

<p style="text-align: center;"><b>Biology 142 – Advanced Topics in Genetics and Molecular Biology</b> <b>Course Syllabus</b> <b>Spring 2006</b></p>
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**Faculty Information:** Dr. Nitya Jacob, *Office:* Room 104, Pierce Hall; *Phone:* 770-784-8346  
*Office Hours:* M 3:30-4:30 PM, Th 9:30-10:30 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

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**Required Books:**

Text: *Genetics – Analysis of Genes and Genomes*. Sixth Edition. By Daniel L. Hartl and Elizabeth W. Jones. 2005. Jones and Bartlett Publishers, Inc. This book will be needed in lecture and lab.

Lab Book: Laboratory research notebook. This notebook should be purchased in the lab from the instructor. We will not be using a published laboratory manual for this course. Laboratory exercises will be provided as handouts prior to lab and are available on the class conference.

Reference Book: *Biology*, N.A. Campbell and J. B. Reese. 2005. Seventh edition. Benjamin/Cummings Publishing Co., Inc.

**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. Control of gene expression, is an important concept covered in this course. The genetic basis of organism development will be examined. The causes of mutations and resulting genetic disorders, such as cancer, will also be explored. Major technological advances have greatly facilitated the study of genetics. 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. The laboratory portion of this course encompasses the theme “genes, organisms and the environment.” The laboratory exercises will involve a field study, introducing you to the use of genetic analysis 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**

Date	Topic	Assigned Reading
W, Jan 18	Introduction	
	The DNA revolution	
F, Jan 20	Important people and history	Ch. 1
M, Jan 23	DNA structure	Ch. 2: p.44-53
W, Jan 25	Importance of DNA structure to technology	Ch. 2: p.53-68
F, Jan 27	Transmission of genes	Ch. 3: p.88-112
	Human pedigree analysis	
M, Jan 30	Gene-gene interactions	Ch. 3: p.112-125
W, Feb 1	Mitosis, meiosis and gene shuffling	Ch. 4: p.136-150
F, Feb 3	Sex and inheritance, pedigrees	Ch. 4: p.150-158
M, Feb 6	Current Research and Discussion	Article
W, Feb 8	Linkage and chromosome maps	Ch. 5: p.176-198
F, Feb 10	Linkage and chromosome maps	Ch. 5: p.203-212
M, Feb 13	Application: genetics and the environment	Handout
W, Feb 15	DNA replication and recombination	Ch. 6: p.222-241 p.245-252
<b>Thurs, Feb 16</b>	<b>EXAM I - 8:00-9:30 AM, Chs 1-5, application</b>	
F, Feb 17	Bacteria and viruses	Ch. 7: p.260-266 Ch. 9: p.344-364
M, Feb 20	Bacteria and viruses	Ch. 9: p. 365-388 (selected topics)
W, Feb 22	Chromosome organization	Ch. 7: p.266-287
F, Feb 24	Polyploidy	Ch. 8: p.329-337
M, Feb 27	DNA markers and applications	Ch. 2: p. 69-79
W, Mar 1	DNA sequencing	Ch. 6: p.241-245
F, Mar 3	Current Research and Discussion	Article
M, Mar 6	Colinearity and transcription	Ch. 10: p.398-417
W, Mar 8	Translation	Ch. 10: p.417-435
F, Mar 10	Review and catch up	

