



The mission of Concord University is to provide quality, liberal arts based education, to foster scholarly and creative activities and to serve the regional community (<http://www.concord.edu/academics/>).

Course Prefix, Number and Title: BIOL 401 and 401L Genetics

Course CRN # and Section: 20026 01 (lecture); 20027 1A, 20028 1B (labs)

Semester Taught: Spring 2019

Professor: Darla Wise

Credit Hours: 4

Office Location: A-232

Prerequisites: BIOL 302; CHEM 331; MATH 105

Hours: M –11, 1; W-11; R-8; F-8

Course Time (if applicable): 10 MWF; 2:30 T, W

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College/Department

Website:<http://www.concord.edu/biology/>

Course Description/Rationale: Mendelian, cytological, microbial, molecular, and population genetics. Includes the human genome project, bioinformatics, and the legal and ethical considerations of public genetic information.

BIOL 401/401L is a senior level course for all biology students, as many of today's technologies are increasingly more DNA/genetics based. As an upper level class, it is reliant on information learned earlier in the program curriculum. This information includes: plants and animals as organisms, ecology, cell biology, mathematics, chemistry (inorganic, organic, and biochemistry), and physics. In addition to the science, the impact of genetic-based technologies on society is also examined. Therefore, BIOL 401 is an "interdisciplinary" course. Further, this course is more "student self-reliant" in orientation, meaning that the student is more responsible for their learning in an independent manner. Programmatically, the course is designed to encompass knowledge from lower level core courses and aid students in working independently, skills needed for jobs, graduate, or professional schools. In addition to the traditional areas, newer areas of genetics are introduced, including pharmacogenomics, epigenetics, and others. Successful completion of this course fulfills the BIOL 401 requirement for all areas of emphasis in biology.

Course Management System (Blackboard/Moodle or other systems): Moodle

Course Communication: Additionally, students are encouraged to enroll for the course Remind 101. To enroll, text to **81010**, the message @**biol401**. This will enable me to text information to the class for

various class announcements. Due to changes in some phone plans beginning 1/27/19, make sure to download the mobile app or enable email notifications for Remind—both of which are free of charge. If you have Verizon, for example, you will no longer receive class text messages if you do not follow these directions. If you are not able to use your cell phone, you can access remind online to see if class messages are available.

Hardware/Software Needed (include privacy policies, if applicable): A computer with internet access and a web browser compatible with Moodle. Moodle's privacy notice is available at moodle.org.

Text requirements:

Required

- 1) Griffiths, et al. *An Introduction to Genetic Analysis*, 11th edition.
- 2) Mukherjee, S. 2016. *The Gene: An Intimate History*.

Required Materials for Lab:

- 1) If you have long hair, a rubber band or other holders to tie your hair back.
- 2) A Sharpie marker to label plates and tubes.
- 3) Goggles.
- 4) Bound Composition (stitched binding) notebook (can be either lined or grid).

Concord University Educational Goal(s):

Skills: 1, 2, 3, 4, 5, 7

Knowledge: 1, 3, 5

Attitudes: 1, 3, 7

** Refer to the list of Educational Goals as listed in the current Academic Catalog for more information.*

National Standards (if applicable) For example, NCTM, IRA, CAEP, etc.: N/A

Specific Learning Outcomes

Goals:

1. Learn aspects of the historical development of genetics and society's response to that understanding. Further, to communicate how society understands genetics and how this impacts science today with regard to current genetics-based issues.
2. With an interdisciplinary perspective, examine the societal aspects of DNA-based technologies on societies, including: genetically modified organisms, human cloning, embryonic genetic screening, vaccine development, gene therapy, and others.
3. To understand that DNA-based inheritance is not solely nuclear and be able to communicate the different ways in which cytoplasmic-based inheritance can occur and how this affects genetic inheritance patterns.
4. Gain an understanding of the genome as something dynamic, rather than static. Further, how the environment and other non-genetic factors influence the phenotype of an individual, in addition to the genetic factors.
5. To work and learn independently with guidance from the instructor. Within group activities, learn responsibility for your contribution to the effort, work as a team, deal with team problems, and develop leadership skills from working as a group.
6. Gain an appreciation of the inheritance of traits at both the individual and population levels. The student should be able to calculate probabilities and analyze inheritance from these types of information and explain the pattern.

