# BIOLOGY 141 (INQ, WR) CELL BIOLOGY AND GENETICS SYLLABUS

## SPRING SEMESTER 2016 SECTION 10A

**Professor:** Dr. Elizabeth Gleim **Office:** OSB 310 **Phone:** 770-784-4745
**Lecture Hours:** MWF 10:45 AM – 11:50 AM **Room:** OSB 115
**Lab Hours:** Wednesday 2:30-5:30PM **Room:** OSB 325

**Office Hours:** Monday 1:30-2:30 PM and Friday 2:00-3:00 PM. You may also catch me by chance in my office and if I am free I am happy to talk with you. Alternatively, you can e-mail or talk to me before or after class to make an appointment to meet at a time that works for your schedule.

**Required Texts:** *Campbell Biology*, Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V., and Jackson, R.B. 10th edition, Benjamin/Cummings Publishing, 2014; *Practicing Biology*, Heitz, Jean and C. Griffen. Benjamin/Cummings Publishing Co., Inc. 2014.

**Required Lab Text:** SYMBOSIS: *Investigating Biology*, 8th ed. Morgan, J. G. and M. E. B. Carter. Benjamin/Cummings Publishing Company, Inc., 2014. A customized edition published for BIO 141 is available ONLY in the bookstore. ***Used lab manuals are not permitted.***

**Optional Writing Book:** *A Student Handbook for Writing in Biology*, Karin Knisely, 2013, 4th edition, W.H. Freeman and Co. This is a great resource for writing, and is also on reserve in the library.

**Web Site:** *MasteringBiology* provides online study materials, practice exams, learning activities and strategies for success. *www.masteringbio.com* Your text may include access to this site, if not you can purchase access.

**Course Objectives:** The purpose of this course is to give you a firm foundation in the underlying themes of biology. You will study living organisms, cell structure and function, genetics, and evolution. You will first develop an understanding of the chemical molecules that make up the structure of a cell and how these molecules govern cell function. Secondly, you will study the fundamentals of cell function, including transport across cell membranes and energy transformation in living cells. Thirdly, you will learn the basic mechanisms of cell reproduction, inheritance of biological traits, and processing of genetic information. You will also develop an understanding of gene transmission within populations and how genes are responsible for the evolution of populations. Finally, a very important objective of this course is teaching you to "think and act like a scientist" through methods of scientific inquiry and the practice of deductive reasoning. Mastering these fundamental themes of biology will prepare you to further explore the more intricate and specialized areas of this field. *This course fulfills the Inquiry (INQ) and Continuing Writing Requirement (WR).*

| Date | Topic | Assigned Reading |
|---|---|---|
| W, Jan 13 | Science as a Way of Knowing | 1 |
| F 15 | Major themes in Biology | 1 |
| | | |
| M 18 | Martin Luther King Day – no class | |
| W 20 | Hierarchies: beginning with living chemistry and water | 2,3 |
| F 22 | Building biological macromolecules: carbohydrates and lipids | 4, 5 |

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|---|---|---|---|
| M | 25 | Proteins and nucleic acids | 5 |
| W | 27 | Structure and function revealed in cells | 6 |
| F | 29 | Cell biology - Problems/Case Study | |
| | | | |
| M, Feb | 1 | Membrane structure and cellular transport | 7 |
| W | 3 | Transport problems | |
| Th | 4 | *Scientific Literature & Research (Required, Rm TBD) 8:00 – 8:45am and 9:00 – 9:45am* | |
| F | 5 | Fundamentals of energy transformations: enzymes, ATP and electron carriers | 8 |
| | | | |
| M | 8 | Cellular respiration I - Glycolysis | 9 |
| W | 10 | Cellular respiration II - Transition and the Krebs Cycle | 9 |
| **Th** | **11th** | **EXAM I 8:00 - 9:30 a.m. (through membrane transport)** | |
| F | 12 | *Presentation of Scientific Data – bring your lab data and laptop to class* | |
| | | | |
| M | 15 | Cellular respiration III – Chemiosmosis and The Electron Transport System | 9 |
| W | 17 | Review and recapitulation: Accounting Day | |
| F | 19 | Homage to photosynthesis | 10 |
| | | | |
| M | 22 | Photosynthesis I: the light dependent reactions | 10 |
| W | 24 | Photosynthesis II: the light independent reactions and variations (C4 and CAM) | 10 |
| F | 26 | Cell reproduction: cell cycle, mitosis | 12 |
| | | | |
| M | 29 | Sexual life cycles and meiosis | 1 |
| W Mar. | 2 | Chromosomal mutations | 15 pp. 304-307 |
| **Th** | **3** | **EXAM II – 8:00 – 9:30 a.m. (through photosynthesis)** | |
| F | 4 | Mendelian principles; genes and chromosomes | 14, 15 pp 292-295 |
| | | | |
| March 7-13 | | *****SPRING BREAK**** | |
| | | | |
| M | 14 | Patterns of inheritance | 14 pp. 276-288 |
| W | 16 | Chromosomal theory and linkage | 15 |
| F | 18 | Genetics problems and review | 14, 15 |
| | | | |
| M | 21 | DNA structure | 16 |
| W | 23 | DNA replication | 16 |
| Th | 24 | *Effective Presentations Workshop – in classroom 8:00 – 8:45, 9:00 – 9:45 a.m. Two members from each research group must attend* | |
| F | 25 | Gene to Protein I: transcription and the genetic code | 17 |
| | | | |
| M | 28 | Gene to Protein II: translation and genetic mutations | 17 |
| W | 30 | Modeling Beyond Watson and Crick | |
| F Apr. | 1 | Molecular genetics workshop | |
| | | | |
| M | 4 | Charles Darwin and development of evolutionary concepts | 22 |
| W | 6 | Evidence for evolution | 22, 25 pp 519-530 |
| **Th** | **7th** | **EXAM III - 8:00 – 9:30 a.m. (through genetics)** | |
| F | 8 | Genetic Variation, Population Genetics and Hardy-Weinberg | 23 |
| | | *Scientific Papers – "Ask THE EDITORS" 2:30-3:30 p.m., in classroom* | |

