# BIOL 4580(6580), Molecular Genetics
## Summer Semester II 2022
## BIOL 4580 (CRN# 52597), BIOL 6580 (CRN# 52598)
## Credit hours: 4

***Before reading any more information, please jump to the last page and complete the task.***

**Instructor:** **Dr. Ansul Lokdarshi**
Office: BC 2212
Email: alokdarshi@valdosta.edu

**Office (Student) hours** **Wednesday 3:00 PM- 5:00 PM in my office, BC2212**

| | | |
|---|---|---|
| **Lecture (BC 1202)** | **Tuesday and Thursday** | **11:10 AM – 2:00 PM** |
| **Lab (BC2071)** | **Tuesday and Thursday** | **2:30 PM – 5:20 PM** |

***Important points in the syllabus are in bold or highlighted in yellow or marked with red. Please pay special attention and make a note of these points.***

**Pre-requisites:** BIOL 3200 or permission of instructor.

**Course Description:** The study of basic molecular mechanisms that govern gene expression and regulation, and introduction to latest gene editing technology, CRISPR-Cas9 system. The lecture will focus on using modern molecular genetics and biochemical techniques as a means to understanding and manipulating complex prokaryotic and eukaryotic genomes. The laboratory will involve hands-on experience in which the student will learn fundamental lab techniques and application of CRISPR-Cas9 technology in gene editing.

**Recommended Text:** **No Book Required.**
Suggested readings below.
Text: 1) Mark Ptashne. A Genetic Switch: Phage Lambda Revisited. 2004. 3rd Ed. Cold Spring Harbor Laboratory Press (ISBN # 0879697164)
2) Other options include Concepts of Genetics, 12th edition, *William S Klug, Michael Cummings, Charlotte A. Spencer, Michael A Palladino, Darrell Killia* (Chapter III, IV, Special Topics in Modern Genetics)
https://www.ibiology.org/genetics-and-gene-regulation/crispr-cas9/

Laboratory Manual: None; mainly handouts or laboratory protocols and papers. TBA

**Course outcomes**

- Students will acquire fundamental understanding of molecular biology, microbiology, genetics, bioinformatics, and statistics with special emphasis on applied advanced molecular biology tools.
- Students will gain knowledge about different genome engineering technologies such as ZFN, TALEN and the latest transformative molecular biology tool called CRISPR.
- Ultimately students will develop understanding about modern techniques in DNA assembly, precision gene editing, regulation of gene expression and protein activity for applications in biology, biotechnology, and biomedicine.
- Student will learn how to read research articles and write a research summary paper.
- Students will learn how to write a lab report, give an oral presentation and handle audience Q&A.

**Upon completion of this course the student should be able to:**
1) Comprehend the central dogma of molecular biology as discussed in the lecture and lab (BO3, BO4, & GE4, & GE7); 2) Understand how genomes are experimentally investigated using bio techniques such as molecular biology, genomics, gene expression, and transgenics (BO3, BO4, & GE4); 3) Develop practical laboratory knowledge and skills through inquiry-based experimentation employing molecular genetic techniques (BO1, BO4, GE5 & GE7).

These course outcomes support the VSU Biology Department Outcomes # 1, 3, & 4 and the University General Educational Outcomes # 4, 5 & 7 as listed in the VSU Undergraduate Catalogue (see below).

**VSU Biology Department Objectives:**

BO1. Develop and test hypotheses, collect and analyze data, and present the results and conclusions in both written and oral formats.

BO3. Demonstrate an understanding of the cellular basis of life.

BO4. Relate the structure and function of DNA/RNA to the development of form and function of the organism and to heredity.

**VSU General Educational Outcomes:**

GE4. Students will express themselves clearly, logically, and precisely in writing and in speaking, and they will demonstrate competence in reading and listening.

GE5. Students will demonstrate knowledge of scientific and mathematical principles and proficiency in laboratory practices.

GE7. Students will demonstrate the ability to analyze, to evaluate, and to make inferences from oral, written, and visual materials

**Lab**

Laboratory Manual: None; mainly handouts or laboratory protocols and papers. **TBA**

**Attire:** Lab aprons and face shields will be provided and must be worn during lab. **SANDALS, FLIP-FLOPS AND OTHER OPEN-TOED SHOES ARE NOT PERMITTED IN LAB. IF YOU ARRIVE IN FOR LABS SANDALS OR FLIP-FLOPS YOU WILL NOT BE ALLOWED ENTRY INTO THE LAB AND WILL BE MARKED AS ABSENT.**

**Attendance:** Attendance policy: **Attendance to both lecture and lab is required.** If you miss a lecture or lab I reserve the right to determine what constitutes an excused or unexcused absence. To name a couple of examples of unexcused absences, scheduled appointments or leaving town, except for University related activities (e.g. you are on a sports team or are presenting at a conference), do not constitute excused absences. "Not feeling well" will only work one time as an excused absence; any additional "not feeling well" absences will be counted as unexcused.

