Biology 401 Course Syllabus
Recombinant DNA
Spring Term 2011

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OFFICE HOURS: MW 9:30-11 am; TR 3-4 pm
If I am not in my office during scheduled office times I am probably somewhere nearby (another faculty member's office, research lab, etc.) and will return momentarily. I will leave a note on my door indicating where I've gone. Please be patient and wait until I return. If I do not return in a timely manner, please ***leave a note on my door so that I can contact you ASAP****. You can always reach me by sending an e-mail (preferable) or leaving a message on my answering machine. I do not tweet or use text-messaging. If it is a* ***dire*** *emergency you can contact me at home: 724-657-1416.*

REQUIRED:
Text: Campbell and Reece. *Biology,*
Links to scientific literature and handouts (My.Westminster)

Laboratory Manual: My.Westminster and/or R-Drive
Lab Notebook: Composition-style, quad-lined laboratory notebook

COURSE DESCRIPTION: The primary emphasis of this course will be a sample of the numerous advances in the field of recombinant DNA and DNA technology. The laboratory component of this course will emphasize basic techniques in DNA manipulation and genetic engineering. We will begin the semester with an overview of gene expression, genomes, and the basic tools and techniques of genetic engineering. Then we will explore some of the more recent advances in the fields of molecular genetics, genetic engineering, and the use of recombinant techniques. **Prerequisite: BIO 303 or BIO 302**.

COURSE OBJECTIVES: This course is being taught as an upper-level biology course for those students majoring in biology and/or molecular biology. It is designed for students interested in the field(s) of medicine, genetics, basic research, and/or scientific writing. The primary learning objectives for this course include, but are not limited to:

- demonstrate a basic conceptual understanding of recombinant DNA techniques and their applications;
- demonstrate proficiency in the lab with recombinant DNA techniques and their applications;
- improve reading, evaluation, and presentation of information from secondary and primary literature specific to this field;
- effectively incorporate peer evaluation and constructive criticism into scientific writing assignments, while demonstrating an appreciation and understanding of why this skill is crucial for scientific progress.
- develop a basic understanding and an appreciation for group work, communication and collaboration.
- demonstrate an awareness of recent advances and applications within the field of recombinant DNA and DNA technology, as well as basic tools and techniques of genetic engineering.

STRUCTURE: Each week there will be two (2) one and a half hour lecture/discussion/group work sections (TR 11 am–12:30am; HSC 206) and one 3 hour lab/research section (W 6:30-9:30 pm; HSC 343). Student are expected to maintain a binder that contains all assigned readings (handouts, articles, etc.) and bring this resource to both lecture and lab. Student are expected to maintain a 3-ringed binder of all lab exercises (as they become available on the R-drive), and any pre-lab assignments, along with a quad-ruled lab notebook. Assignments in lecture and lab often require the use of multiple resources. Students are expected to review much of the background material and readings outside of the classroom. We will be covering significant amounts of material during class periods, so it is important that you miss as few classes as possible. Students who are absent for group work must make up the assignment an individual basis and will be graded as such. Unauthorized electronic devices are not allowed to be on in the classroom or laboratory (e.g., cell phones, MP3 devices). **If a cell phone rings or a student answers their cell phone during class or lab, I will deduct points from their total grade** (1 point for the first occurrence; 2 points for the second; 4 points for the third; etc.). **If the offending phone is not identified, the entire class will be penalized**. I will make exceptions to this rule if you tell me that you are waiting for a call **prior** to that class and it pertains to a medical or family emergency. Students are more than welcome to bring a laptop to lecture, but only for the purpose of taking notes.

ATTENDENCE POLICY: While there is no numerical penalty for missing lectures, I will be taking note of absences. I have noticed a strong correlation between classes missed by a student and their grade. If two or more consecutive classes are missed, or two classes within a one week period are missed, I will notify the Dean. **Students are responsible for any material covered if absent from class, regardless of the reason**. Class and lab notes must be obtained from classmates. Handouts or assignments can be obtained from me during my office hours. I will be more than happy to help clarify material missed during any absence, but it must be during my office hours or another time outside of class that has been arranged by the student and is convenient for both of us. The student must come to help sessions prepared (read and thought about the material and come prepared with *specific* questions).