7. Understand the mechanisms of prokaryotic and eukaryotic gene regulation, how these mechanisms compare and contrast, and how they influence expression of genes.

8. Using *Drosophila* as a model organism, start with a parental (P1) generation, hypothesize the genotypes and phenotypes of the F1 and F2 generations, collect and analyze data, and communicate in writing the results and how they compare to the original hypothesis effectively.

9. To understand how gene linkage can affect inheritance patterns and how this can be used to map genes relative to one another.

Objectives:

1. Define the science of genetics and describe the general methods used in the study of genetics; including some of the history of science, historical genetics, and current uses of genetic information.

2. To understand how traits are inherited and use this understanding in genetic analysis (problem solving and pedigrees).

3. Describe comparisons and contrasts between prokaryotic and eukaryotic gene regulation and genomic structure and how these relate to evolution and current taxonomic structure.

4. Perform basic genetics-based laboratory techniques, including the proper handling of *Drosophila* cultures, aseptic technique, staining, and methods of assessing various genetics parameters, probability, etc.

5. Understand the structure of the bacterial, viral, and eukaryotic genomes, gene regulation, natural methods of genetic transfer and the impact on the diversity of organisms.

6. Based on inheritance patterns, be able to determine whether or not genes are linked, and if so be able to calculate the distance between genes and draw a map of the genes.

7. Describe the molecular basis of genetics and describe how it functions as a mechanism of evolution.

8. Use statistical analysis of large numbers of genetics-based data to either verify or refute hypotheses.

9. Based on given information, determine if a particular phenotype is inherited in a nuclear or cytoplasmic fashion.

10. Learn and describe how epigenetic factors affect expression of phenotypes for various traits. Further examine the use of known epigenesis in the manipulation of the genome.

11. Communicate effectively the impacts of genetics-based scientific advances from a general public perspective; includes legal and ethical aspects of genetic genomic science.

12. Conduct an in-class research project using *Drosophila* as a model organism.

13. Develop in-depth analysis of genetics at the population level and how this impacts prevalence of genetic diseases, etc.

14. Examine the new science associated with CRISPR activity in gene editing and the potential treatment of genetic conditions. Discuss the legal and ethical aspects to such treatments.

Course Approach: The Team-Based Learning (TBL) approach will be used in this course. TBL advocates self-directed learning of course content and will facilitate your application of new knowledge within small collaborative teams and full classroom discussions. Many of you will be heading to professional programs, most of which follow the TBL method.

- TBL requires you to be prepared for and attend all classes (some absences can be accommodated, as indicated by the instructor). Your participation will provide you with the opportunity to learn from your peers, as well as work and negotiate within your team.
- The traditional lecture is one very good way to deliver information, but it's got a lot of competition. What makes the TBL classroom unique is that it brings students and instructors together where they can learn from each other. In a TBL class, lectures are very limited and are used almost exclusively to clarify questions that arise rather than simply imparting information.
- In a TBL class, students work in small groups that last the entire semester. Coming to class prepared is essential to your success and that of your team. To reward proper preparation you will

be tested on the first day of a module/unit, prior to discussion and questions on the material. These initial tests are completed on an individual basis.

- Following the initial exam and content discussion, an individual exercise – small assignment, class discussion, etc that allows you to apply the information associated with the module/unit and solidify your understanding.
- The final exam on the module/unit is based upon case studies. This exam is taken in two phases. It is taken individually (no grade), which gives you the opportunity to answer the questions and jot down your rationale for a solution prior to interacting with your peers. The next phase is the team exam where the group must discuss all answers and determine which they feel is the best answer to a question (graded).
- Your participation will be evaluated by your peers and will affect your grade.

