# Cell Biology Laboratory (Fall 2015)
# (Biology 3040–002)

**Time:** Mon 1:00 - 1:50 pm; Fri 12:00 - 2:50 pm
**Room:** Wolfe Hall 1256
**Instructor:** Dr. Fan Dong,
Office: WO3257B
Phone: 419-530-1577
Email: fan.dong@utoledo.edu
**Office Hour:** Tue 10:00 am-11:30 am and Thu 1:00-2:30 pm or by appointment
**Teaching Assistant**: Sahezeel Awadia, BO3090, x1991

**Course Description**
BIOL 3040 is a laboratory based companion course to the Cell Biology lecture course (BIOL 3030). It is assumed that students taking the lab course have already taken or are simultaneously taking the lecture course. The goals of this course are to introduce some of the fundamental techniques that are used in the field of Cell/Molecular Biology and the basic concepts behind these techniques. This will include growth of mammalian cells in culture, cell proliferation and apoptosis, cellular transformation, signal transduction, analysis of gene activation and transient gene expression. Students will also gain fundamental experience in Cell/Molecular Biology research including: experimental design, hypothesis testing, experimentation, collection and analysis of data, and communication of experimental results.

**Textbook and Required Material**
There is no required textbook or lab manual. However, it is recommended that you purchase the Molecular Cell Biology textbook (Lodish et al.) that is required for the Cell Biology lecture course if you do not already have one. Lab and lecture handouts as well as protocols will be posted on the course website prior to the lecture. Students are required to provide a hard covered ruled notebook to be used for class preparation, note taking, and data collection. Protective goggles are not required, but it is advisable to wear a lab coat during the lab sessions.

**Student Evaluation (Grading)**
There will be a total of 400 points available. The breakdown is as follows:

| | | |
|---|---|---|
| Lab Report 1 | 120 | |
| Lab Report 2 | 120 | |
| Quiz 1 | 25 | |
| Quiz 2 | 25 | |
| Final Exam | 60 | |
| Lab Notebook | 25 | Hand in to TA after last class |
| Attendance/Participation | 25 | |

Quizzes and examination will be based on lecture material. To prepare yourself for the quizzes/exam, you should also understand all the experiments that you have performed.

## Grading scale

| Grade | % Correct | | Grade | % Correct |
|---|---|---|---|---|
| A | 92-100 | | C | 72-77 |
| A- | 90-91 | | C- | 70-71 |
| B+ | 88-89 | | D+ | 68-69 |
| B | 82-87 | | D | 62-67 |
| B- | 80-81 | | D- | 60-61 |
| C+ | 78-79 | | F | 0-59 |

**Course Policy on Absences**

Students are expected to attend **all of the lectures and lab sessions**. In the event of an unanticipated absence due to illness or emergency it is the students' responsibility to provide written documentation of the reasons for missing the lab session. Whether an excuse for missing a session is acceptable or not will be at the discretion of the instructor. If you have substantiated to me that you have to miss a quiz, I will work with you to create a makeup quiz, but it will not be possible to make up any missed lab sessions. In that case, it is still your responsibility to obtain any data and information from your lab partner or another student in your lab section for inclusion in lab reports. A missed lab session is not an excuse for not including any data/information from that lab session in your lab report.

**Course Policy on Cheating**

Although you will be working with a partner during the lab session, it is your individual responsibility to prepare for each lab as if you were performing the experiment on your own. It is also each person's responsibility to analyze their data, answer the questions, and write their own lab reports. Plagiarism of lab reports or notebooks or cheating on quizzes/exams will not be tolerated. Students caught cheating will be given a zero for that assignment, may be given an F for the course, and all information pertaining to the incident will be forwarded to departmental, college, and university disciplinary committees (See official Departmental Policy on Academic Dishonesty at the end of the syllabus).

**Getting the most out of BIOL 3040**

**Preparation-**The laboratory experimental procedures and brief background information will be available on the course website prior to the scheduled lab session. You are expected to read the material, write out any notes or questions, and outline the experimental procedure in your lab notebook. Knowing what to do before you get to the laboratory bench will maximize your time and help you better understand the experiments. The teaching assistant is present to help you with any problems you may encounter during the lab session and in analysis of your results, but they are not there to tell you what to do at each step of the experiment.

**Participation-**All students are expected to actively participate in each lab session. The lecture each week will be used to review and add to the material that will be encountered in the laboratory. This is a good opportunity for any questions you may have pertaining to

the laboratory experiment. Two of these time periods will be used to administer quizzes to assess your knowledge of the material. The quizzes will be short and should take about 15 minutes to complete. A final comprehensive exam will be given during the last lecture period of the semester (Monday, December 7, 2015).

