

Laboratory Techniques in Biotechnology JUNE 11 - JULY 30, 2024
Summer Semester 2024
BIOL 4010 (CRN# 53461) Special Topics in biology
Credit hours: 4

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Office (Student) hours Wednesday 3:30 PM- 5:00 PM in my office, BC2212 or by appointment

Lecture (BC 1202) Tuesday and Thursday 11:10 AM – 1:10 PM
Lab (BC 2071) Tuesday and Thursday 1:30 PM – 5:20 PM

Pre-requisites: BIOL 1107, BIOL 1108 or permission from instructor.

Course description:

- The lecture will focus on building/refreshing and advancing concepts for a variety of key lab techniques such as electrophoresis, spectrophotometry, polymerase chain reaction, microbial aseptic techniques, bioinformatics, CRISPR etc., that are essential to biology related careers.
- Laboratory exercises will provide extensive hands-on experience with lecture related topics, in addition to strengthening the ideas of experimental design (developing hypotheses, setting up an appropriate experiment, statistics and evaluation of data).
- Although laboratory experience with practices such as sterile technique and pipet usage are ideal, these techniques will be part of the early-on laboratory instructions.
- This course also benefits students who are aspiring for careers outside medical, dental, nursing and pharmacy schools such as molecular technologists, laboratory technicians, research associates, school teachers.

Recommended Text: No specific textbook is required. Maintain good lecture notes.

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

Other resources: BlazeView

Course outcomes

- Students will acquire fundamental understanding of molecular biology, microbiology, genetics, bioinformatics, and statistics with special emphasis on applied molecular biology and biochemical techniques.
- Students will gain knowledge about current advanced technologies in nucleic acid and protein analysis 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 and maintain lab notebook, give an oral presentation, work in teams and handle audience Q&A.

Course Objectives:

Upon completion of this course the student should be able to:

- 1) Understand the principles of the structure and function of biological molecules including carbohydrates, lipids, proteins, membranes, enzymes and nucleic acids.
- 2) Understand how genomes are experimentally investigated using techniques such as molecular biology, genomics, gene expression, protein biochemistry and transgenics.
- 3) Develop practical laboratory knowledge and skills through inquiry-based experimentation employing a variety of molecular biology and biochemical techniques.
- 4) Prepare laboratory report while working independently and within a team.

This course learning outcomes support the achievement of the Department of Biology Educational Outcomes 1, 3 and 4 (<http://catalog.valdosta.edu/pdf/2021-2022.pdf>) and VSU's as well as USGs general education learning goals (https://www.usg.edu/academic_affairs_handbook/section2/C738).

Attendance:

- **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.
- **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.

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

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.

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.

Lecture Exams:

- There will be three lecture exams based on lecture notes.
- All 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 make-up exam is allowed except under extraordinary circumstances. A second make-up exam under extraordinary circumstances will require strong evidence and are at 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 Blazevue. 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	15%
Lecture Exam 2	15%
Final Exam	15%
Quizzes	5%
Lab Exam 1	15%
Lab Exam 2	15%
Lab notebook/Report	15%
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 Farbar Hall. The phone numbers are 245-2498 (V/VP) and 219-1348 (TTY).

Student Opinion of Instruction survey (SOI): At the end of the term, all students will be expected to complete an online Student Opinion of Instruction survey (SOI) that will be available on BANNER. Students will receive an email notification through their VSU email address when the SOI is available (generally at least one week before the end of the term). SOI responses are anonymous to instructors/administrators. Instructors will be able to view only a summary of all responses after they have submitted final grades. While instructors will not be able to view individual responses or to access any of the data until after final grade submission, they will be able to see which students have or have not completed their SOIs. These compliance and non - compliance reports will not be available once instructors are able to access the results. Complete information about the SOIs, including how to access the survey and a timetable for this term is available at SOI Procedures and Timelines (located at <http://www.valdosta.edu/academics/academic-affairs/sois/welcome.php>).

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

DAY	DATE	LECTURE	LAB
Tuesday		Course Introduction and Objectives; <u>Syllabus quiz</u>	Lab safety, Pipetting, Units of Measures, pH and Buffers, Microbiology aseptic techniques
Thursday		Fundamentals of DNA, RNA and protein structure and function	Molecular Cloning PART I - Spectrophotometry and Bacterial transformation
Tuesday		Protein-DNA and Protein-RNA Interactions	Molecular Cloning PART II - PCR genotyping and bacterial cell culture
Thursday		Control of gene expression – Transcription and Translation	Molecular Cloning PART III – Plasmid DNA extraction and Restriction endonuclease mapping, DNA gel Electrophoresis, Lab notebook review.
Tuesday		Review	LAB EXAM 1
Thursday		LECTURE EXAM 1	Biochemistry lab - Protein extraction and purification - Chromatography
Tuesday		Molecular Biology and Biochemical Techniques PART I (Gene editing - RNAi)	Biochemistry lab - Colorimetric assay for protein quantification and denaturing gel electrophoresis
Thursday		Molecular Biology and Biochemical Techniques PART II (Gene editing - CRISPR)	Biochemistry lab - Immunoblotting -I
Tuesday		Review	Biochemistry lab - Immunoblotting -II
Thursday		LECTURE EXAM 2	LAB EXAM 2
Tuesday		Molecular Biology and Biochemical Techniques PART III	Data analysis using Image J and statistical tests. Lab notebook review. Student project – Part I (Choice of Molecular OR, Biochemical technique)
Thursday		Molecular Biology and Biochemical Techniques PART IV	Student project – Part I continued.
Tuesday		Review + <u>Headshot photoshoot and Workshop on Resume building, LinkedIn and job search</u>	Student project – Part II (Completion of team project)
Thursday		FINAL EXAM	Final student project submission on Blazeview, 11:59 PM ET