Quizzes and in-class assignments will be given throughout the semester, which is why attendance is required. Generally, quizzes or in-class assignments in lecture cannot be made up if lecture is missed. If you miss the lecture and I approved your absence the total number of points possible to you will be reduced. If you miss quizzes and/or in-class lecture assignments and I did not approve the absence a zero will be given for that particular assignment, quiz, etc.

**Lectures and Labs cannot be made up; therefore do not miss either.** I also reserve the right to determine what constitutes an excused absence from lab. If you miss 2 labs (excused or unexcused) you will earn an F for the course as per University policy.

If students must be absent due to a quarantine or isolation requirement for COVID-19, they must report this situation via the COVID Self Reporting Link in MyVSU and through the Dean of Students Office to report any other absences as well.

**Conduct:** Arrive on time to lecture and lab. Turn off cell phones during lecture and lab. Don't talk during lecture; if you don't understand something or didn't hear something ask. Unless it's an emergency (and texting does not constitute an emergency) do not get up in the middle of lecture, leave and come back. Do not ask to get up and leave the room during an exam, unless it is an emergency.

**Mid-term and Attendance**: Students will have several lecture and laboratory assignments to determine their overall grade by the Mid-Term and decide whether to withdraw at the deadline date (STUDENT IS RESPONSIBLE TO CHECK THE DEADLINE). As detailed above, attendance is mandatory.

**Lab rules and regulations:**

- Bring a notebook to lab to write down your data. You will need this to complete your weekly lab report and submit that file in BV for grading. A final lab report will be built on these weekly lab reports.
- Read the lab handouts ahead of time so that you have some idea of what will be going on in the lab.
- Be on time for lab. Instructions, clarifications and changes in protocols will be given at the beginning of lab, and I will not repeat myself just because you are late.
- No eating or drinking in the lab at any time. Some of the chemicals we will be using are toxic or mutagenic.
- Clean up after yourself. Remove all labels/tape from the glassware, rinse and place in the tub by the sink.
- If you break something or think you may have broken something, please tell me. Accidents happen. It's a bigger problem if you do not tell me because I won't be able to fix or replace whatever is non-functional. If you have any questions about using a piece of equipment, it's always better to ask.

**Mask mandates:** This course is offered ONLY face-to-face. Everyone is encouraged to wear mask during the lecture and labs.

**Lecture Exams:**

- There will be three lecture exams based on lecture notes.
- Both unit exams will each be worth 100 points.
- The format of exams will be discussed in the class.
- Dates of these exams are included in the attached schedule of lectures.
- If you fail to attend one of the exams for any reason, you **must provide documented evidence** (e.g., from doctor, police, etc.) that circumstances beyond your control prevented you from taking the exam. **Failure to provide reasonable evidence for absence within one week of the exam will result in a grade of 0 for the exam**.
- Only one time makeup exam is allowed and will be administered at any time during the semester at the discretion of the instructor. Under extraordinary circumstances only the students may be allowed for another make up exam. This will require strong evidence of excuse as mentioned above and will solely depend on the discretion of the instructor.
- If you arrive late for an exam you will be allowed to take the exam. However, you must turn in the exam paper at the regular scheduled end of the class. You will not be allowed extra time unless a documentable emergency has occurred.
- **All exam paper will remain with the instructor after the course completion and students are not allowed to take pictures or maintain a copy of the exam paper in any form. Students found breach of this contract will get F in the course with administrative action.** Advance appointment will be required to view answered exam papers in person in my office.
- During the test, all smart devices must be stowed away. It is your responsibility to take care of your items.

**Lab Report:** Deadline for lab report submission is fixed unless stated in the class by the instructor and posted on Blazeview. It is the responsibility of the student to post the lab report in the correct format (Microsoft word format only) before the deadline. Rubrics of the lab report and grading will be provided on BlazeVIEW.

**Quizzes:** Quizzes will be unannounced and will be given during the lecture and/or lab at any given point. **THERE IS NO MAKE UP FOR MISSED QUIZZES.** Quizzes will be comprised of a combination of multiple choice and short answer type questions. These quizzes are designed to evaluate your knowledge of the various concepts in the lecture and labs.

**Study Tips**

- It is recommended that you form small study groups and study together in the library or other locations without TV, stereo or other distractions.
- Before you begin reading a chapter, make a very quick outline using the chapter subheadings, this will give you some idea of what the chapter is all about and how it is organized.