Attendance for exams and labs is required. Students are responsible for identifying any conflicts between exams and college sponsored activities or events and reporting them to me **at least 2 calendar days *prior*** to the absence so that alternative plans can be arranged. **Any exams that conflict** with other college sponsored activities **must be taken *prior* to the scheduled exam or lab date**. The decision for whether or not a missed lab can be made up is left to the discretion of the instructor. Missed labs must be made up outside of lecture and lab time. Absences due to illness must be reported to the health center within 48 hours and a written excuse provided for the instructor at the next class period.

EXAMS: There will be four exams during the semester. The fourth exam will take place during finals week, but it is **not** comprehensive. **Exams will cover material presented in lecture and lab**, and will consist of a variety of assessment methods: multiple choice, multiple-multiple choice, recognition, short answer, short essay questions, and problem solving. **A portion of each exam will also require group work**.

LABS, LAB NOTEBOOKS, FORMAL LAB REPORTS, and LAB QUIZZES:

While some of the labs will be self-contained exercises, the majority of labs will be interconnected exercises that span the course of two or more weeks and introduce students to some of the more basic techniques frequently used in this field. Because most of the labs are continuous, and lab practicums will be given throughout the semester, it is important for students to be thorough with documentation and remain in constant communication with all members of the class. We will explore some of the most basic techniques of recombinant DNA technology and genetic engineering, such as sub-cloning, construction and screening of genomic libraries, and DNA sequencing. **Some of these labs will require time commitments extending beyond scheduled class/lab time.**

Lab Notebooks: Notebooks must be organized and maintained using guidelines specified at the beginning of class. (Also review the Powerpoint file on the R-drive/profnotes - "lab notebook organization".) Notebooks will be collected for grading only twice during the semester (at mid-term and then again at the end of the semester). I will be grading each notebook based on content, attention to detail, and organization. Organization and content *must* follow the guidelines. **Exercises designated as formal labs must still be written in you lab notebook *first*.** (If sections of the formal lab are cut and pasted into the notebook in place of what should have been written *prior* to the formal lab report, an accurate account of procedures and results is not possible. This will also result in points being deducted from the total lab notebook grade.)

Lab Practicums: There will be three lab practicums. You will be allowed to use your lab notebooks because **any** material covered during lab or discussions will be considered fair game. This includes observations, data analysis, calculations and content discussed during lab. It is in your best interest to be as thorough as possible when writing methods, observations, results, and conclusions.

Formal Lab: There will be two (2) formal lab reports. *Each* report will consist of anywhere from 1-3 lab exercises that span a particular topic or related topics. Guidelines for reports will be handed out prior to completion of these labs. A well-written formal report requires *significant* amounts of background literature research *before* writing the report. The final report is to be submitted to the R-drive or by e-mail no later than **10 calendar days** after completion of data collection. Because this is a 400 level course and each group will submit one report (instead of individual reports by each group member), expectations for the quality of each lab report are high and there will be **no opportunity for revisions**.

RESEARCH PRESENTATIONS: Two times during the semester each student will be required to perform a literature search and give an 8-10 minute presentation on a particular concept or technique discussed in a primary source. The literature search will require a **minimum** of one secondary source and two primary sources, both from journals; **internet/web sites are not allowed**. The student will provide a brief introduction of the purpose and significance of what they have researched, select 1-3 important data figures and explain them in detail, summarize the final conclusions of the article, and then provide a personal evaluation of the article. A copy of each source and an electronic version of the presentation must be submitted at the time of the presentation.

COURSE GRADING:

Lecture Exams (4; 125 pts. each).....	500 points
Lab Notebook.....	175 points
Lab Practicums (3; 20 pts, 25 pts, 30 pts)……...	75 points
Formal Labs (50 pts each).....	100 points
Research Presentations (35 pts, 40 pts) ……..	75 points
Discretionary Points (participation, attitude, etc.)	75 points

Total = 1,000 points

A.....	93% or greater	C^+.....	77% - 79.95%	F.....	below 60%
A^-.....	90% - 92.95%	C.....	73% - 76.95%		
B^+.....	87% - 89.95%	C^-.....	70% - 72.95%		
B.....	83% - 86.95%	D^-.....	67% - 69.95%		
B^-.....	80% - 82.95%	D.....	63% - 66.95%		
		D^+.....	60% - 62.95		

ACADEMIC INTEGRITY: Academic integrity is one of the cornerstones of any academic community and is an essential component of the scientific process. Much of the progress achieved by various scientific disciplines, such as physics, chemistry, engineering and biology, over the past two centuries is a direct result of academic rigor and integrity. The sciences have thrived because our community is based primarily on objectivity and rigorous testing (and re-testing) of ideas. Scientific theories such as gravity, cell theory, atomic theory and evolution are constructed from the observations and experimentation of many individuals, all relying on the accuracy and authenticity of previous work.