It will be important for you to work efficiently to complete all experimental steps during the lab session although there will be occasions when you are not required to do so. There may also be occasions when you will need to come into the lab to perform steps at other times. Typically, these steps should not take much time but are necessary to successfully perform these experiments. For these experiments, the TAs will schedule set times that they will be in the lab to help with any problems that may arise. In addition, the lab will be open each day so that you can come in to observe your cultures or perform any necessary steps on your own. If for some reason you or your lab partner cannot come into lab to perform these steps, please let your TA know so that it can be taken care of for you.

**Lab Notebook-**For each lab session, you should bring your lab notebook that contains your outline for the experiment of that day as well as a copy of the formal lab protocol. Use the notebook for writing out exactly what you have done at each step, especially if it deviates from the protocol. Also use the notebook for recording data and making observations. Be sure to write out everything you do in the lab as this will make it easier when it is time to write lab reports. **Keep in mind that the lab notebooks will be collected and graded after the student presentations.**

**Guide for Writing Lab Reports**

A significant portion of your grade will be based on the two formal lab reports that you will hand in during the semester. The lab reports should be written following the format of a scientific research paper. The following general guidelines should be followed closely.

**General:** Reports should be typed and figures or tables should be included where appropriate. Use a 12-point font size, line spacing of 1.5 spaces, and 1" margins. Your reports must be prepared individually at all stages except for data collection where collaboration with your lab partner is ok. It is also ok to discuss and share experimental results with your partner and with other groups. There is no length restriction except that scientific reports should be concise and to the point, but comprehensive. Each report will be graded based upon its completeness, accuracy, organization and overall quality. The point breakdown is as follows:

| | |
|---|---|
| Abstract and Introduction: | 20% of the points |
| Materials and Methods: | 20% of the points |
| Results: | 25% of the points |
| Discussion: | 25% of the points |
| Literature Cited: | 10% of the points |

**Title and Abstract**

Provide a brief title (about 100 characters) of the experiment that is inclusive of all that has been achieved. The abstract should describe the hypothesis, significant results, and the conclusions (or lack thereof) that can be made in about 200 words.

**Introduction**

The introduction provides the context for the experiment(s) and, most importantly, poses the hypothesis that has been tested in the study. The format should include background information, question and hypothesis.

**Materials and Methods**

This is a summary of the materials and methods used in the experiment(s). In most instances this will consist of a brief statement verifying that the instructions in the protocol have been followed. If any changes are made in the protocol, they should be indicated here. If a particular step is not followed, it must be mentioned and a reason for why the change is made included. In general, the Materials and Methods section should be complete enough so that somebody could repeat all of the experiments you have performed with the information in this section. Do not write in a step-by-step manner. This section should be written in paragraph form using complete sentences.

**Results**

Report the outcome of each major step in the series of experiments. It may be easier to break down the Results section into different subsections based on the different steps from each week's steps. Include tables, diagrams, graphs, or figures where necessary and appropriate. Be sure they are numbered and refer to these numbers in the text of the results section. Also, each table, figure, etc. should include a brief figure legend and any abbreviations should be defined. Describe in the text of the results section what you found and draw a brief but valid conclusion from the data.

**Discussion**

In this section, the results you have obtained are interpreted and clearly explained to the best of your ability. The following steps may help you organize your discussion.

1. Restate your question and hypothesis.

2. Briefly summarize the most significant results of your experiments

3. What is your interpretation of the results in light of the hypothesis being tested? Do they support your hypothesis or they might be interpreted differently? If the experiments have failed (so you may not be able to answer the question), you should discuss why your experiments have failed and how to avoid the mistakes in the future.

4. What are your conclusions based on the data that you have obtained?

5. You may also discuss whether your data are reliable or whether there might be any problems with your experimental design. Might there be better ways to answer this question or additional experiments that could be performed?

6. What is the overall relevance or significance of your results?

If you are reporting the results of several experiments, you should organize the discussion into several concise paragraphs. Do not ramble in your discussion.

**Literature Cited**

Correctly cite any references you have used throughout your report. The citations must include the authors, title, volume number, page numbers and publication year. Include web page address if you cite material from a web page. Note that although web pages can be used as sources, you should not rely only on web pages for your information and must include sources from the primary literature. This includes both research articles and review articles.

