**Bios 3450 Cell Molecular Biology Syllabus SPRING 2022**

**INSTRUCTORS** (contact by e-mail recommended over telephone):

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**COURSE HOURS/LOCATION:**MWF 11:00-11:50 am, ES&T L1255

**OFFICE HOURS:**No regular office hours are scheduled, but students are STRONGLY ENCOURAGED to meet with the TA and instructors when needed by arranging a time via e-mail.

**COURSE DESCRIPTION:**Modern cell biology is a unifying discipline that describes the structure and function of cells in all their genetic, biochemical, developmental, physiological and pathophysiological aspects. This course will introduce students to the dynamic relationships between cell structure and the biochemical reactions that are necessary for cell growth, differentiation, survival and death with an emphasis on eukaryotic cells. The format of the course will consist of **class lectures** (which primarily draw on information found in the textbook), **in-class discussion of topics related to the lecture material**, and **analysis of assigned research articles**. It is estimated that 1-2 hours will be required outside of class to prepare for EACH lecture, although some students might need to commit more time.

**TEXTBOOK:**H. Lodish et al. 2016. *Molecular Cell Biology, 8th Ed.*W.H Freeman and Company.

E-textbook is available from the publisher ([https://store.macmillanlearning.com/us/product/Molecular-Cell-Biology/p/1464183392?\_ga=2.186277162.2035816532.1544723579-592544735.1544723579 (Links to an external site.)](https://store.macmillanlearning.com/us/product/Molecular-Cell-Biology/p/1464183392?_ga=2.186277162.2035816532.1544723579-592544735.1544723579)).

There is also the option to rent the textbook from Amazon ([https://www.amazon.com/Molecular-Cell-Biology-Harvey-Lodish/dp/1464183392/ref=mt\_hardcover?\_encoding=UTF8&me=&qid=1543424729 (Links to an external site.)](https://www.amazon.com/Molecular-Cell-Biology-Harvey-Lodish/dp/1464183392/ref%3Dmt_hardcover?_encoding=UTF8&me=&qid=1543424729))

Optional reading (on reserve in the library): Gillen, C. M., 2007. *Reading Primary Literature*, Pearson/Benjamin Cummings Pub. (ISBN-13: 978-08053-4599-5).

**Learning Catalytics:**In-class participation and homework assignments will be administered via Learning Catalytics. Students must purchase an individual subscription ($12 per semester) at [http://learningcatalytics.com/student\_sign\_up (Links to an external site.)](http://learningcatalytics.com/student_sign_up) If you are enrolled in other courses that also use Learning Catalytics this semester, just one subscription will serve multiple courses for the semester.

**OTHER SOURCES:** Biomedical search tools: PubMed [http://www.ncbi.nlm.nih.gov/pubmed/ (Links to an external site.)](http://www.ncbi.nlm.nih.gov/pubmed/).  Online journals via the Georgia Tech library: [http://sfx.galib.uga.edu/sfx\_git1/az (Links to an external site.)](http://sfx.galib.uga.edu/sfx_git1/az%C2%A0%28Links%20to%20an%20external%20site.%29) (and link “Citation Linker” on that web site).  Link to useful online cell biology resource: [http://www.cellbio.com (Links to an external site.)](http://www.cellbio.com/)

**CLASS CONTACTS:**We strongly suggest that you get to know at least a few other students in the class so you can help each other with questions, studying, etc.