- You should read ahead of the schedule. So, when you come to class you can ask questions.
- When studying, ask yourself how this information would be applied.
- Come to office (student) hours and ask questions if there is material you do not understand.
- Ask questions in class! This is graded and you can earn free points.

**Grading:** Your grade will depend on how well you do on the exams, quizzes, and lab report. Expect the following grading scale (based on the total number of points actually assigned:

| Grade Calculation | |
|---|---|
| **Category** | **Possible weight** |
| Lecture Exam 1 | 20% |
| Lecture Exam 2 | 20% |
| Final Exam | 20% |
| Quizzes | 5% |
| Lab Exam 1 | 10% |
| Lab Exam 2 | 10% |
| Lab Report | 10% |
| Participation | 5% |
| **Total** | **100%** |

| Grade distribution | |
|---|---|
| **Letter** | **Percentage** |
| A | 90-100% |
| B | 80-89% |
| C | 70-79% |
| D | 60-69% |
| F | ⩽59% |

**Notes on grading:** Students should note that a grade of "A" in this course represents an exemplary command of the material covered. To obtain this grade of excellence, it is recommended that students study daily, be prepared to participate in class discussion and laboratory sessions, and clarify with their instructor any problems regarding course information, as they arise.

**Cheating or Plagiarism**

- Incidents of cheating or plagiarism will result in an automatic "**F" grade for the course and referral to the Office of Student Conduct for disciplinary action.**
- For the VSU's Academic Integrity Code please see http://www.valdosta.edu/administration/student-affairs/student-conduct-office/
- For the VSU's Academic Honesty policies and procedure please see http://www.valdosta.edu/academics/academic-affairs/vp-office/academic-honesty-policies-and-procedures.php

**COVID-19 related policy**

As the Blazer Creed articulates, members of the VSU community are expected to live by the high standards of civility, integrity, and citizenship and embrace their responsibility as a member of the Blazer community. In recognition of this responsibility, and in response to the best available science and current guidance from the Centers for Disease Control and Prevention and the Georgia Department of Public Health, while face coverings are no longer required, individuals are strongly encouraged to continue wearing a face covering indoors. **Unvaccinated individuals are strongly encouraged to get vaccinated. Vaccines remain available at no cost for all members of the university community by appointment at Student Health Services.**

**Learning Support**

- **Access Office**: Students with disabilities who are experiencing barriers in this course may contact the Access Office for assistance in determining and implementing reasonable accommodations. The Access Office is located in Farbar Hall. The phone numbers are 229-245-2498 (V), 229-375-5871 (VP) and 229-219-1348 (TTY). For more information, please visit VSU's Access Office or email: access@valdosta.edu.
- **The Academic Support Center**: The Academic Support Center provides free peer tutoring for most core courses and some upper-division courses. It also offers time management and study skills workshops as well as other learning support services. Call 333-7570 to make an appointment, or visit the website: https://www.valdosta.edu/asc/
- **Odum Library** provides a variety of services to assist classroom instruction, including library instruction, course reserves, and interlibrary loan. Please see https://www.valdosta.edu/academics/library/ for further information.
- **Title IX Statement:** Valdosta State University (VSU) is committed to creating a diverse and inclusive work and learning environment free from discrimination and harassment. VSU is dedicated to creating an environment where all campus community members feel valued, respected, and included. Valdosta State University prohibits discrimination on the basis of race, color, ethnicity, national origin, sex (including pregnancy status, sexual harassment and sexual violence), sexual orientation, gender identity, religion, age, national origin, disability, genetic information, or veteran status, in the University's programs and activities as required by applicable laws and regulations such as Title IX. The individual designated with responsibility for coordination of compliance efforts and receipt of inquiries concerning nondiscrimination policies is the Office of Student Affairs.

**Privacy Act (FERPA):** The Family Educational Rights and Privacy Act (FERPA) prohibit the public posting of grades by Social security number or in any manner personally identifiable to the individual student. No grades can be given by email or over the telephone, as positive identification cannot be made by this manner.

**Student identification:** Students should have in their possession at all times their VSU student identification card. In order to verify the identification of students officially enrolled in the course, it is the instructor's prerogative to request official student photo identification cards at any time during lecture or during exams.

**Students with Disabilities:** Students requesting classroom accommodations or modifications because of a documented disability should discuss this need with the instructor at the beginning of the semester. These students must contact the Access Office for Students with Disabilities located in Farber Hall. The phone numbers are 245-2498 (V/VP) and 219-1348 (TTY).