**Bio 142 Lecture Schedule (continued)**

Date	Topic	Assigned Reading M,
<b>Mar 13-17</b>	<b>SPRING BREAK!</b>	
M, Mar 20	Operons	Ch. 11: p.444-454
W, Mar 22	Gene regulation	Ch. 11: p.454-459, 464-471
<b>Thurs, Mar 23</b>	<b>EXAM II - 8:00-9:30 AM, Chs 6-9, 2, application</b>	
F, Mar 24	Eukaryotic gene regulation	Ch. 11: 471-488
M, Mar 27	Types of mutations	Ch. 14: p. 592-606
W, Mar 29	Causes of mutations	Ch. 14: p.606-626
F, Mar 31	Repairing mutations	Ch. 14: p.626-640
M, Apr 3	Karyotypes and chromosome mutations	Ch. 8: p.298-329
W, Apr 5	Cell cycle genes and proteins	Ch. 15: p.642-656
F, Apr 7	The genetics of cancer	Ch. 15: p.656-676
M, Apr 10	Cancer Research discussion	Article
W, Apr 12	Application: Gene Therapy	Handout
F, Apr 14	Genetic Control of Development	Ch. 13: p.551-558
M, Apr 17	Genetic Control of Development	Ch. 13: p.565-585 (selected topics)
W, Apr 19	Application: Stem Cells	
<b>Thurs, Apr 20</b>	<b>EXAM III - 8:00-9:30 AM, Chs. 10-11, 14, application</b>	
F, Apr 21	Review and catch up	
M, Apr 24	Complex inheritance – selected topics	Ch. 18: p.761-774
W, Apr 26	Application: Genetically Modified Organisms	Handout
F, Apr 28	The DNA revolution – ethics and environment	
M, May 1	Future directions	

**\*\* FINAL EXAMINATION\*\* Finals Week TBA Comprehensive**  
**(NOTE: Final exam time and date may be different from the Spring Final Exam**  
**Schedule published by the Registrar's office)**

*Syllabus continues on next page*

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

<b><u>Date</u></b>	<b><u>Topic</u></b>	<b><u>Writing Assignment</u></b>
Jan 18	No Lab	
Jan 24, 25	Molecular Biology Techniques PCR, Restriction Enzymes, Gel Electrophoresis	Report due 1/31, 2/1
Jan 31, Feb 1	Introduction to Model Organisms	
Feb 7, 8	Introduction to Microbes and Granite Outcrops Literature Search for Research Project Introduction and proposal due 2/21, 2/22	
Feb 14, 15	Field Trip to Rock Outcrops Sample Collection	
Feb 21, 22	Bacterial DNA Extraction and PCR	
Feb 28, Mar 1	Analysis of PCR products , extraction	
Mar 7, 8	RFLP analysis of bacterial rDNA	Lab notebooks due 3/7, 3/8
<b>Mar 14, 15</b>	<b>SPRING BREAK</b>	
Mar 21, 22	Bioinformatics and Analysis Tools Exercise in Sequence Analysis and Tree Building	Report due 2/28
Mar 28, 29	Sequence Analysis and Phylogeny of Outcrop Microbes	
Apr 4, 5	Completion of Research Projects	
Apr 11, 12	Research Symposium - Presentations	
Apr 18, 19	Yeast Mutations	
Apr 25, 26	Future Questions and Research	

## 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 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. If you are not prepared for class, you will certainly fall behind in your understanding, thereby affecting your performance on exams. You are expected to attend every lab and lecture (see absence policy). Please pay attention to the explanations that I give in class and take good notes. 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 a very 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.** There is no SI program for Biology 142 this semester. I will be available for questions and possible question/answer sessions prior to lecture exams. Please note my office hour timings and contact information.

**Examinations:** The lecture exams will be a combination of multiple choice, short answer and short essay questions. Exams will cover all material in lecture in addition to 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.

**Current Research Discussion Days.** There are 3 scheduled discussion days on current research 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. 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. Each student is required to write a one page summary of the investigation conducted in the article and the main conclusions. 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 one week prior to the lab. These handouts will also be available on Learnlink. I suggest keeping these handouts in a 3-ring binder so that they are easily

available for use in 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. 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, gene therapy, 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 uphold 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	150 points

### Laboratory:

PCR Results and discussion report	25 points
Introduction and Proposal	15 points
Bioinformatics report	10 points
Lab notebooks	60 points
Work on project	20 points
Symposium presentation	20 points
Full length scientific paper	60 points

<b>Total</b>	<b>710 points</b>
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### Final grade determination

*(Plus and minus grades are given)*

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