**IMPORTANT GEORGIA TECH DATES**

Mon         **January 10** CLASSES BEGIN

Mon           **January 17** OFFICIAL SCHOOL HOLIDAY

Fri            **March 18** Last day to withdraw from individual courses Sat-

**March 21 – March 25** GT SPRING BREAK

Mon         **April 25** LAST DAY OF CLASSES

Fri            **April 29**      FINAL EXAM

**EVALUATION CRITERIA:**

**Lecture exams: 40% of the final grade.**There will be FIVE closed-book exams during the semester. Each will consist of multiple-choice and short answer questions. **Your lowest score will be dropped**, and grades from each of the remaining exams will be averaged.   If you are participating in an excused activity (scientific conference, sports event, etc.) that causes you to miss an exam, the instructors will try to schedule for you to take it early, but you must arrange when (which is usually the day before the scheduled exam date) at least two weeks before the scheduled exam date.  If it is not possible to schedule a time for you to take the exam early (or you elect not to do so), the one you miss will be counted as the dropped exam. **NO Makeup exams will be given so try to take all exams in case you miss one due to illness or another unexpected interruption.**If you have a more prolonged illness (or several) that cause you to miss more than one exam, you should contact the Dean of Students office to certify the illness(es) and the Dean will inform us that some sort of accommodation would be appropriate.

**Final exam:  20% of the final grade.**THE FINAL EXAM is an integrative overview of all of the cell biology concepts covered in the course (not just the chapters since exam 5, but also the earlier material). The final exam cannot be dropped.

**Paper Critique: 20% of the final grade.**You are expected to identify a cell and molecular biology research article, read the article critically, and write a report to summarize the background (what is known before the study is done), rationale (why the study is performed, what is the expected outcome), and findings (what is the result, does it answer the question) of the article. Also, discuss whether there is any problem in the article and how to improve it (are the experiments done properly, are the results interpreted correctly, is there anything missing, and what can be done next).

**Participation and in-class exercises: 20% of the final grade.**There will be homework assignments and in-class exercises using Learning Catalytics, which will help you understand the lecture concepts and prepare for exams.

**Extra credit opportunities**may be offered, such as to attend and report on a major conference or seminar at Tech related to class, etc. If these become available, they will be posted as announcements on Canvas.

Near the end of the semester, if >80% of the class performs the on-line course critique, everyone in the class will receive 1 point; if >90% reply, everyone will earn 2 extra credit points.

**CALCULATION OF FINAL GRADE:**

Your average for the course is calculated as follows:

Mean of the scores on 4 of the 5 lecture exams (having dropped the lowest lecture exam score) = 40%

Score on the final exam = 20%

Paper critique = 20%

Class participation score = 20%

The letter grade is assigned by the scale:  A= >90; B= >80, C= >70, D= >60, F= <60.  Grades are not “curved,” but fractions are rounded to the nearest number (e.g., 79.6 -> 80). **Comment about not curving the grades**:  the instructors examine the class responses to each question of each exam and if we discover that performance was lower than expected on a given question due to deficiencies in the design of the question, we adjust the points immediately and inform the class when the exam grades are posted.  **If you disagree with the points that have been awarded to you on an exam:**  you should report this to the TA within a week after you have received the grade to determine if the error was merely a miscalculation.  If you disagree with the number of points that have been awarded by the TA, you should contact the instructor who prepared the question (or assigned the paper) within two weeks (thus, you have one week to check with the TA first, then another week to consult the professor, if you deem necessary).  You are welcome to do this, however, you should examine your answers carefully first.  TA’s sometimes give more points for an answer than the instructor would, so review of your answers by the instructor might reduce your grade rather than increase it, if your argument for why your grade should be higher is not strong.

**THE HONOR CODE AT GEORGIA TECH:**All students are required to adhere to the Georgia Tech Academic Honor Code ([www.honor.gatech.edu (Links to an external site.)](http://www.honor.gatech.edu/)). This includes, but is not limited to, the following issues that pertain to the oral and written critiques, mnemonic tools, and exams for this class:

1. Plagiarism is not allowed. Plagiarizing is defined by Webster’s as “to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source.”

In simpler terms: When you use any phases, sentences, etc. verbatim from another source, they must be identified by quotation marks and citation of the source. In scientific writing, it is generally preferable to rephrase information from other sources and cite the source rather than use the same text, even when you offset the text with quotation marks. When you show diagrams, models and other materials that are not your own, the sources must also be identified.

In science, it is assumed that most of what you write or say has come from another source, even if you are assembling the information into a hypothesis or conclusion that is uniquely your own.  Therefore, you are expected to acknowledge those sources. These rules apply both to published information and information that you might receive from another student, website, previous class report, etc.

