

Syllabus

I. General Information

Instructor:	Dr. Piotr Filipczak
Phone/Email:	505-925-8876 / pfilipczak@unm.edu
Office Hours:	Tuesday and Thursday, 1:00 pm to 3:00 pm and Wednesday, 10:30 am to 11:30 am.
Office Number:	VAAS 132A
Course Section:	501
Meeting Room:	VHS 110
Meeting Time:	Tuesday and Thursday (9:00 am to 12:45 pm)

II. Course Description

Prerequisite: None

The goal of this course is to provide you with the core conceptual foundation and hands on experience required to perform basic laboratory techniques used in a biotechnology laboratory. It is essential that these skills are mastered, since this will be the basis for all of the techniques used in future courses. This class will provide theory and experience in lab safety and measurement, bacterial transformations and cloning, recombinant DNA, gel electrophoresis, tissue culture and basic bioinformatics skills.

III. Resources

Canvas (learning management system for communication, grades entry, resources navigation and selected assignments).

IV. Student Learning Outcomes

Outcome #1: Discuss the elements of laboratory safety.

- Explain the four types of laboratory safety controls including how they are designed to keep laboratory workers safe.
- Identify individuals and organizations responsible for workplace safety.
- Recognize chemical, biological and physical hazards present in the biotechnology lab.
- Demonstrate the safe handling, labeling and disposal of chemical, biological and physical hazards.

Outcome #2: Demonstrate techniques of laboratory measurement.

- a) Explain the units of measurement used in the biotechnology laboratory.
- b) Define key terminology used in measurement and solution making.
- c) Demonstrate appropriate selection and usage of appropriate instruments for measurements based on the application they will be used for.
- d) Demonstrate the ability to accurately use pipet-aids (serological pipets), micropipettors, and electronic balances.

Outcome #3: Demonstrate the preparation of solutions.

- a) Solve basic equations used in making solutions including mass/volume solutions, percent solution, molar solutions, making dilute solutions using a concentrated stock.
- b) Demonstrate the basic steps used in solution making including technical considerations and safety.
- c) Demonstrate the ability to accurately use pH meters.

Outcome #4: Perform a bacterial transformation with plasmid DNA.

- a) Explain the fundamentals of bacterial transformation.
- b) Define plasmid or vector DNA.
- c) Explain and utilize antibiotic selection.
- d) Demonstrate correct standard practices used in working with bacteria.
- e) Perform a bacterial transformation experiment and interpret results.
- f) Calculate the transfection efficiency of a bacterial transformation.

Outcome #5: Utilize a mini-prep to extract plasmid DNA from bacteria.

- a) Explain the purpose of a mini-prep Perform a mini-prep.
- b) Explain the function of the major steps in an alkaline lysis mini-prep.

Outcome #6: Utilize restriction enzymes to perform a restriction digest.

- a) Explain what restriction enzymes are and how they are used in the biotechnology laboratory.
- b) Demonstrate an understanding of the technical considerations associated with using restriction enzymes, both singly and in a double digest.
- c) Utilize restriction enzymes to cut lambda DNA and plasmid DNA.

Outcome #7: Perform agarose gel electrophoresis.

- a) Explain how gel electrophoresis is used to separate macromolecules.
- b) Demonstrate an understanding of how DNA migrates through an agarose gel and factors which can influence its' mobility.
- c) Explain the use of loading dye, ethidium bromide and DNA size markers or ladders in gel electrophoresis.
- d) Prepare and run agarose gels of different percentage e. Interpret agarose gel results and properly label a gel photograph.

Outcome #8: Perform a basic subcloning experiment.

- a) Define subcloning.
- b) Utilize previously taught skills to move a gene from one plasmid to another.
- c) Interpret results from subcloning experiment.

Outcome #9: Perform a ligation reaction.

- a) Describe the use of ligations and their importance in recombinant DNA.
- b) Explain the chemical reaction involved in ligation and identify required reaction components.
- c) Utilize a ligation reaction in a cloning experiment.

Outcome #10: Demonstrate Cell Culture Techniques.

- a) Define cell culture.
- b) Explain the usage of different cell lines, including immortalized and primary cells lines.
- c) Demonstrate knowledge of the proper selection, preparation and storage of media.
- d) Calculate quantities of reagents needed to formulate media.
- e) Describe important technical considerations associated with performing cell culture.
- f) Perform basic cell culture tasks, including starting cells, feeding, splitting & counting cells, harvesting cells.
- g) Utilize an on-line database to search for cell lines and appropriate growth media.

Outcome #11: Utilize online resources to perform basic bioinformatics tasks.

