

BIO 591
Advanced Genetics
Spring Semester 2008

Professor: David A. Gangitano, PhD
Telephone: 936-294-4413
Class hours:
Lab Hours:
Office Hours:

e-mail: dag006@shsu.edu
Classroom:
Classroom:

Required textbooks

Recombinant DNA

Suggested textbooks

Molecular cloning (Maniatis)

Suggested journal subscriptions

Biotechniques

Course description

This course will cover the analysis of the main targets in Basic Molecular Biology Research: gene expression, RNA expression, protein expression and population genetics. Using the latest technology available, the most important techniques used in Basic Research will be studied.

Special DNA extraction methods for very degraded samples (bone & teeth), plants and bacteria will be discussed as well as techniques for DNA quantification, strategies for the design of PCR and Real time PCR (genotyping and DNA sequencing), interpretation of results, biostatistics and quality assurance procedures.

Population genetics software will be employed to generate data and compare to another DNA databases (fragments and sequence) to establish phylogenetic relationships.

RNA expression will be assessed by different detection techniques combined with real time PCR as well as in situ hybridization and chip-hybridization.

Protein expression will be studied by immunocytochemistry, immunohistochemistry and Western-blot techniques.

An advanced knowledge of the scientific literature and the ability to integrate molecular biology into practical applications and research is required. During the course students will develop independent learning skills and improve their ability to present complex scientific information orally.

Objectives

1. Familiarize with advanced techniques for DNA extraction from very degraded human tissue, plants and bacteria
2. Master the criteria used to decide which molecular technique should be used for gene expression, genotyping, RNA and protein expression.
3. Interpret results obtained from DNA sequencing as well as genotyping-based techniques from human, plants and bacteria.
4. Familiarize with the use of population genetics software and interpretation of results.
5. Be capable of design research strategies.
6. Understand the theory and application of new molecular technologies.
7. Complete a laboratory-based proficiency test involving gene, RNA or protein expression

Examinations and Assignments

There will be one written final examination, in accordance with university policy. The final examination is *comprehensive* and may be based upon any information from anytime during the course. The written final examination will be composed of multiple choice questions, true-false questions, fill in the blank questions, and/or short answer questions. The final examination and tests may be composed of any combination of the aforementioned question types or may be composed of only two or three of the question types. In addition to the written examination there will be a final laboratory-based proficiency test. This proficiency test will consist in the application of one of the mentioned techniques. Students will be required to apply their acquired knowledge to design and perform an experiment using techniques that are widely accepted by the scientific community.

Assignments will consist of lab reports, a written paper and oral presentations.

Lab reports will summarize data and address pertinent questions. Successful completion of lab reports will require the student to apply advanced knowledge acquired in class to molecular lab techniques. Assignments are due at the beginning of class on the due date. The instructor reserves the right to refuse late work, but will make reasonable accommodations for students who experience unfortunate circumstances.

Students will write a research paper on an assigned *Advanced Molecular Biology (AMB) topic*. This research paper must be fully referenced and cite published studies in the peer reviewed scientific literature. Students will present their

findings orally during a Science Seminar at the close of the semester. A second oral presentation on another topic will be made during class. This second presentation will be on a AMB topic selected by the student and approved by the instructor. The student may elect to present a technical report or reports pertaining to AMB. This presentation can be made from the peer reviewed scientific literature.

The total combined weight of the lab reports will be 20% of the final grade. The written paper will comprise 30% as will the two oral presentations (combined). The laboratory-based proficiency test will account for 10% of the final grade and the remaining 40% will be based on the performance in the final examination.

	Number	Scope	Timeframe	Weight of Grade
Lab Reports	Variable	Non-comprehensive	Throughout term	20%
Written Paper	1	Defined	Variable	15%
Oral Presentations	2	Defined	Variable	15%
Lab Proficiency Test	1	Comprehensive	End of term	10%
Final Examination	1	Comprehensive	End of term	40%

Material for the final exam and tests may come from class material, supplemental reading material or class discussion that was not covered in the reading material. *In other words, attendance and active participation in class is extremely important in order to complete the course successfully and receive a good grade.*

If a student is absent from the laboratory he/she may not be given an opportunity to make up the laboratory exercise, even if prior notice has been given the instructor. No make-ups will be given for the final exam unless arrangements have been made prior to the exam date. It is the student's responsibility to monitor the accuracy of the grades.

Deadlines for assignments, lab reports and other important announcements such as test times and locations will be announced either in class or by email. As a result, students *must* read their SHSU email in order to remain current.

Grading Policy

Final grades will be based upon the following scale: 90 plus average an "A"; 80 to 89 a "B"; 70 to 79 a "C"; 60 to 69 a "D"; and below 60 an "F". Students should

not count on a curve of the final grade. The instructor reserves the right to modify the grading scheme to accommodate for a missed test or final examination in extenuating circumstances.

The instructor reserves the right to assign a final exam grade of 0% should she deem the absence was not properly handled or was unjustified. Appeals will be handled in accord with University Policy Statement 900823, Academic Grievance Procedures for Students.

Attendance policy

Attendance will be recorded in keeping with University policy. Students are expected to attend class. Class attendance requirements will be followed in accordance with Academic Policy Statement 800401. In accordance with university policy, students will not be penalized for absences of up to three hours as long as examinations and other assigned work have not been missed. If a student is absent it is their responsibility to obtain the class material and remain current with information distributed during class. Occasionally changes in schedule may be announced in class. *These changes apply to all students, even those who were absent from class.* One letter grade may, at the discretion of the instructor, be deducted from students' final grade if they miss more than four classes. There will be no distinctions between "excused" and "unexcused" absences. Students are expected to be on time to class. After the beginning of the class, late students may be counted as absent.

Academic dishonesty

<http://www.shsu.edu/administrative/faculty/sectionb.html#dishonesty>

Disabled student policy

http://www.shsu.edu/~vaf_www/aps/811006.html

Services for disabled students

<http://www.shsu.edu/~counsel/sswd.html>

Student absences on religious holy day policy

<http://www.shsu.edu/catalog/scholasticrequirements.html#holyday>

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Syllabus topics (15 weeks)

Plant DNA

Bacterial DNA

Mammal DNA

Bone-teeth DNA

Mitochondrial DNA (Sequencing)

SNPs

Real time (gene expression)

Real time SNPs

Real time genotyping

Real time FRET

Western blot (protein expression)

Immunocytochemistry

Hybridization in situ

Bio-chips (gene expression)

FISH

Population genetics (software): phylogenetic analysis (autosomal markers and sequence)