Plagiarism will be dealt with according to the GT Academic Honor Code.

1. Unless specifically identified as group work; quizzes, tests, take–home-tests, homework, etc. are to be completed alone.
2. For Quizzes/Tests: Cheating off of another person’s test or quiz is unethical and unacceptable. Cheating off of anyone else’s work is a direct violation of the GT Academic Honor Code, and will be dealt with accordingly.
3. Because the exams for this course change every semester, students may use old tests as study tools.

For any questions involving these or any other Academic Honor Code issues, please consult the professors, teaching assistant, or [www.honor.gatech.edu (Links to an external site.)](http://www.honor.gatech.edu/).

**Office of Disability Services**

Some student also benefit from assistance from the Georgia Tech disability services office, and if you think they can be helpful, we encourage you to contact them ([http://disabilityservices.gatech.edu/ (Links to an external site.)](http://disabilityservices.gatech.edu/)). Sometimes students have difficulty taking an exam when uncomfortably crowded between other students, so if that happens to you, feel free to move to another seat in the room (there are usually several at the front), and we’ve occasionally had students take the exam in the hallway.

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|  **Class #** | **DAY** | **DATE** | **Chap** | **LECTURE TOPIC** | **Lecturer** |
| 1 | MON | 10-Jan | 1 | Introduction to Cells and Cell Biology | JC/SN |
| 2 | WED | 12-Jan | 2 | Chemical Foundations | JC |
| 3 | FRI | 14-Jan | 3 | Protein Structure and Function | JC |
|  | MON | 17-Jan |  | Institute Holiday |  |
| 4 | WED | 19-Jan | 4 | Culturing and Visualizing cells | JC |
| 5 | FRI | 21-Jan | 5 | Basic Molecular Genetic Mechanisms | JC |
| 6 | MON | 24-Jan | 6 | Molecular Genetic Techniques | JC |
| 7 | WED | 26-Jan | 6 | Molecular Genetic Techniques | JC |
| 8 | FRI | 28-Jan | 8 | Genes, Genomics, Chromosomes | JC |
| 9 | MON | 31-Jan | 8 | Genes, Genomics, Chromosomes | JC |
| 10 | WED | 2-Feb |  | EXAM 1 |  |
| 11 | FRI | 4-Feb | 7 | Membrane Structure | JC |
| 12 | MON | 7-Feb | 11 | Transport of Ions & Small Molecules | JC |
| 13 | WED | 9-Feb | 12 | Cell Energetics | JC |
| 14 | FRI | 11-Feb | 13 | Moving Proteins into Membranes and Organelles | JC |
| 15 | MON | 14-Feb | 14 | Vesicular Traffic, Secretion, and Endocytosis | JC |
| 16 | WED | 16-Feb | 14 | Vesicular Traffic, Secretion, and Endocytosis | JC |
| 17 | FRI | 18-Feb |  | EXAM 2 |  |
| 18 | MON | 21-Feb | 9 | Transcriptional Control of Gene Expression | SN |
| 19 | WED | 23-Feb | 9/10 | Transcriptional/Post-transcriptional Control  | SN |
| 20 | FRI | 25-Feb | 10 | Post-transcriptional Gene Control | SN |
| 21 | MON | 28-Feb | 15 | Signal Transduction and G-protein receptors | SN |
| 22 | WED | 2-Mar | 16 | Signaling pathways | SN |
| 23 | FRI | 4-Mar | 16 | Signaling pathways | SN |
| 24 | MON | 7-Mar |  | EXAM 3 |  |
| 25 | WED | 9-Mar | 17 | Cell Organization: Microfilaments | SN |
| 26 | FRI | 11-Mar | 17/18 | Cell Organization: Microtubules  & IF | SN |
| 27 | MON | 14-Mar | 18 | Cell Organization: Microtubules  & IF | SN |
| 28 | WED | 16-Mar | 20 | Integrating Cells into Tissues | SN |
| 29 | FRI | 18-Mar | 20 | Integrating Cells into Tissues | SN |
|  | MON-FRI | 21-Mar – 25-Mar |  | GT SPRING BREAK |  |
| 30 | MON | 28-Mar |  | EXAM 4 |  |
| 31 | WED | 30-Mar | 19 | Eukaryotic Cell Cycle | SN |
| 32 | FRI | 1-Apr | 19/21 | Eukaryotic Cell Cycle/Stem Cells | SN |
| 33 | MON | 4-Apr | 21 | Stem Cells, Cell Asymmetry & Cell Death | SN |
| 34 | WED | 6-Apr | 21 | Stem Cells, Cell Asymmetry & Cell Death | SN |
| 35 | FRI | 8-Apr | 22 | Nerve Cells | SN |
| 36 | MON | 11-Apr | 22 | Nerve Cells | SN |
| 37 | WED | 13-Apr | 23 | Immune Cells | JC |
| 38 | FRI | 15-Apr | 23 | Immune Cells | JC |
| 39 | MON | 18-Apr | 24 | Cancer | JC |
| 40 | WED | 20-Apr | 24 | Cancer | JC |
| 41 | FRI | 22-Apr |   | EXAM 5 |   |
| 42 | MON | 25-Apr |  | Course Wrap-up | SN/JC |
|  | FRI | 29-Apr |  | Final Exam (11:20-2:10) |  |