Research shows that studying in groups is one of the most productive ways of learning. This can mean explaining a difficult concept to a friend or asking for help with explanations. It can also mean asking a friend to edit your completed assignment for mistakes. While faculty and administration strongly encourage student collaboration and the use of all available resources when studying or researching topics, it is important that the student (1) properly acknowledge the origins of their information and (2) process this information in a way that allows them to reach their own conclusions and express concepts in their own words. In order to achieve these goals, the student must learn proper citation of scientific resources, must have a thorough understanding of the material, and be willing to accept and learn from constructive criticism. We believe students have the ability to think for themselves and form their own conclusions. The mission of Westminster College is clearly stated in the College catalog:

> *The mission of Westminster College is to help men and women develop competencies, commitments, and characteristics which have distinguished human beings at their best. [. . .] Develop and demonstrate moral and ethical commitments to neighbor, society, and the natural world consistent with an understanding of self.*

The academic integrity policy of this institution can be found in the College catalog. Violations of academic integrity are included, but not limited to, those found in the College catalog, along with the process, consequences and stipulations. While the academic community and scientific process is severely undermined by any of these violations, the I would like students to pay particular attention to the categories of "plagiarism" and "providing false information". Research papers and lab reports build on the ideas of others. Failure to acknowledge or document your sources is called plagiarism and will be handled in accordance with Westminster's academic integrity policy. Plagiarism covers any material used for assignments mentioned above (textbooks, journal articles, lab partners or fellow students, internet sites, other faculty, etc.). If a student must use the words of another person, credit must be given to that source or person (i.e. direct quotes, paraphrasing of statements or ideas, thoughts or concepts that are not "common knowledge".) I will be clear about what I consider plagiarism prior to giving an assignment because it might differ between instructors and disciplines. Providing false or fabricated information is another *serious* violation of scientific integrity (lab notebooks, formal lab reports). Obtaining laboratory results from another source or person and/or fabricating results will result in a minimum penalty of zero for the assignment or a failing grade for the course. Any papers or lab reports may be submitted by me to *Turnitin.com*. Academic dishonesty applies to any student participating in activities listed in the College catalog either for their own or for another's benefit.

Tentative schedule:

Week	Lecture Topics (Tues. & Thurs.)	Lab Exercises (Wed., 6:30 pm)
1/17-1/19	Introduction: Genes & Genomes - Genes	Lab Introduction & Metric

1/24-1/26	- Genomes	Bioinformatics
1/31 **2/2**	- Genome Analysis **Exam I**	Bioinformatics
2/7-2/9	Recombinant DNA Technologies - Basic Molecular Tools	Lab Pract. #1 Restriction Digest of Genomic DNA & Vector
2/14-2/17	- Plasmids & Vectors	Ligation & Transformation
2/21-2/23	- Sequencing	Analysis of Genomic Library
2/28 **3/1**	Frontiers of Recomb. Tech. **Exam II**	Preparation of Genomic Clones for Sequencing (3/1 Lab Notebook Due)
3/3 - 3/11	*Spring Break*	
3/13-3/15	Gene Expression	Lab Pract. #2 Isolation of RNA
3/20 3/22	Gene Expression Gene Expression & Microarrays	Isolation of RNA and Conversion to cDNA
3/27 – 3/29	Interference RNA	Presentations
4/3 *4/5-4/9*	**Exam III** *Easter break*	Quantitative PCR (qPCR)
4/10 4/12	*"Westminster Monday"* Viruses	RNAi
4/17 - 4/19	Viruses	RNAi
4/24 - 4/26	Vaccines	Lab Pract. #3 TBA
5/1-5/3	Human Gene Therapy	Presentations (5/3 Lab Notebook Due)
5/7 (Mon.)	**Exam IV, 8 AM** (Finals period)	