

Methods in Biotechnology: Molecular Cloning
ADVS/BIOL/NDFS/PSC 5260
Fall 2015

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Instructors/TAs

There are two instructors for this course. Drs. Thomas and Campbell will each teach approximately half of the topics. Office hours will be by appointment. You can discuss any of the topics of the course with either instructor, as both have extensive experience with all of the topics (with a few exceptions).

Required Text and Supplies

- Protocols will be available on Canvas or a copy will be provided in class.
- Readings and class slides will be available on Canvas.
- Notebook—3-ring binder, spiral notebook, etc. Your choice.

Laboratory Fees

A laboratory fee of \$75 is required for the course. All laboratory fees will be used for purchasing supplies (molecular reagents, plastic ware, etc.) for use in the course.

Course Description and Goals

Methods in Biotechnology: Molecular Cloning is a laboratory-based course designed to present the theory and provide in-depth laboratory experience in DNA isolation and purification, restriction enzyme digestion, agarose gel electrophoresis, ligation, cloning, bacterial transformation, polymerase chain reaction (PCR), DNA sequencing, labeling DNA, *in vitro* mutagenesis, transfection, and bioinformatics. Emphasis will be placed on conceptual understanding and application of these techniques in a research setting.

At the end of this course the student will have an understanding of the basic methods in recombinant DNA techniques and will be able to apply these methodologies in answering scientific questions.

Grading and Assignments

You will be expected to maintain a lab notebook during the course of the semester. In this notebook, you will record what you did and the results of each experiment performed during the semester. Protocols should be recorded in sufficient detail that someone reading it later could replicate what you did and achieve the same results. You may use a three-ring binder, a traditional lab notebook, a spiral-bound notebook, or any other format you wish, provided it is something you can turn in. Notebooks will be graded with each of the midterm exams. In addition, information recorded in the notebook will be used to write a research paper based on the experiments conducted during the semester.

Lecture each day will start with a short quiz. These quizzes serve two purposes: (1) to test your understanding of material from the previous class session, and (2) to take and encourage attendance. Part of the score for each quiz will be for merely turning it in.

There will be three midterm exams. They will not be comprehensive, but will cover the material since the previous exam. The final day of class will be a lab-based practical exam. The final exam will be comprehensive.

Grades will be based on attendance, quizzes, laboratory participation and notebooks, three mid-term exams, and a comprehensive final exam.

Final grades will be assigned according to the following scale:

Daily quizzes	100
Lab math assignment	25
Notebook	75
Final write-up	50
Mid-term exams (3 X 100 pts)	300
Practical Final	50
Final exam	150
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Total	750

Course Grading Scale

A	705-750 (94%)	B-	600-621 (80%)	D+	495-524 (66%)
A-	675-704 (90%)	C+	570-599 (76%)	D	450-494 (60%)
B+	645-674 (86%)	C	547-569 (73%)	F	449 or less
B	622-644 (83%)	C-	252-546 (70%)		

Lecture and Laboratory Schedule

Date	Instructor	Lecture Subject	Lab
8/30	Campbell	Introduction and orientation (Biochem, sample math)	Pipetting, lab math
9/1	Campbell	Restriction enzyme digestion/notebooks	
9/6	Thomas	Cloning vectors and strategy	Cloning strategy
9/8	Campbell	Genomic DNA isolation	Cheek cell DNA isolation
9/13	Thomas	PCR and primer design	Primer design- computer lab
9/15	Thomas	PCR	PCR
9/20	Campbell	Gel electrophoresis	Analyze PCR by agarose gel electrophoresis
9/22	Thomas	Cloning of PCR products	TA cloning
9/27		Exam #1/notebook check	
9/29	Campbell	Bacterial transformation	Bacterial transformation, pick colonies 10/3
10/4	Campbell	Plasmid miniprep	Plasmid miniprep, start PCR screen
10/6	Campbell	DNA quantification	Finish PCR screen
10/11	Thomas	Cloning	Digest to begin subcloning
10/13	Campbell	DNA recovery from agarose	Gel extraction
10/18	Thomas	Mutagenesis	Ligation
10/20		No class – attend Friday schedule	
10/25	Thomas	Mutagenesis	Transformation (pick colonies 10/28)
10/27	Thomas	DNA sequencing	Miniprep/PCR colony screen
11/1		Exam #2/notebook check	
11/3	Campbell (Tho. lab)	Mammalian cell transfection	Finish colony screen/submit for sequencing/
11/8	Campbell (Tho. Lab)	Mammalian cell transfection	DNA-sequence analysis- computer lab
11/10	Campbell	Preparation of labeled DNA	transfection
11/15	Campbell	Blotting and hybridization	Probe labeling, membrane spotting
11/17	Thomas (Camp. lab)	Bioinformatics	Hybridization, washing
11/22	Thomas (Camp. lab)	Next generation sequencing	Detection of blot
11/24		No class -Thanksgiving Break	
11/29	Thomas	Applications of NGS	Bioinformatics- computer lab
12/1		Exam #3/notebook check	
12/6		Review for final	
12/8		Practical exam	
12/13		Section 2 Final Exam (1:30-3:20)	
12/15		Section 1 Final Exam (9:30-11:20)	

Policies on Attendance, Class Conduct, Academic Integrity Ethics, and Special Needs and Accommodations

Attendance. As this is a lab class, attendance is mandatory. Part of your grade will come from the daily quizzes.

Class Conduct. This is a laboratory-based class that requires working directly with other students and teaching and/or laboratory assistants. It is expected that you treat each member of the class and instructors with dignity and respect. No discriminatory behavior directed toward a person's race, religion, creed, national origin, age, sex, or disability will be tolerated.

Academic Integrity – “The Honor System”

Each student has the right and duty to pursue his or her academic experience free of dishonesty. The Honor System is designed to establish the higher level of conduct expected and required of all Utah State University students.

The Honor Pledge: To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: “I pledge, on my honor, to conduct myself with the foremost level of academic integrity.” A student who lives by the Honor Pledge is a student who does more than not cheat, falsify or plagiarize. A student who lives by the Honor Pledge:

- Espouses academic integrity as an underlying and essential principle of the Utah State University community;
- Understands that each act of academic dishonesty devalues every degree that is awarded by this institution; and
- Is a welcomed and valued member of Utah State University.

Students with Disabilities

The Americans with Disabilities Act states: “Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation within the program. If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center (797-2444), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative format, large print, audio, diskette or Braille.”

Plagiarism

Plagiarism includes knowingly “representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.” The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

Sexual Harassment

Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any “unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature.” If you feel you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266.