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|---|---|---|---|
| M | 11 | Microevolution: genetic drift, gene flow and mutation | 23 |
| W | 13 | Selection and Speciation | 23, 24 pp 500-513 |
| F | 15 | Evolution of land plants<br>*Research papers due in class* | 29 |
| M | 18 | Bryophytes and seedless vascular plants | 29 |
| W | 20 | Seed plants: gymnosperms and angiosperms | 30, 38 pp 822-826 |
| F | 22 | Sexual Encounters of the Floral Kind | 38 pp. 815-821 |
| M | 25 | Evolutionary trends in land plants & Big Themes Revisited | |

***** FINAL EXAMINATION ***May 2nd, Monday, 9 a.m.- 12 p.m.*****

# BIO 141 Wednesday Laboratory Schedule

## Spring 2016

| **Date** | | **Lab Topic (#)** | **Writing Assignment*** |
|---|---|---|---|
| Jan. | 27 | Scientific Investigation | Materials and Methods; Title page |
| Feb. | 3 | Microscopes and Cells | Review table** |
| | 10 | Diffusion and Osmosis | Introduction; References |
| | 17 | Enzymes | Table; Figure |
| | *19* | *Respiration/Fermentation Proposal posted to Blackboard by 2:30 p.m.* | |
| | 24 | Cellular Respiration and Fermentation | Figure; Results; Discussion; References |
| | **25** | **(Thur.) LAB EXAM (thru Enzymes)†** | |
| Mar. | 2 | Mitosis and Meiosis<br>Research Teams: Proposal Development<br>*Team Research Proposal submitted to Blackboard on Friday March 4th by 2:30 p.m.* | Comparison Table** |
| | 7- 13 | ***** SPRING BREAK ***** | |
| | 16 | Field Research: Ecology and Evolution on the Outcrops | |

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|---|---|---|---|
| | **17** | **(Thur.) LAB EXAM (Mitosis and Meiosis)†** | |
| | 23 | Microbial Diversity (Bacteriology) | *Research papers due in class 4/15* |
| | 30 | Research Symposium<br>*Technology Rehearsal - Upload and check your presentation at 2:30!* | |
| Apr. | 6 | Molecular Biology | Map** |
| | 13 | Plant Diversity I & II | |
| | 20 | Bioinformatics: Molecular Phylogeny of Plants | *Report completed in lab* |
| | **21st** | **(Thurs.) LAB EXAM (Bacteriology, Molecular Biology and Plant Diversity I & II)†** | |

***Writing assignments are due one week later at the beginning of the lab period unless otherwise noted.**
******These assignments are **not** turned in for a grade
†Lab exams are scheduled in several sessions on Thursday afternoon and evening; session sign-ups will occur in class.

