

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

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Office Hours:, Wed, 9:30-10:45AM; Th 9:30-10:30AM, or by appointment
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Lecture: MWF 8:30-9:20 AM, Room 102, Pierce Hall

Laboratory: Monday 2:00-5:00 PM, Room 123, 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.

Highly 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, 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, is 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 Fall 2007

<u>Date</u>	<u>Topic</u>	<u>Assigned Reading</u>
W, Aug 29	Introduction	
F, Aug 31	DNA: The Secret of Life	Ch. 1
M, Sep 3	** Labor Day **	--
W, Sept 5	The history of DNA	Ch. 1: p.1-25
F, Sep 7	DNA structure and technology	Ch. 2: p.42-69
	<i>(Note: This topic will be re-visited after the human genotyping lab)</i>	
M, Sep 10	Transmission genetics and pedigree	Ch. 3: p.88-109
W, Sep 12	Human pedigree analysis	Ch.4: 155-156
F, Sep 14	Pedigrees and probability	Ch. 3: p.109-112
M, Sep 17	Incomplete dominance, epistasis, etc	Ch. 3: p.112-122
W, Sep 19	Chromosomes, karyotypes and cell division	Ch. 4: p.136-150 Ch. 8: 296-309
F, Sep 21	Chi Square analysis and linkage	Ch. 4: p.150-58, 162-67
	<i>Review of human genotyping analysis</i>	Ch. 5: p.176-189
M, Sep 24	Linkage and three-point maps	Ch. 5: p.189-198
W, Sep 26	Linkage problems and applications	
Thurs, Sep 27	EXAM I 8:00 - 9:30 a.m. (through linkage and applications)	
F, Sep 28	DNA replication and recombination	Ch. 6: p.222-241
M, Oct 1	DNA sequencing	Ch. 6: p.241-245
W, Oct 3	Application: Genetically Modified Organisms	
W, Oct 3	<i>Special Session – 7pm: DNA: Pandora’s Box, Social Implications of Genetics</i>	
F, Oct 5	Chromosome organization	Ch. 7: p.260-274; 277-287
M, Oct 8	** Fall Break **	
W, Oct 10	Current research article discussion	Article
F, Oct 12	Bacteria and viruses	Ch. 9: p.344-354 Selected figures

Biology 142 – Lecture Schedule Fall 2007 Continued

Date	Topic	Assigned Reading
M, Oct 15	Review of transcription and translation	Ch. 10: p.398-403
W, Oct 17	Mechanism of Transcription	Ch. 10: p.403-417
F, Oct 19	Mechanism of Translation	Ch. 10: p. 417-433
M, Oct 22	Review and catch up	
Tues, Oct 23	EXAM II – 8:00 – 9:30 a.m. (through translation)	
W, Oct 24	Principles of gene regulation	Ch. 11: p.445-448
F, Oct 26	Bacterial transcriptional regulation	Ch. 11: p.448-460
M, Oct 29	Application exercises in regulation	
W, Oct 31	Eukaryotic gene regulation	Ch. 11: 464-477
F, Nov 2	Eukaryotic gene regulation	Ch. 11: p.477-485
M, Nov 5	Application exercises in regulation	
W, Nov 7	Genetic Control of Development	Ch. 13: p.551-556
F, Nov 9	Genetic Control of Development	selected topics
M, Nov 12	Review and catch up	
W, Nov 14	Genetic diseases	handout
F, Nov 16	Types and causes of mutations	Ch. 14: p. 592-626
M, Nov 19	Repairing mutations	Ch. 14: p.626-640
Tues, Nov 20	EXAM III - 8:00 – 9:30 a.m. (through regulation, development)	
W, F 21-23	** Thanksgiving Break **	
M, Nov 26	DNA: Curing Cancer film	
W, Nov 28	Cell cycle genes and proteins	Ch. 15: p.642-656
F, Nov 30	Current research and discussion	Article
M, Dec 3	The genetics of cancer	Ch. 15: p.656-676
W, Dec 5	Application problems – cell cycle and cancer	
F, Dec 7	Application: Stem Cells	
M, Dec 10	Questions raised by the study of genetics	

***** FINAL EXAMINATION*** December 19, 2-5pm**

Biology 142 - Advanced Topics in Genetics and Molecular Biology
Laboratory Schedule Fall 2007