- a) Utilize PubMed to search for scientific papers by author, date, subject and relevance.
- b) Utilize an on-line search program to perform a basic restriction enzyme search and design a simple subcloning experiment.

Outcome#12: Discuss the history and the current state of the field of biotechnology.

- a) Define biotechnology.
- b) Describe the many scientific disciplines that contribute to biotechnology.
- c) Provide examples of historic applications of biotechnology.
- d) Describe different types of biotechnology and their applications.

Outcome #13: Discuss current topics of importance in Biotechnology – Stem Cells and Cloning.

- a) Explain what stem cells are and their origins.
- b) Explain why stem cells are so useful in biomedical research.
- c) Describe obstacles to using stem cells in research and/or therapies.
- d) Outline the ethical, religious and political concerns associated with embryonic stem cells.
- e) Identify the relationship between stem cells and cloning.
- f) Differentiate between therapeutic and reproductive cloning.

V. Course Requirements

Attendance: In-person participation is required in this course. Student who missed 15% of a class time (which stands for 5 meetings) may be dropped by the instructor with a W, F or D (depending on the stage of the course).

Technology & Computer Requirements:

- Dependable computer
- Reliable internet connection
- Computer speakers
- Reliable web browser
- Microsoft Suite (PowerPoint and Word)
- Adobe Flash Player

VI. Students Evaluation Criteria

Type of Assignment:	Points per Assignment:	Total Points in this Category:	Percentage of the Final Grade:
Quizzes (10x)	8 pts	80 pts	40%
Lab Reports (10x)	4 pts	40 pts	20%
Oral Presentation	10 pts	10 pts	5%
Final Paper	30 pts	30 pts	15%
Final Exam	40 pts	40 pts	20%
Total	NA	200 pts	100.00%

- **Quizzes:** Taken in class. One lowest score will be dropped from the final grade.
- **Lab Reports:** Completed digitally and submitted via Canvas.
- **Oral Presentation:** Given in a slide format during the second last week of the semester.
- **Final Paper:** Completed digitally and submitted via Canvas.
- **Final Exam:** To be completed in class during the final week of the course.

Grading scale:

- 100 or higher: A+
- 94-99.99: A
- 90-93.99: A-
- 87-89.99: B+
- 83-86.99: B
- 80-82.99: B-
- 77-79.99: C+
- 73-76.99: C
- 70-72.99: C-
- 60-69.99: D
- below 60: F

VII. Course Policies

Academic Integrity: All homework, quizzes and exams in this course must be completed by students as their original and individual work. No group work is allowed when it comes to completing these assignments. While taking quizzes and exams, only resources listed by the instructor (such as non-graphing calculator, scratch paper, periodic table etc.) are allowed. Use of any other resources such as but not limited to textbooks, unauthorized internet websites, personal notes are forbidden. Plagiarism or cheating is not tolerated. Any instance of this will result in a grade of zero for that assignment. For more details on academic integrity violation examples, please see the UNM Academic Dishonesty Policy: <https://policy.unm.edu/regents-policies/section-4/4-8.html>.

Compliance and Safety: Students must read, understand and obey safety rules while present in chemical laboratory. That will be documented by signing safety contract during the first on-campus meeting. Student who does not obey the safety rules and brings the risk on himself/herself and/or on colleague students, may be suspended from the class by the instructor at any time of the course with the consequent non-passing grade.

Communication: Instructor will do his best to follow original schedule of this course. However, because of the element of unpredictability caused by ongoing COVID-19

pandemic, some modest changes to the course design such as exact number of assignments, face-to-face meetings or other aspects of the course cannot be completely ruled out. Whenever the modification is applied, it will always be implemented to favor students' success in the course, and will be announced by the instructor as soon as possible. It is the student's responsibility, however, to pay attention to the instructor's communications, and in case of any confusion or conflict, communicate back ASAP. All information important to the course will be passed to students via Canvas: either as announcement posted in the course content, or as an email sent to all students via Canvas, or both. Thus, keep in mind to (i) log in to your Canvas account REGULARLY (at least two times per week) and (ii) remember that all email correspondence will take place via student's @unm.edu address which is associated with your Canvas account (correspondence via other email addresses is not allowed).

Disruptive Behavior: Disruptive behavior will not be tolerated and can lead to being dropped from the course at the instructor's discretion. No "guests" will be allowed unless they are explicitly invited to attend the class by the instructor.

Communication on Change in Modality: The university may direct that classes move to remote delivery at any time to preserve the health and safety of the students, instructor and community. Please check your email and your UNM Learn site regularly for updates about our class, and please check <https://bringbackthepack.unm.edu> regularly for general UNM updates about COVID-19 and the health of our community.

