment)– Read PDF #6 8B. Inducing bacteria & making a cell homogenate– Read PDF #7
March 9 th	9A. SDS-PAGE of proteins & plating on X-Gal– Read PDF #7 9B. Data analysis & interpretation of results– Read PDF #7
March 16 th	10A. Powerpoint presentations of your data in lab– Read PDF #7 10B. Light Microscopy: cell culture & counting cells– Read PDF #8
March 23 rd	11A. Fluorescence Microscopy: Imaging the cell cycle using fluorescence – Read PDF #9 11B. Preparing specimens: immunofluorescence – Read PDF #9
March 30 th	12A. Imaging your own immunostained fluorescent slides; brief oral presentations on findings to lab group – Read PDF #9 12B. NO WET LAB; Lab notebooks will be collected; TA office hours

Please note:

- **Labs run twice a week for a total of 6 hours per week! Exceptions: Weeks 1 & 12 (1 wet lab only).** It is mandatory to turn in notebooks on Lab 12B.
- **Attendance in labs is mandatory.** There are NO makeup labs. You will **lose 4% of your lab performance grade** for each missed lab. You will not be allowed to hand in any assignments relating to the missed lab or write the quiz, so the penalty will likely exceed the 4% stated above. Missing more than three labs with no acceptable excuse can lead to removal from the course.
- If you miss a lab due to illness, you must provide a UTSC medical certificate to be excused from the lab and hand in any assignments related to that lab.

Evaluation:

- Surprise (pop) quizzes: 15% (Ex: 5 quizzes worth 3% each)

-Assignments: 29%

1. Restriction mapping test: 4%

Lab 7B – solve a restriction mapping problem in lab.

2. Writing lab reports: 25%

A. M &M for lab # 3A (bacterial growth curves): 5%

B. Discussion for lab # 3A & 3B (what do the results mean, how would you extend this study): 5%

C. Design, execute & write up of your own experiment (labs 7A/7B & 8A)- a detailed lab report/paper (modeled on a scientific paper): 15%

Your TA (for your specific session) will instruct you how he/she would like to receive these reports. It may be required as a hard copy or as an electronic attachment. You will also be asked to submit lab reports to turnitin (details will be provided on blackboard). Delays in turning in assignments 2A & 2B = 1% penalty per day and for assignment 2C = 5% penalty per day. Note: plagiarism on these written assignments can have serious academic consequences.

-Lab performance: 20%

-You will receive 2 different lab performance marks. Lab performance marks – first half =8% ; Lab performance grade second half = 12%

1. The first half grade of 8% will be based on your level of contribution to the group's activities, your lab technical skills and your general level of preparation and enthusiasm for lab experiments (3%). Another contributor to this grade is your organized, legible and accurate record keeping in your lab notebooks (3%). Your own restriction mapping problem will also be assessed in this grade (2%).

2. The second half grade of 12% will be based on your level of contribution to the group's activities, your lab technical skills and your general level of preparation and enthusiasm for lab experiments (5%). Another contributor to this grade is your organized, legible and accurate record keeping in your lab notebooks (3%). Your oral (Powerpoint) presentations in lab on March 16th/17th will count towards 4% of your lab performance grade-second half.

-Exams: 36%

Final exam (2 hours): 36%: combination of short answer, multiple choice & calculation questions.

Due dates and other important dates:

1. Lab report (M&M) for lab #3A – Jan 28th /Jan 29th.
2. Lab report (discussion) for labs 3A & 3B – Feb 4th /Feb 5th.
3. Making up your own restriction mapping problem during lab time (as directed by TA) – Feb 9th/10th .
4. Restriction mapping test during lab time (as directed by TA) – Feb 25th/26th .
5. Powerpoint presentations in lab – March 16th/ 17th.
6. Detailed lab report/research paper for labs 7A/7B/8A –March 20th before noon.
7. Final lab notebook assessments – turned in to TAs on April 1st / 2nd (12B) in the lab. Note that the TAs will initial your notebooks when they check your notes periodically throughout the term. These checks ALSO contribute to your final lab performance grade.
8. Final exam: TBA.

Submission of reports to Turnitin

Students will be asked to submit all three written reports (Assignments 2A, B & C as laid out in the Evaluation section) to **Turnitin.com** for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their reports 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: <http://www.utoronto.ca/ota/turnitin/ConditionsofUse.html>.

Turnitin.com is most effective when it is used by all students; however, if and when students object to its use on principle, the course offers a reasonable offline alternative (the instructor and student will meet and discuss the process of creating a report that fits the academic integrity policy of the University in such instances).

Course staff:

Instructor: Dr. Aarthi Ashok

Email: aashok@utsc.utoronto.ca

Office hours: **Mondays, 1-2pm** (also by appointment outside of these hours)

Office location: SW521D

TAs: Andrew Peters, Alexander Myrka, Sadek Shorbagi, Allan Edelsparre, Carina Carianopol and Daman Bawa.

You can make appointments with your TAs by email (see below), if necessary.

Course email policy:

Dr. Ashok: aashok@utsc.utoronto.ca

- Your email message must include in the Subject line the course identifier and a concise and clear statement of purpose [e.g., BIOB12H3S: appointment outside of office hours]; the body should contain your full name; otherwise it is likely to be deleted, along with spam messages. **Please only use your UTSC email address.**

- I will respond to email inquiries by email within 48 hours (in most instances) during the workweek (does not apply to weekends).
- If a question cannot be answered easily by email, I will send a reply to indicate to the student that they should attend my office hours instead.
- Specific questions regarding prerequisites or conflicts should be addressed to the course coordinator.

TAs: Arujun: a.brahmendra@mail.utoronto.ca; **Allan:** a.edelsparre@utoronto.ca; **Sadek:** sadek.shorbagi@mail.utoronto.ca; **Alex:** alex.myrka@mail.utoronto.ca; Carina: carina.carianopol@mail.utoronto.ca; Daman: daman.bawa@gmail.com
 These email addresses should be used to schedule appointments with TAs to ask specific questions about the course schedule and content, if required. TAs will check and answer email inquiries within 48 hours (does not apply to weekends).

Accessibility Needs:

(text provided by Centre for Teaching and Learning, UTSC)

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:

(text provided by The Centre for Teaching and Learning, UTSC)

Please consult: <http://www.utoronto.ca/academicintegrity/resourcesforstudents.html>. 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: **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, copying someone else's answers or data when preparing lab reports or papers, 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. There are other offences covered under the Code, but these are the most common. ***Please respect these rules and the values that they protect.***