# Important Dates for Biology 141

## (Includes lab and out of class sessions)

February:

| | |
|---|---|
| 3 | Materials & Methods; Title page due in lab |
| 4 | *Scientific Literature Workshop, preliminary references due (required)* |
| 17 | Introduction; References due in lab |
| **11** | **Exam I** |
| 12 | *Effective Data Presentation Workshop – bring your data and laptops to class* |
| 19 | Respiration/Fermentation proposal due on Blackboard by 2:30 p.m. |
| 24 | Table; Figure due in lab |
| **25** | **Lab Exam I** |

| | | |
|---|---|---|
| **March**: | 2 | Figure; Results; Discussion; References due in lab |
| | 3 | Exam II |
| | 4 | Laboratory research project proposals due on Blackboard by 2:30 p.m. |
| | **17** | **Lab Exam II** |
| | 24 | *Effective Presentations Workshop (2 group members must attend)* |
| | TBA | Advanced Literature Search Techniques - Optional |
| | 30 | Research symposium (*Technology Rehearsal 2:30 p.m.)* |
| **April:** | **7** | **Exam III** |
| | 8 | *"Ask the Editors" session 2:30 p.m*. |
| | **15** | **Research paper due in class** |
| | 20 | Molecular phylogeny report completed in lab |
| | **21** | **Lab Exam III** |
| **May:** | **2** | **Final Exam, 9AM-12PM** |

# Expectations, Evaluation and Tips for Success in Biology 141

*Welcome to Biology 141! Please read carefully and follow the information in this handout and any accompanying materials. You are responsible for understanding all of the information presented here, so please ask questions if needed. Please pay attention to any changes to the syllabus as some information may be subject to change during the semester.*

Introductory Biology (141) is designed for students who **plan to major in biology or neuroscience and behavioral biology (NBB)**, attend **professional school in a health related field, or have a strong background in biology** and have chosen biology to fulfill their distribution requirements. This may be one of the more difficult courses you will take, as you will be expected to not only memorize biological concepts and mechanisms, but have a strong enough grasp and understanding of these concepts and mechanisms to apply and think critically about them---in short, you will begin the process of learning how to think like a scientist. The material you learn in this course and the shift in thinking about science critically will serve as a foundation for the rest of your course work in biology and beyond; because of this, it is critical that you succeed in this course. Many of you in the future will be applying for summer jobs and internships and further down the line taking examinations to enter graduate or professional schools and/or applying for jobs in science and the knowledge and skills you gain here will be required for your success.

Tips for Success: Biology 141 is an intensive course and requires time. To perform well in this course, you must develop a proper plan for managing your time and your work, beginning from the first day of class. The following are some good study habits that will help you succeed in BIO 141:

- **Keep up with assigned readings.**
  - **How to Read Effectively:** Take the time to summarize what you read in your own words in the form of notes that can later be used to study. This will help you learn what you've read while also allowing you to determine any questions you might have which you are encouraged to ask in or outside of class. Finally, don't skip the figures, for many people they are more helpful than the text.

- **Take good notes.** In lecture, I will explain the most significant concepts from your readings and present images and examples that may not be in your textbook. You are responsible for all of this information. I strongly recommend taking notes on the printed power points that I provide so that they correlate to specific slides. Review your notes frequently.
  - If I say "write this down" or "this is important"---write it down. Even if you think you'll remember it, write it down anyway and put a star by it. That information may very well re-visit you!

- **Review material on a regular basis.** Take time to review the lecture PowerPoint's, your notes, handouts, and worksheets at least once a week if not more frequently. While you are reviewing material, practice writing out pathways and re-working questions from worksheets and other study guides.

- **Do the worksheets and check your answers.** You will be given many ungraded worksheets and handouts throughout the semester. These worksheets and handouts are a way for you to organize and learn material and/or practice applying your knowledge and critical thinking skills. It is almost guaranteed that the types of questions you answer on worksheets will also be on exams. *Be sure to check your answers to ensure that you are learning correctly*. Answer sheets are available on Blackboard for almost all handouts and most worksheets are also covered in SI. If you are struggling with a particular worksheet or question: 1) Attend SI, most worksheets are covered 2) Check answers and/or work on the handouts in a study group, or 3) Come see me and we can work through things together.

- **Take advantage of your resources:** Attend SI on a regular basis, attend open labs, and attend optional sessions. Finally take advantage of my office hours or make an appointment to get individual assistance. I am always happy to help. *The importance of these resources cannot be overstated!*

- **Keep this in mind**. In this course we hope to lay your foundation as a biologist. This means that we expect you to not only learn foundational knowledge (i.e. terms, concepts, processes, etc.) but to also be able to apply and integrate this knowledge in meaningful ways. *Both* of these tasks take work and practice. Thus, studying should always be a two-step process 1) Learn the foundational knowledge, 2) Learn how to apply and integrate this knowledge. Only doing step one will not be sufficient in this course! To practice and learn how to do step two, make use of the in-class worksheets and handouts, mastering biology website, and questions at the ends of sections and chapters in your textbook.

- **Lab is equally important!** Please read your lab manual BEFORE lab and pay attention to the details. During lab, take good notes and make detailed observations---drawings can often be helpful. Always ask yourself, have I taken thorough enough notes that if I revisit these in a few weeks, I will 1) remember the purpose of each reagent and piece of equipment used & identify organisms studied, 2) remember why I did things the way I did, 3) be able to interpret and understand data? Answer all questions in the lab manual either during lab or immediately following lab. Review the objectives and prepare a study guide for the lab materials and activities on a weekly basis.

