

<p style="text-align: center;">Biology 142 – Advanced Topics in Genetics and Molecular Biology Course Syllabus Spring 2007</p>

Faculty Information: Dr. Nitya Jacob, *Office:* Room 104, Pierce Hall; *Phone:* 770-784-8346
Office Hours: M 3:30-4:30 PM, Th 9:00-10:00 AM, or by appointment
Email: njacob@learnlink.emory.edu

Lecture: MWF 9:35-10:25 AM or MWF 10:40-11:30 AM, Room 102, Pierce Hall

Laboratory: Tuesday 2:30-5:30 PM or Wednesday 2:00-5:00 PM, Room 125, Pierce Hall

Required:

Text: *Genetics – Analysis of Genes and Genomes*. Sixth Edition. By Daniel L. Hartl and Elizabeth W. Jones. 2005. Jones and Bartlett Publishers, Inc. – for lecture and lab.

Lab Book: Laboratory research notebook. This notebook should be purchased in the lab from the instructor. There is no published laboratory manual.

Lab Binder: A 3 ring binder is required for weekly laboratory handouts. Laboratory handouts are available on the blackboard site and Learnlink.

Recommended:

Supplement: Student Solutions Manual and Supplement Problems to accompany *Genetics – Analysis of Genes and Genomes*. Sixth Edition.

Writing in Biology: *A Student Handbook for Writing in Biology*, Karen Knisely, 2005, 2nd edition, W.H. Freeman and Co. Very useful for writing assignments.

Course Objectives: Biology 142 examines how genetic and molecular mechanisms influence multiple aspects of biological life. Physical and chemical properties of genes, transmission mechanisms, and processes by which genes are manifested as physical characteristics in a whole organism will be covered in detail. The control of gene expression is an important concept covered in this course. The causes of mutations and resulting genetic disorders, such as cancer, will also be explored. You will be introduced to techniques in the laboratory such as DNA analysis, recombinant DNA technology, analysis of gene transmission, transformation, bioinformatics and mutation analysis, which are major technological advances in the field of genetics. The laboratory is designed as a research setting including a field study to examine biodiversity in the environment. Practical applications of genetics in the areas of two major human concerns - medicine and agriculture -will be discussed in the laboratory and the classroom. An emphasis will be placed on recognizing social, ethical and environmental impacts of current advances in genetic research. Critical thinking and scientific communication skills will be developed throughout the semester in laboratory and lecture.

NOTE: This syllabus, particularly the schedule, may be subject to change. You will be notified of any changes in the classroom and the Learnlink conference. It is your responsibility to keep track of the changes.

Biology 142 – Advanced Topics in Genetics and Molecular Biology
Lecture Schedule

<u>Date</u>	<u>Topic</u>	<u>Assigned Reading</u>
W, Jan 17	Introduction	
F, Jan 19	DNA: The Secret of Life	Ch. 1
M, Jan 22	The history of DNA	Ch. 1: p.1-25
W, Jan 24	DNA structure and technology	Ch. 2: p.42-69
F, Jan 26	Human pedigree analysis	Ch. 3: p.88-108
M, Jan 29	Pedigrees and probability	Ch. 3: p.109-112
W, Jan 31	Incomplete dominance, epistasis, etc	Ch. 3: p.112-119
F, Feb 2	Cell division and sex chromosomes	Ch. 4: p.136-150 Ch. 8: 296-309
M, Feb 5	Sex linkage and pedigrees	Ch. 4: p.150-158
W, Feb 7	Chi Square analysis and linkage	Ch. 4: p.162-167 Ch. 5: p.176-189
F, Feb 9	Linkage and three-point maps	Ch. 5: p.194-198
M, Feb 12	Linkage problems and applications	
Tues, Feb 13	EXAM I - 8:00-9:30 AM (Chs 1-5)	
W, Feb 14	DNA replication and recombination	Ch. 6: p.222-241
F, Feb 16	Current research article discussion (summary due in class)	Article
M, Feb 19	DNA sequencing	Ch. 6: p.241-245
W, Feb 21	Chromosome organization	Ch. 7: p.260-274; 277-287
F, Feb 23	Bacteria and viruses	Ch. 9: p.344-354 Selected figures
M, Feb 26	Application: Genetically Modified Organisms	
W, Feb 28	Review and catch up	
F, Mar 2	Current research article discussion (summary due in class)	Article
M, Mar 5	Review of transcription and translation	Ch. 10: p.398-403
W, Mar 7	Mechanism of Transcription	Ch. 10: p.403-417
F, Mar 10	Mechanism of Translation	Ch. 10: p. 417-433