**Tentative Schedule**

| | |
|---|---|
| M Aug 24 | Introduction to Cell Biology Lab<br>Lecture: Introduction to cell culture/Cell cycle regulation |
| F Aug 28 | Lab: learn how to culture cells (NIH/3T3 cells) |
| M Aug 31 | Count cells you plated on Friday August 24 |
| F Sep 4 | Lab: perform proliferation assay (sulforhodamine B colorimetric assay) |
| **M Sept 7** | **No Class - Labor Day** |
| F Sept 11 | Lab: treat cells with calf serum, prepare whole cell extracts and perform Bradford protein assay |
| M Sept 14 | Lecture: Signal transduction-Erk1/2 pathway |
| F Sept 18 | Lab: perform SDS/PAGE |
| M Sept 21 | Lecture: SDS/PAGE and Western blot analysis |
| F Sept 25 | Lab: Immunoblotting for Erk1/2 phosphorylation and culture Ras transformed cells |
| M Sept 28 | Lab: Count Ras transformed cells |
| F Oct 2 | Lecture: Oncogene and cellular transformation<br>Lab: stimulation of Ras transformed cells with FGF/calf serum, prepare whole cell extracts, perform protein assay |
| M Oct 5 | **No Class - Fall break** |
| F Oct 9 | Lab: SDS/PAGE |
| M Oct 12 | **Quiz 1**/Writing a lab report |
| F Oct 16 | Lab: Immunoblotting for Erk1/2 phosphorylation/Induce apoptosis of 32D cells through growth factor deprivation or DNA damage |
| M Oct 19 | Lecture: Apoptosis/DNA fragmentation |
| F Oct 23 | Lab: Isolate genomic DNA and run DNA gel/**Lab report 1 due** |
| M Oct 26 | Lecture: Chromosomes and chromosome spreading |
| F Oct 30 | Lab: Chromosome spreading |
| M Nov 2 | Lab: Count mitotic nuclei |
| F Nov 6 | Lecture: Signal transduction—Jak/Stat pathways<br>Lab: transiently transfect 293T cells with Jak2 and Stat5a |
| M Nov 9 | **Quiz 2**/Harvest cells |

| | |
|---|---|
| F Nov 13 | Lecture: Transient transfection and protein expression in eukaryotic cells<br>Lab: prepare whole cell extracts and protein assay |
| M Nov 16 | Lecture: light microscopy/immunofluorescent staining |
| F Nov 20 | Lab: perform SDS/PAGE |
| M Nov 23 | Lecture: Regulation of gene expression—how to examine gene activation |
| **F Nov 27** | **No Lab – Thanksgiving** |
| M Nov 30 | Lab: transiently transfect NIH/3T3 cells with SRE luciferase reporter construct |
| F. Dec 4 | Lab: Immunoblot for Stat5 phosphorylation/perform SRE luciferase report assay |
| **M Dec 7** | **Lab Final Exam** |
| F Dec 11 | Lab (TA demonstration): examine Erk1/2 phosphorylation by immunofluorescent staining/**Lab Report 2 due** |
| **M Dec 14** | **No Class – Final Exam Week** |
| **F Dec 18** | **No Lab – Final Exam Week** |

**Quizzes**

There will be 2 short quizzes during the semester that will be given during the lecture portion of the class.

| | |
|---|---|
| M 10/12 | Eukaryotic cell culture, cell proliferation/cell cycle regulation, signal transduction, and Western Blot Analysis |
| M 11/9 | Oncogene transformation, apoptosis, chromosomes, transient transfection and RNA interference |

**Lab Reports**

| | |
|---|---|
| Lab Report 1 | Due on Friday Oct 23. Growth factor dependence and oncogenic transformation |
| Lab Report 2 | Due on Friday Dec 11. Apoptosis or Jak/Stat5 pathway (Students choice) |

**Important Dates**

| | |
|---|---|
| M Oct 12, 2015 | **Quiz 1** |
| M Nov. 9, 2015 | **Quiz II** |
| M Dec. 7, 2015 | **Lab Final Exam** |

# STATEMENT OF ACADEMIC DISHONESTY

## Department of Biological Sciences

Academic dishonesty by students enrolled in undergraduate and graduate courses and programs offered by the Department of Biological Sciences will not be tolerated. Academic dishonesty includes but is not limited to:

1. Obtaining assistance from another individual during an examination.

2. Giving assistance to another individual during an examination.

3. The unauthorized use of study material or textbooks during an examination.

4. Changing answers on an examination after it has been returned and then submitting it for regarding.

5. Plagiarizing written assignments. Plagiariizing includes but is not limited to : a) Copying laboratory reports from previous years, b) copying or paraphrasing reports, term papers, or these prepared by other students, c) unauthorized collaboration in the preparation of reports, term papers, or theses, and d) use of another author's materials without appropriate acknowledgement through quotation and citation.

6. Attempting to bribe or otherwise induce an instructor to alter either a grade or examination score.

7. Obtaining or attempting to obtain a copy of an examination prior to its administration.

In accordance with policies presented in The Student Handbook and The University Catalog, Instructors have the responsibility and right to report cases of alleged dishonesty to departmental, college, and university administrative units. Students involved in academic dishonesty may expect to receive a grade of F on specific assignments as well as in the course where the assignment was made. In addition, disciplinary action may be recommended through appropriate college and university disciplinary committees. Please consult your instructor for instructions on the implementation of this policy.