**The above schedule is subject to change – any changes will be communicated to the class by email and Canvas announcements as soon as possible.**

**Suggestions for studying:**  Here are suggestions from three sources about how best to learn the material in this course.

1. **General principles/approaches:**
2. a) Take notes by hand. Rewrite your notes, preferably no later than the evening of the class day. Do not just recopy your notes, but rather both condense and extend them where appropriate, paraphrasing them so that you make the meaning your own.
3. b) Develop relationships with other class members and form study groups if you can, so you can convert the information from a passive mode into an active mode, as you discuss it with others.
4. c) Work “what if” scenarios and practice problems: study the text and lecture information, then ask yourself (and/or study team members) questions about it to ensure you really know it.  If there are mathematical relationships, think of practice problems using them.
5. d) Enter the tester’s mind by asking yourself (or team members) what are the most important things in each section, keeping in mind both that you need to know the concepts involved and the appropriate vocabulary to describe the process. You can take the exams from previous semesters to see if your level of questioning is similar to the instructors, but do not study the exams because most of the questions are made fresh every semester.
6. e) Set attainable study/learning goals so the time you allocate to studying this course is used most effectively. For examples:  If you learn best from the notes with supplementation from the textbook, do not read the textbook first and end up using all your study time getting halfway through the chapter and having none left to review the notes.  If you start your review by recopying the diagrams in the notes from memory, do not get bogged down in trying to exactly recapitulate the artwork when a simpler sketch will describe the main ideas adequately.
7. **Learning suggestions from Dr. Merrill**(who was the lead instructor for this course for many years):

As you study the material, ask yourself:

1)  What fundamental cell biology question is this addressing?  For example:  How do proteins get from their site(s) of synthesis to their ultimate destination(s) in cells?

2)  Then, imagine that you have been asked this question by someone you know, and you are answering it for them….

3)  …and they keep asking you for clarification--”Okay, but how does that work?”  “How does the cell turn that on and off?” “What happens after that?” “ What use is that?”

4)  Repeat this exercise until you think you have been able to explain how the process works using the appropriate terms that apply to the steps you have had to explain. You will retain this vocabulary of new terms and concepts longer than if you try to memorize them as items on a page.

**III. Comments/suggestions from previous students who have done very well on the exams:**

>I have learned … to focus heavily on the lecture slides, and to completely understand every word and mechanism discussed in these slides. As I go through the lecture slides, I look at the corresponding book material, focusing only on the picture captions for diagrams discussed in class and the text descriptions of the complex mechanisms. Thus, I refer to the book more as a secondary reference to clear up material that I find confusing from lecture. I find the section summaries in the textbook to be very helpful for understanding big concepts as well. I also look through all the old practice exams and make sure to not only understand what the correct answer is and why, but also why the other answer choices are wrong. I have found these methods of studying to help me on past exams, and I hope they can be of some assistance to other students.