What TBL is not:

- It is not normal group work – there will be no group work required outside of the classroom. Note that there *will be* individual work required outside of the classroom.
- Resource: adapted from Richard Woodward, Texas A&M.

Grading Policy and Scale, Make-up Policy, Late Work

Grades

I. Seventy-five (75) percent of the grade will come from the following:

A. Five Modules, comprised of thirteen units; each unit will be assessed with:

- Initial Quiz (10pts each)
- Individual activity (10pts each)
- Individual activity participation (10 pts each)
- Team quiz (20pts each)

Total: 650 points

B. One Module: Book

- divided into three portions; a written summary of each section (10 points each)
- participation in group discussions (10 points each)

Total: 60 points

C. Peer evaluations

- two peer evaluations at midterm and end of course (50 points each)

Total: 100 points

D. Comprehensive Final – May 10 @ 9A

- includes all module material and book material (200 points total); may include (but not limited to) essay, multiple choice, short answer, or true-false items.

Total: 200 points

Part I total points: 1010 points

II. Twenty-five percent of the grade will come from the following:

- Three laboratory exams (100 pts each)
- Fly Inheritance report (100 points)

Part II total points: 400 points

Total course points (part I plus part II): 1410 points

Grade Scale: A = 1269-1410 points; B = 1128-1269 points, C = 987-1127 points, D = 846-986 points, F = less than 846 points. Grades can be monitored throughout the semester on the Moodle Grade Center.

Attendance and Make-up Policy

Regular class attendance is part of a student's academic obligation at Concord. Irregular attendance may affect academic performance adversely and is detrimental to the atmosphere of a class. (See University Catalog Academic Policies and Procedures.)

All parts of many activities can be electronically submitted for full credit, except when in-class participation is required. In this case, the submitted materials will be worth half credit, as in-class participation cannot be replicated. The same is true for group activities, if your portion is complete but you were unable to work with the group, you can receive half credit by electronic submission of your portion of the work.

For those items to be turned in electronically, they must be turned in **on time** to receive full credit. Those late items submitted within three (3) days past the due date will receive a maximum half credit; those more than three (3) days late will not be accepted and will receive a zero (0). Those with extenuating circumstances will be remedied on a case-by-case basis.

Students are still responsible for materials and assignments even during inclement situations, as all materials will be made available on Moodle during these times, so as not to interrupt the educational process. Due dates may be shifted at the discretion of the instructor in cases of local extensive power outages.

Missed labs are difficult to make up but I will work with you, as best as possible, in light of your personal circumstances should this happen. Realize some materials/reagents are very expensive to prepare and have a relatively short life.

Course Timeline (Schedule of Assignments/Assessments/Presentations)

The following is a tentative class schedule for the semester:

| Week | Lecture Module | Laboratory Module/Exercise |
|--------|--|--|
| Jan 14 | Module 1, Unit 1 Review of Mendelian Inheritance | Lab Safety; Probability Exercise; Set up corn for population genetics (S-207) |
| Jan 21 | Module 1, Unit 2 Extensions of Mendel | Mendelian and Epigenetic Corn Analysis |
| Jan 28 | Module 1, Unit 3 Population Genetics | Corn population Genetics |
| Feb 4 | Module 2, Unit 4 Linkage Mapping I | <i>Sordaria</i> Linkage Mapping |
| Feb 11 | Module 2, Unit 5, Linkage Mapping II | Lab Exam #1 |
| Feb 18 | Module 3, Unit 6, Genomics | Bioinformatics - classic |
| Feb 25 | Module 3, Unit 7, Genome Dynamics I | Bioinformatics – 3 rd gen |
| Mar 4 | Module 3, Unit 8, Genome Dynamics II | Lab Exam #2 |
| Mar 11 | <i>Spring</i> | <i>Break</i> |
| Mar 18 | Module 3, Unit 9, Repair Mechanisms Book Summary & Discussion 1- 3/22 | UV Irradiation on yeast growth F1 data collection (S-207); set up F2 cross |
| Mar 25 | Module 4, Unit 10, Gene Regulation | Bacterial Gene Regulation; F1 data collection (S-207) |
| Apr 1 | Module 3, Unit 10, Viral Taxonomy Book Summary & Discussion 2 – 4/5 | F2 data collection (S-207) |
| Apr 8 | Module 4, Unit 11, Organelle Inheritance | F2 data collection (S-207) |
| Apr 15 | Module 5, Unit 12, Epigenetics Book Summary & Discussion 3 – 4/19 | Gene Regulation in the Lactose Operon (S-207) |
| Apr 22 | Module 5, Unit 13, Gene Imprinting | Legal and Ethical Considerations/GATACCA <i>Drosophila</i> paper due 4/26 @ 10A |
| Apr 29 | | Lab Exam #3 |
| May 10 | Final Exam @ 9A | |

Accessibility/Accommodations:

Concord University is committed to responding to the needs of students with disabilities as defined by the Americans with Disabilities Act. Please inform your instructor at the beginning of the class semester if you have a disability and are requesting accommodations. It is your responsibility to self-disclose that you are requesting accommodations. The University and instructor will provide you with a reasonable accommodation. You should register with CU's Disability Services Office, located in the Athens campus Jerry and Jean Beasley Student Center, Bottom Floor, across from the Campus Post Office. The Disability Services Office phone is 304-384-6086 or you can email the Director, Nancy Ellison, at nellison@concord.edu for assistance.

Academic Dishonesty

Academic dishonesty is morally unacceptable as well as destructive to the learning and teaching atmosphere. Academic dishonesty includes the giving or receiving of improper help on examinations or assignments, falsifying documents, and plagiarism (the act of stealing and using, as one's own, the ideas or the expression of the ideas of another). Such dishonesty can lead to a variety of penalties — including but not limited to failure of assignment, failure of course, loss of institutional privileges, or dismissal from the University. (See University Catalog Academic Policies and Procedures.)

Concord University Honor Code

A Concord University Honor Code was approved by students, staff, faculty, administration, and the CU Board of Governors. The Code states:

"As a member of the Concord University Community I will act with honesty and integrity in accordance with our fundamental principles and I will respect myself and others while challenging them to do the same."

The Honor Code is intended to unite the Concord community behind a culture of honesty, integrity, and civility.

Because of the nature of this course, some specific rules need to be mentioned:

- Individual work is your own, as is your contribution to a group activity. Your answers to homework, projects, exams, etc. are your own, unless an assignment is collaborative.
- It is understood that if group collaboration has not specifically been indicated for an assignment, the assignment is to be done as an individual.
- You will not make solutions to homework, quizzes or exams, etc. available to anyone else. This includes both solutions you have written and official solutions provided by online sources.
- The term "group activity" refers to working with the students in your designated group and not others in the class.
- Furthermore, violation of any of part of this Code of Conduct can result in a zero (0) on individual assignment(s) or test(s) or an "F" in the course for Academic Dishonesty as described in the current *Concord University Catalog*.

Emergency Alert System

In an effort to increase safety and security on our campus, Concord University encourages everyone to register for instant text message alerts. Alerts will only be used for security and safety notices. All students, faculty, and staff are eligible to receive text message alerts on their cell phones or email alerts. Please contact the IT Help Desk for further assistance (304-384-5291).

Emergency Information

Emergency/courtesy telephones are located at the main entrance of each residence hall and at various other locations on campus. Emergency telephones can be identified by the flashing blue light and will provide the user with a direct link to Public Safety at the press of a button. To report an on-campus emergency, call 304-384-5357 or 911. The Office of Public Safety is located on the bottom floor of the Rahall Technology Center. For further emergency information go to:

<http://www.concord.edu/administration/office-public-safety>.