**Tentative schedule: Please check BV for any changes that may occur during the semester.**

| WEEK | DAY | DATE | LECTURE | LAB |
|---|---|---|---|---|
| WEEK 1 | Thursday | 6/9/22 | Course Introduction and Objectives | No lab. |
| WEEK 2 | Tuesday | 6/14/22 | Central dogma, Phage Lambda The Master Elements of Control | Common Units & Measures; Common Stock Solutions |
| | Thursday | 6/16/22 | Protein-DNA Interactions & Gene Control | Dilution Chemistry & Pipetting |
| WEEK 3 | Tuesday | 6/21/22 | Control Circuits - Setting the Switch | Microbiology aseptic techniques |
| | Thursday | 6/23/22 | Catch-up & Review | LAB EXAM 1 |
| WEEK 4 | Tuesday | 6/28/22 | LECTURE EXAM 1 | DNA extraction, Spectrophotometry, PCR, Electrophoresis |
| | Thursday | 6/30/22 | Introduction to gene editing - PART I | CRISPR Lab I |
| WEEK 5 | Tuesday | 7/5/22 | Introduction to gene editing - PART II | CRISPR Lab II |
| | Thursday | 7/7/22 | Catch-up & Review | CRISPR Lab III |
| WEEK 6 | Tuesday | 7/12/22 | LECTURE EXAM 2 | No lab. Submission of lab report with Bioinformatics assignment 11:59PM ET. |
| | Thursday | 7/14/22 | Molecular Biology and Biochemical Techniques PART I | CRISPR Lab IV |
| WEEK 7 | Tuesday | 7/19/22 | Molecular Biology and Biochemical Techniques PART II | LAB EXAM 2 |
| | Thursday | 7/21/22 | Catch-up & Review | Review of CRISPR labs. Lab report, Data analysis and interpretation |
| WEEK 8 | Tuesday | 7/26/22 | FINAL EXAM | Final lab report submission, Blazeview, 11:59PM ET |

**NOTE: Graduate students enrolled in BIOL 6580 will be required to submit one review article on the topic given by the instructor. Rubrics will be posted on BV.**

# *Learning contract – Dr. Ansul Lokdarshi*

1) ***I care*** – I teach because I want to contribute to your successful career. You must also promise to make the effort to rise to expectations worthy of your own future goals.
2) ***Knowledge ownership*** – "You can lead a horse to water, but you can't make him drink". I try really hard do three things to lead students to knowledge. A) I select only the most important topics. B) I organize the topics so each lecture builds on previous ones. C) I include current and personal details to make the class relevant, interesting, and cutting edge. This effort is lost on students who expect proficiency to come from little more than simply listening to lectures and last-minute cramming. Your success is proportional to your amount of effort and review.
3) ***Self-motivation*** – College is not an extension of a kid's legally-required high-school education. It is an adult's entry into the job market. The distinction is important because your future career job application will hinge on your college transcript. Your peer competition understands this and is doing all he or she can to out-perform you. I try hard to motivate you, but ultimately, good grades only go to students with high internal drive.
4) ***Synthetic thinking*** – A fancy way of saying "make connections". I will give you new conceptual "tools", so become a tool user. Own your newfound knowledge and use it to understand your world. If you come across something that's peripherally related to class material, ask questions about it. You can't help but become motivated when you're mentally engaged.
5) ***Honesty and integrity*** – Do not cheat. People who care about you, including me, expect more from you than that. I punish cheaters to the fullest extent allowed by the Student Code and in the future, it is tough explaining why you should be given the job or admitted to grad school when your transcript has an F because you got caught plagiarizing or palming a crib note.
6) ***Participate!*** – Have a question? Ask it! Here is a universal truth: if you have a question, chances are good that someone else is wondering the same thing. You're not alone and I will never, ever belittle you for trying to learn. It makes for engaged learning and who knows, maybe your question unlocks a fundamental concept that half of the final exam questions are about. My deal for shy people: I won't pick on you if you promise not to keep questions bottled up.
7) ***Email etiquette*** – Emails lack non-verbal cues and often lead to unintended consequences. As such, I require you to email me using standard formal etiquette: A) Include a salutation, (e.g. Dear Dr. X or Hello Prof. X, not Hey), B) follow this by a complete description of your question/message and your course/section information, and C) always sign off using a complementary closing and your name/ID number. **I do not respond to emails that do not have all these components. Use your VSU email address; others are often blocked by our inbox system.**
8) ***Start early*** – This class is fast moving, and builds on itself; there is no time later to catch up. **If you miss a class, it is up to you contact me to see what can be done within a week. Otherwise, you will get a zero for that grade.**
9) ***Priorities*** – In signing this, you have made the commitment to learn. It is a priority that is similar to that of a paying job. To teach you effectively, I require you to show up on time, to be mindful of the above points and be respectful to me and your fellow students.

I have read and understand these crucial tips for success: Name:_____; Date_____

**After signing, scan and upload a copy to the assignment folder in BV.**