COVID-19 Health and Awareness: For anyone who has [symptoms of COVID-19](#), regardless of your vaccination status, please remain at home and quarantine until your symptoms clear for at least 24 hours. If you develop symptoms at work, you should notify your supervisor and return home and quarantine until your symptoms clear for at least 24 hours. If you test positive for COVID:

- Notify your supervisor and exit campus if you are on campus.
 - You do not need to get an additional PCR test if you have had a positive at-home rapid test.
- Next, please isolate at home for five (5) days.
 - The day that you became symptomatic OR tested positive (whichever comes first) is counted as "Day 0". You will then count five days starting on the next day and can return to work on day 6 *as long as you do not have symptoms and are fever-free for 24 hours without medicine.*
- If you have no symptoms after five (5) days, you can return to work but must wear a 3-ply or better medical/health procedure mask when around others for **five (5) more days.**

- To prevent the spread of COVID, please inform anyone you have recently had close contact with and encourage them to get tested, monitor for symptoms, and reduce exposure to other people.

Support:

- Student Health and Counseling (SHAC) at (505) 277-3136. If you are having active respiratory symptoms (e.g., fever, cough, sore throat, etc.) AND need testing for COVID-19; OR If you recently tested positive and may need oral treatment, call SHAC.
- LoboRESPECT Advocacy Center (505) 277-2911 can offer help with contacting faculty and managing challenges that impact your UNM experience.

Students with Disabilities:

If you have a documented disability, the Equal Access Services office will provide me with a letter outlining your accommodations. I will then discuss the accommodations with you to determine the best learning environment. If you feel that you need accommodations, but have not documented your disability, please contact Yolanda Pino, the coordinator for Equal Access Services at 925-8910 or pinoy@unm.edu.

Equal Opportunity and Non-Discrimination: In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered “responsible employees” by the Department of Education. This designation requires that any report of gender discrimination which includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity (oeo.unm.edu). For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>.

UNM-Valencia Tutoring Services:

Tutoring is available to you in math, science, writing, and other subjects through the Learning Commons: Tutoring Services - Learning Center and Writing Center. In person tutoring and Zoom tutoring are available in these centers in the LRC (the building that also has the library). For writing, tutoring through email is also available.

Making use of tutoring is a fantastic way to use your resources and set yourself up to learn deeply and well in your courses.

To schedule an appointment, please go to: [Learning Commons Bookings](#). If you are making an email appointment with the Writing Center, email your draft to tutor@unm.edu after you fill out the form above.

If you have difficulty with the scheduling link above, would like an appointment in a subject not listed at that link, or have a question, email tutor@unm.edu. You will receive a response during business hours Monday through Friday. The webpage, with more details about available hours, is here: [Learning Commons Tutoring webpage](#). At UNM Albuquerque, you may contact: [Center for Academic Program Support \(CAPS\)](#).

VIII. Course Schedule

Week	Meating Date	Topic	Assignment
1	8/20 8/22	Main concepts in biotechnology, laboratory safety and introduction to research project.	
2	8/27 8/29	Aseptic techniques and an introduction to human in vitro cultures.	Quiz #1
3	9/3 9/5	In vitro cytotoxicity assessment using a crystal violet assay.	Quiz #2
4	9/10 9/12	Total DNA isolation and spectrometric analysis of DNA concentration.	Quiz #3
5	9/17 9/19	PCR amplification and electrophoretic analysis of amplicons.	Quiz #4
6	9/24 9/26	PCR amplification and electrophoretic analysis of amplicons (continue).	Quiz #5
7	10/1 10/3	Bioinformatic analysis and restriction enzyme digestion of amplicons.	Quiz #6
8	10/8 10/10 – No Class	Molecular cloning of amplicons into an expression vector.	
9	10/15 10/17	Molecular cloning of amplicons into an expression vector (continue).	Quiz #7
10	10/22 10/24	Transformation of the cloned vectors into competent bacteria.	Quiz #8
11	10/29 10/31	Analysis of transcriptional activity of cloned vectors via RT-qPCR.	Quiz #9
12	11/5 11/7	Purification of cloned vectors using mini-prep protocol.	Quiz #10
13	11/12 11/14	Sequencing amplicons cloned into recombinant vectors.	Quiz #11
14	11/19 11/21	Bioinformatic analysis of sequenced amplicons.	
15	11/26 11/28 – No Class	Comprehensive data analysis and poster preparation.	
16	12/3 12/5	Paper write-up, oral presentations, peer reviews and course summary.	
17	12/10	Final Exam	