Inclement Weather Policy

As a general policy, the University will remain in normal operations during adverse weather conditions. In the event of severe weather conditions, the following may occur:

University Closure

No students or employees are to report.

Classes Cancelled

Students do NOT report BUT employees are expected to report to work at their normal time.

Operating on an Inclement Weather Delay

Under this schedule, all 8 a.m. classes will start at 10 a.m. Students and faculty will follow the Inclement Weather Schedule. (See <http://www.concord.edu/emergency-alerts> for Athens/Beckley Inclement Weather Schedules.)

**Announcements invoking the late schedule or other options referenced above are aired on area radio and television stations and are sent as text and email messages to those enrolled for this service.*

Student Conduct

In classrooms, online, laboratories, and during any activities that are part of course requirements, students are expected to observe reasonable rules of conduct.

Plagiarism

Academic dishonesty is morally unacceptable as well as destructive to the learning and teaching atmosphere. Academic dishonesty includes the giving or receiving of improper help on examinations or assignments, falsifying documents, and plagiarism (the act of stealing and using, as one's own, the ideas or the expression of the ideas of another). Such dishonesty can lead to a variety of penalties — including but not limited to failure of assignment, failure of course, loss of institutional privileges, or dismissal from the University. (See University Catalog Academic Policies and Procedures.)

Online portions of activities are submitted to turnitin.com anti-plagiarism software. Extensive plagiarism will be treated with: 1) a warning and penalty of 2 to 9 points on the assignment (depending on severity) with the first infraction; 2) a second infraction will result in receiving a zero on the assignment; and 3) repeated plagiarism (2 or more infractions) will result in an F in the course for academic dishonesty.

Cell Phone Use

In the classroom, cell phones should be set to silent or vibrate. If you are expecting an important call or need for phone availability as an emergency contact, please let me know directly. Should you receive a call that you must take during class, please quietly exit the classroom to take the call.

Use of cell phones for activities other than those associated with classroom activities will result in the loss of your cell phone for the duration of the class or lab period. Cell phones **may not** be used to record lectures or to take pictures of diagrams on chalk or white boards or other materials without permission of the instructor. Doing so will be considered a violation of the code of conduct and will result in your dismissal from the course. Further, cell phones may not be used as calculators and are PROHIBITED during quizzes and exams. Further, the use of cell phones in the laboratory is also PROHIBITED.

Lab Safety Rules & Procedures

The first week of lab, you will need to be trained on the proper lab safety rules & procedures for the microbiology laboratory. These rules need to be followed, not only for learning proper procedure, but also for the safety and well being of all students. Those who do not follow these rules & procedures will be addressed in the following manner: 1) both verbal and written warnings for a first infraction; 2) a second infraction will result in removal from the course and an F in the course for academic dishonesty.

Sexual Harassment & Assault

Federal law, Title IX, and Concord University policy prohibits discrimination, harassment, and violence based on sex and gender (Including sexual harassment, sexual assault, domestic/dating violence, stalking, sexual exploitation, and retaliation). If you or someone you know has been harassed or assaulted, you can receive confidential counseling support through the Concord University Counseling Center (304-384-5290). Alleged Violations can be reported non-confidentially to the Concord University Title IX Coordinator at 304-384-6327 or titleix@concord.edu. Reports to Campus Security can be made at (304-384-5357). As an employee at Concord University, I am a mandatory reporter, which means I must report any sexual misconduct I am made aware of. This includes verbal or written (such as in an assignment) disclosures of sexual harassment or sexual assault.

Technology Services

Contact the CU Help Desk at extension 5291 from campus or 304-384-5291 off campus. You may also e-mail cuhelpdesk@concord.edu.

Syllabus Disclaimer

"This syllabus is subject to change based on the needs of the class. Please check it regularly."