<u>Date</u>	<u>Topic</u>	<u>Assignment</u> <i>(due in lab unless indicated)</i>
Sept. 3	*Labor Day*	
10	Molecular Biology Techniques I Human DNA Extraction and PCR	<i>Introduction due 9/17</i>
17	Molecular Biology Techniques II Human Genotype Analysis	<i>Full paper due 10/1</i>
24	Microbes and Granite Outcrops Literature Search for Research Project	<i>Proposal due 9/24 (end of lab)</i> <i>Summary due in class 10/5</i>
Oct. 1	Field Trip to Rock Outcrops Sample Collection	
8	***Fall Break***	
<i>Fri, Oct 12</i>	Week of Fall Break - Selection of samples for DNA extraction	
15	Bacterial DNA Extraction and PCR	
22	Purification of PCR products, Restriction enzyme digest	
29	RFLP analysis of rDNA	<i>Lab notebooks due 10/29 (end of lab)</i>
Nov. 5	Bioinformatics and Analysis Tools Exercise in Sequence Analysis	
12	Sequence Analysis of Outcrop Microbes	<i>Materials and Methods due (optional)</i>
19	Preparation for Research Symposium	<i>Figures and tables due 11/19</i>
26	Yeast Mutations	<i>Paper drafts due 11/26</i> <i>(optional)</i>
Dec. 3	Research Symposium - Presentations	<i>Final paper due 12/7 in class</i>
10	GUS expression analysis and wrap up	<i>Lab notebooks due 12/10</i> <i>(end of lab)</i>

Important Dates For Biology 142 Fall 2007 (may be subject to change)

September:

- 17 Introduction section (Lab 1) due in lab
- 24 Proposal due end of lab
- 27 **Exam I**

October:

- 1 Lab paper (human genotyping) due in lab
- 3 Finish short story by Octavia Butler, Evening film session 7-9pm
- 5 Literature summary (lab) due in class
- 10 Research article summary due in class
- 23 **Exam II**
- 29 Lab notebooks due in lab

November:

- 12 Materials and methods section draft due in lab (*optional*)
- 19 Figures and tables draft due in lab
- 20 **Exam III**
- 26 Full paper drafts due in lab (*optional*)
- 30 Research article summary due in class

December:

- 3 Research symposium in lab
- 7 **Final paper due in class**
- 19 **Final Exam, 2-5pm**

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:

- * **Class notes are most important!** Please work on taking good notes in class – this will be the most important information in the course. Some examples discussed in class may not be found in the text. Many of the exam questions come out of the material discussed in the classroom.
- * **Your textbook is a supplementary resource.** Please read these assignments BEFORE you come to class or lab. The textbook reading gives you an overview of the subject matter. We will not focus on all details presented in the text, so pay close attention to your class notes to determine the most important concepts and highlight them in your text reading. Learning every single detail from the textbook is not a good use of your time.
- * **Practice all assigned problems and worksheets.** I will assign specific problems from the textbook and provide worksheets that I have designed. Genetics is an applied field – you must learn how to use your knowledge of concepts and terminology for analysis. You must make it a point to keep up with the problem solving and practice solving them well in advance of an exam.
- * **Keep up regularly.** There will be a lot of information covered in this course. To be successful, you must keep up with the material from class to class. Attending your SI sessions and coming by during office hours throughout the semester (not just before exams) will help you tremendously. Being prepared everyday for class is crucial for your performance on exams.
- * **Be a regular participant.** It is important to be an active participant in course work and discussion.

Supplemental Instruction. Khushboo Patel will be the SI for this course. There will be two SI sessions per week. 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 2 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 (as directed) of the investigation conducted in the article and the main conclusions. For each discussion day, students will be expected to discuss specific aspects of the paper in class. 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 the Blackboard site for the course. 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 on their own, 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. Biology 142 is an interactive course. There is a general participation requirement. I will be paying attention to your contribution to the classroom. I expect you to think carefully about the material and ask questions that extend beyond what is presented in the classroom. You can also participate by contributing to the Learnlink conference. 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 and Film Discussions: 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, genetically modified organisms (GMOs), sustainable agriculture and GMOs, stem cell research, social and ethical concerns. There will be 3 films shown this semester and your participation in discussion is required.

Special Topic/ Film Showing. One of the 3 films we will watch this semester is *DNA: Pandora's Box*, a documentary about the role of genetics in human enhancement. This film will be shown on October 3rd at 7pm, followed by a discussion from 8-9pm (location TBA). This event is outside of class time but is required. You are also required to read a short story "The Evening and The Morning, and The Night" by Octavia Butler by October 3rd to prepare for discussion.

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
General class participation	10 points
Film responses	10 points
Oct 3 rd film and story discussion	10 points
Article discussion	30 points
Final exam	170 points

Laboratory:

Human genotyping paper	30 points
Proposal and literature summary	15 points
Lab notebooks	40 points
Figures and tables	10 points
Symposium presentation	20 points
Full length scientific paper	80 points

Total 725 points

Final grade determination

(Plus and minus grades are given)

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