>I hear people say Biology is all about memorization, but I completely disagree. In fact, I can't memorize anything I don't understand. I believe they should do the same, i.e. understand all the concepts before resorting to memory.

>It's always helpful for me to read the book, before or after class. It helps keep what you're learning on track and in a way put it all in better context.  [this is only true, however, if you can read fast enough to keep up with the class; otherwise, it can make you get behind]

>A studying technique that's been VITAL for me: Here's how I studied for the last test. I went to the Molecular Science and Engr. Bldg, picked an empty classroom and started lecturing!! Granted I sounded crazy for being alone in there and talking to myself for hours, but it was an extremely beneficial experience for me. (1) It prevented me from getting bored as opposed to when sitting and studying on some desk. (2) It allowed me to realize how much I do or don't know about a concept and act accordingly. (3) If you really convince yourself that you're in a real classroom, it would allow you to think like a teacher, elaborate on concepts, and be better prepared for the test.

>To do well … in Cell Bio in general, after studying I'd take the old tests posted on T-square and make sure I know how to answer the questions, not remember the answers.

>My advice to other students would be to look over the parts of the book that were covered in the powerpoints, especially if they don't understand the pictures/figures. I also tend to jot down a few notes when reading over sections of the book just to make sure that I understand the concept.

>The method that I have found most helpful when studying … has been to teach the material to another person, while using the slides and my notes as prompts. Obviously, it's best to have studied some before doing this, so that it's not just reading off the slides. I find this to be more interesting than staring at the pages for hours and involving another person adds motivation and focus, since it is embarrassing to fumble with the information in front of someone else. Additionally, being asked questions by a motivated listener really helps me pick out which areas I need to work on. For me, this is the best method, particularly because I am interested in becoming a professor, but it can be time consuming. Generally, I would recommend small study groups, since it is easier to ask questions and be involved. Removing the answers from the old exams before looking at them and waiting until after studying to attempt the old exams are also helpful because it is easier to identify what has been effectively learned and which topics need to be reviewed.

These suggestions are provided as “food for thought” and we hope you have, or are successful in developing, method(s) that work well for you. Feel free to discuss this with the instructors if you are having difficulty learning the material and doing well on the exams.

**Stress management:** We find that some students have difficulty with stress while taking this course, with a lot of factors coming into play: it covers a lot of material; the students who take it come from a variety of backgrounds; many of the students have a heavy load of other courses and outside activities that compete for their time; and—being a 3000-level course--the format is more “open-ended” than most (or all) of the courses that the students have taken previously.  By “open-ended” we mean that the goal of the course is not just to survey the major concepts and processes in cells at a molecular and cellular levels, but also to prepare students for future developments in the field by discussing recent research publications and broader implications of the subject.

The first way to control stress about the course is to keep up-to-date with the course material, being careful to prioritize your time in dealing with it.  Most students find the class ppt and notes to be the best place to start, then use the textbook to further explain topics that you do not understand from the notes, as well as to read about topics that were not covered but interest you.  If, however, you are the type of student that learns best from the textbook, feel free to use your preferred method to learn the material, but notice which topics are emphasized by the instructors (by what they covered in class--you do not need to learn everything in the textbook, so do not let it scare you).  We think you will find it useful to study with others; however, this doesn’t work for everyone, and you can be just as successful at learning the material by teaching it to an “imaginary friend” as long as she/he is able to ask questions about it to ensure you know what you are talking about!  See the section above about study methods, if you think it might also help.

The Counseling Center is committed to helping Georgia Tech students manage their stress so that they can succeed. They have a variety of brochures and programs devoted to this important skill of stress management. You can get them by going by the counseling center to pick up a brochure or you can download it from their web site, which also has videos on stress and strategies for dealing with stress:   [http://www.counseling.gatech.edu/plugins/content/index.php?id=32 (Links to an external site.)](http://www.counseling.gatech.edu/plugins/content/index.php?id=32)