**Supplemental Instruction**. SI is provided for all students in BIO 141. I will explain this important program that provides assistance for all students who wish to improve their performance in biology. The BIO 141 SI leader for this section is **Athira Penghat**.

**Ways of Inquiry (INQ).** Biology 141 is designated as a "Ways of Inquiry" or INQ course. In INQ courses, students "understand and question the way knowledge is sought by actively learning and practicing the discipline's approaches to inquiry" (INQ Vision Statement). In Biology 141, you will have many opportunities to engage in biological inquiry by asking questions, designing experiments, reading and writing critically, and working independently to seek knowledge.

**Absences**. Your attendance in this class is crucial to your success in this course. Not only will you receive information in class that is not necessarily available in your text or power points, but this is also a highly participatory course. Indeed we often have discussions, individual, and group in-class exercises that are

crucial for your understanding. Please read carefully the absence policy that is handed out separately from this syllabus as you will be responsible and held accountable for this information.

**Cell Phones:** The use of cell phones (texting, ringing, etc.) is strictly prohibited in the classroom and the laboratory. Please turn off your phone before you come to class (or just don't bring it!) and leave your phone at the front during exams. If you feel that you have a legitimate need to use your phone or leave the ringer on, please speak to me *before* class. ***Photography with camera phones is also prohibited in lab and lecture.***

**Personal Computer/ Tablet.** Personal laptops and tablets may not be used in class unless you have received special permission from the instructor. Use of laptops to surf the web, login to Facebook, and/or online chat during class is completely unacceptable and may result in you losing your privilege to use a laptop if you did have prior permission.

**Honor Code**. All examinations and all work for credit in this course come under the regulations of the Honor Code. You turning your work in attests to your upholding the Honor Code. Please read the information on **plagiarism** on the Library web page and always ask if you have any questions about assignments. Note that writing assignments will be submitted to **SafeAssign on Blackboard.**

**Office Hours.** I would like to encourage you to meet with me in person about any concerns or questions that may arise during the semester. I want you to succeed in this course and am here to help in whatever capacity that I can. I have scheduled specific office hours but if these times are not suitable for you, please do not hesitate to make an appointment with me for a different time or just drop by.

**Blackboard Site:** Blackboard will have announcements, your syllabus, power points, answer keys, and other helpful resources. Your SI, TA, and I will email you from Blackboard with important announcements and information so do be sure that you are set-up to receive these messages. You will also upload all writing assignments to SafeAssign via Blackboard.

**Additional Required Sessions.** We have two required and two optional additional instruction sessions in this course for writing, library and information technology. These sessions are held outside of class time and are critical for your laboratory assignments.

**Exam Protocols.** Any item/s you bring to class with you the day of an exam must be left at the front of the room. This includes but is not limited to backpacks, folders, notecards, coats, calculators, and cell phones (which must be turned off or silenced). Do not come to any exam with notecards or cell phones in your pockets or on your person; finding either of these items on your person during an exam is a breach of the Honor Code. No hats or hoodies can be worn while taking an exam. Do not write notes, study material, abbreviations, or material that can be construed to be these on your body. Check for such notations and remove before the exam time as these are considered to be a breach of the Honor Code.

**Evaluation Criteria:**

- *Examinations* - There will be three lecture exams, each worth 100 points, including multiple choice, matching, short answer and short essay questions. Exams will cover all material in lecture in addition to assigned textbook readings and other supplemental materials. The final

examination, worth 175 points, will be both a comprehensive final exam and your last regular exam. There are three laboratory exams, the 1st and 3rd are worth 50 pts. and the 2nd is worth 35 pts. Each lab exam covers topics covered in lab as well as *all* material in your lab manual. The lab exams will include a practical and a written portion.

- *Scientific Writing and Laboratory Project* - You will write individual sections of a scientific paper for specific laboratory exercises. The lab also involves a group independent investigation as a research project. For this laboratory, you will prepare a group symposium presentation and write an individual complete scientific paper. Specific instructions will be provided in lab. This course meets the Continuing Writing Requirement (WR).

**Evaluation Points:** Students are evaluated on their performance in the classroom and the laboratory. The following is the distribution of points:

| | |
|---|---|
| 300 points | 3 lecture exams |
| 135 points | 3 laboratory exams |
| 175 points | final examination |
| 35 points | scientific writing |
| 75 points | lab project |
| **720 points** | **total** |

Final grade determination:

| | |
|---|---|
| 90 – 100% | A |
| 80 – 89% | B |
| 70 – 79% | C |
| 60 – 69% | D |
| <60 | F |

Plus and minus grades are given

***The instructor reserves the right to adjust dates, topics, and any other aspect of the lecture and lab syllabi if she determines it is necessary.***