Bio 142 Lecture Schedule (continued)

Date	Topic	Assigned Reading
Mar 12-16	SPRING BREAK!	
M, Mar 19	Review and catch up	
W, Mar 21	Principles of gene regulation	Ch. 11: p.445-448
F, Mar 23	Bacterial transcriptional regulation	Ch. 11: p.448-460
M, Mar 26	Application exercises in regulation	
Tues, Mar 27	EXAM II - 8:00-9:30 AM (Chs 6-7, 9-10, application, article)	
W, Mar 28	Application exercises in regulation	
F, Mar 30	Eukaryotic gene regulation	Ch. 11: 464-477
M, Apr 2	Eukaryotic gene regulation	Ch. 11: p.477-485
W, Apr 4	Genetic Control of Development	Ch. 13: p.551-556
F, Apr 6	Genetic Control of Development	selected topics
M, Apr 9	Types and causes of mutations	Ch. 14: p. 592-626
W, Apr 11	Types and causes of mutations	Ch. 14: p. 592-626
Thurs, Apr 12	EXAM III - 8:00-9:30 AM, (Chs. 11, 13, applications)	
F, Apr 13	Repairing mutations	Ch. 14: p.626-640
M, Apr 16	Cell cycle genes and proteins	Ch. 15: p.642-656
W, Apr 18	The genetics of cancer	Ch. 15: p.656-676
F, Apr 20	DNA: Curing Cancer film	
M, Apr 23	Current research and discussion (summary due in class)	Article
W, Apr 25	Application problems - cell cycle and cancer	
F, Apr 27	Application: Stem Cells	
M, Apr 30	DNA: Pandora's Box Lab Notebooks Due in Class	

**** FINAL EXAMINATION** 9A section - Thursday, May 3: 2-5pm**

10A section - Tuesday, May 8: 2-5pm

Topics: Chapters 14 and 15, application topics and comprehensive questions

Syllabus continues on next page

Biology 142 - Advanced Topics in Genetics and Molecular Biology
Laboratory Schedule - Spring 2005
Dr. Nitya Jacob

Date	Topic	Writing Assignment
Jan 17	No Lab	
Jan 23, 24	Molecular Biology Techniques I Human DNA Extraction and PCR	Paper due 2/6, 7
Jan 30, 31	Molecular Biology Techniques II Gel Electrophoresis and Genotype Analysis	
Feb 6, 7	Microbes and Granite Outcrops Literature Search for Research Project	Summary due 2/20, 21
Feb 13, 14	Field Trip to Rock Outcrops Sample Collection	
Feb 15, 16	(special task) Selection of samples for DNA extraction	
Feb 20, 21	Bacterial DNA Extraction and PCR	
Feb 27, 28	Purification of PCR products, Restriction enzyme digest	
Mar 6, 7	RFLP analysis of rDNA	Lab notebooks due
Mar 14, 15	SPRING BREAK	
Mar 20, 21	Bioinformatics and Analysis Tools Exercise in Sequence Analysis	
Mar 27, 28	Sequence Analysis and Phylogeny of Outcrop Microbes	
Apr 3, 4	Preparation for Research Symposium	PP draft due in lab
Apr 10, 11	Yeast Mutations	
Apr 17, 18	Research Symposium - Presentations	Final Paper due 4/27
Apr 24, 25	GUS expression analysis and wrap up	Lab notebooks due 4/30

GUIDE TO BIOLOGY 142

Please read this syllabus carefully and please be sure to clarify any doubts. This handout is your map to Biology 142! Please pay full attention to the information contained in this syllabus. Information in this syllabus is subject to change according to my discretion, so please pay attention to any changes made during the semester. Please check the class conference and blackboard site regularly for announcements and changes.

Expectations/ Study tips. You are expected to read the assigned chapters from the book as well as any supplemental materials for both lab and lecture. You must read these assignments BEFORE you come to class or lab. Lecture tests will test information provided in lecture and in assigned exercises. Being prepared everyday for class is crucial for your performance on exams. Please pay attention to the explanations that I give in class and take good notes. Review lecture material every day so you are in touch with the progression of information in each class. You are expected to attend every lab and lecture (see absence policy). Good communication is always the key to success. Please take advantage of my office hours or make appointments with me to communicate any doubts, concerns or questions. I am always ready to listen. We will be covering a vast amount of information in a short period of time, so please make a habit of reviewing the course material on a weekly basis. Genetics is an applied field – you must learn how to use your knowledge of concepts and terminology for analysis. It is extremely important that you solve practice problems and questions at the end of each chapter regularly to help your analytical thinking.

Supplemental Instruction. Michael Spinner will be the SI for this course. There will be two SI sessions per week (both sections combined). Check the class conference SI folder for timings.

Examinations: The lecture exams will be a combination of multiple choice, short answer and short essay questions, including application problems. Exams will focus on material covered in the classroom, and related assigned textbook readings. The final examination will cover the last portion of the material and it will include comprehensive information. Please feel free to ask me about any questions about the material on the exam.

Discussion of Current Research Articles. There are 3 scheduled discussion days on current research articles for this course (see syllabus). A scientific journal article will be distributed for reading prior to each discussion day. Every student is required to read and prepare to discuss the article before class. Each student is required to write a one page summary of the investigation conducted in the article and the main conclusions. For each discussion day, students will be randomly selected to present the article to the class, while other students will be asked to raise questions about the subject of the article. Discussions of these articles will be evaluated on the basis of preparedness for class, participation and the written summary.

Laboratory. There is no published lab manual for this course. I will supply handouts describing the lab exercise. These handouts will also be available on Learnlink and

Blackboard. Please keep these handouts in a 3-ring binder so that they are easily available for lab. You are expected to read each exercise thoroughly and be fully prepared for each lab. The laboratory portion of Biology 142 resembles a research lab setting, where students are expected to think critically, troubleshoot problems and learn to clearly document observations and analysis. A field study on local granite rock outcrops is a main component of this laboratory. Samples will be collected from these outcrops and brought back to the laboratory for genetic analysis. Students will work in research teams, develop an independent question about these organisms and their environment, and will be expected to communicate results in the form of an oral presentation and a full-length scientific paper. A Blackboard site has been prepared for the research project. You will be given instructions and an orientation for how to use this site for your project. Your performance in lab will be evaluated based on your lab reports, lab notebook, project paper and presentation. There will be a few other short written assignments during the semester. No lab practicals will be conducted.

Class Participation and Learnlink Conference. Biology 142 is an interactive course. Class participation will be assessed according to your vocal interaction in the classroom, and your active contribution the learnlink conference. A class conference for Biology 142 is available on Learnlink. The conference will be used extensively for this course. Use the conference to bring up discussion points, post your own interests in genetics, and/or to post interesting websites related to genetics. Please check and use this conference on a regular basis. Please be professional and respectful when making your comments.

Application Topics: During the course we will focus on the practical aspect of genetics and molecular biology on several occasions. There will be discussions on topics such as stem cell research, genetically modified organisms (GMOs), sustainable agriculture and GMOs, social and ethical concerns. You will be expected to participate in the discussions, complete related readings and view related films on the topics.

Honor Code: All examinations and work for credit in this course come under the regulations of the Honor Code. Please follow the Honor Code and include your signature on your work as your pledge.

Absences: The policy on absences is provided in a separate handout. Unexcused absences, tardiness, or a failure to follow the procedures outlined in that handout can result in a reduction in your grade. Any questions about absences should be asked immediately.

Cell Phones: The use of cell phones is strictly prohibited in the classroom and the laboratory. Please turn off your phone before you come to class and leave your phone at the front during exams. Photography with camera phones is also prohibited.

Evaluation: You will be evaluated in this course based on your performance in the classroom and the laboratory. Please see page 7 for the distribution of points.

Evaluation:

Lecture:

Lecture exams (3)	300 points
Discussion and participation	50 points
Final exam	170 points

Laboratory:

PCR Results and discussion report	30 points
Research Proposal and references	15 points
Lab notebooks	40 points
Laboratory work on project	10 points
Symposium presentation	20 points
Full length scientific paper	80 points

Total	715 points
--------------	-------------------

Final grade determination

(Plus and minus grades are given)

90 - 100%	A
80 - 89%	B
70 - 79%	C
60 - 69%	D
<60	F