MOLECULAR BIOLOGY SYLLABUS

Biol 320 Sect 1 & 2 – Fall 2021

Instructor: Dr. Diane Caporale (Dr. C)
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Canvas: Biol 320
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Required Text:
Cox, M.M. et al. 2015. *Molecular Biology: Principles & Practice*, 2st ed. For rent in bookstore.

Required lined paper & 1 inch 3-Ring Binder: Purchase lined paper for note taking and lab journaling. Another option is to purchase a small lab notebook with lines.

Lab Manual: Purchase at the Bookstore.

Lecture Meetings: Mon & Wed: 9:30 – 10:45 am; CBB 135

Lab Meetings:
Section 1: Wed 11:00 am – 1:50pm, CBB 336
Section 2: Thur 11:00 am – 1:50 pm, CBB 336

Exam Times: during lecture time, Check schedule for specific dates

Learning Outcomes:

University Level: *Investigation / Understanding the Physical World*: 1) Identify the basic taxonomy and principles of the scientific method as it pertains to the natural, physical world, 2) Infer relationships, make predictions and solving problems based on an analysis of evidence or scientific information, 3) Apply scientific concepts, quantitative techniques and methods to **solving problems** and making decisions, and 4) Describe the relevance of some aspect of the natural science to their lives and society.

Biology/Biochemistry Program Level: 1) Apply the scientific method, using appropriate theoretical and practical skills to design research studies, answer biological questions and/or solve problems. 2) Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory. 3) Evaluate and discuss contemporary social and ethical issues related to biology. 4) Apply theoretical and practical aspects of biology in a variety of laboratory and/or field experiences.

Course Level: 1) Compare the basic principles of inheritance in detail at the molecular, cellular and organismal levels, beyond the scope of Biol 210 (Genetics). 2) Relate DNA structure and manipulation to the function and control of genes. 3) Relate molecular techniques to discoveries in molecular biology. 4) Appraise ethical issues involved with the study of biotechnology and medicine. 5) Conduct basic molecular techniques to answer a variety of biological questions, and 6) Design molecular-based experiments using the scientific method.

Vaccine Information:
Vaccination is the best way to protect yourself against the SARS-CoV-2 virus. If you are not already vaccinated against the virus, I urge you to make that happen right away. The Pfizer vaccine received full FDA approval, and full FDA approval for the other vaccines currently being used is on the horizon. And for good reason! Vaccines are extremely safe, extremely effective, and one of the best tools you can use to protect yourself and others from Covid. Our university policy is that vaccinated individuals are NOT required to be tested each week and are NOT required to quarantine if/when they are exposed to someone with covid.

Face Coverings:
At this time regardless of vaccination, the wearing of face coverings is mandatory in all buildings. Any student with a condition that impacts their use of a face covering should contact the Disability and Assistive Technology Center to discuss accommodations in classes. This is university policy and not up to the discretion of individual instructors. Failure to adhere to this requirement could result in formal withdrawal from the course.

Grading: The grading scale below is firm. There will be no borderline grades. If you attend and participate in class, keep up with your text reading each week, read lab manual **prior** to lab time, and **ask questions**, then you'll find success in this course. **Late lab reports are subject to 10% off each day late.**

Your final letter grade is calculated as follows: out of 100 pt.

	B+ = 87.5-89.4	C+ = 77.5-79.4	D+ = 67.5-69.4
A = 92.5-100	B = 82.5-87.4	C = 72.5-77.4	D = 60.0-67.4
A- = 89.5-92.4	B- = 79.5-82.4	C- = 69.5-72.4	F = ≤ 60.0

There are four (4) lecture exams, which are in short answer / essay format. **Exams do not cover the lecture before the scheduled exam time.** Grades will be posted on Canvas, as well as weekly posts, suggested studying assignments, and practice questions to help you succeed in this course. There are also 6 formal lab reports. Below is a table indicating the percentage point values for each item.

Lecture Exams	60% Total	Lab Reports & Participation	40% Total
1	15%	Gel Electrophoresis	5% / group of 2
2	15%	DNA Isolation	5% / group of 2
3	15%	Detection of 3 Tick-borne Pathogens by PCR	10% / group of 2
4	15%	Identification of Pathogens by DNA Sequencing	5% / group of 2
		Identifying Genotypes of Interest in your Genome	10% / individual
		Identify Genotype by DNA Sequencing	5% / individual

Attendance Policy: I strongly recommend you attend every lecture. Missing any class will put you at a distinct disadvantage when test taking. Students who must miss an exam due to religious observances or participation in university-sanctioned events should notify me within the first 3 weeks of the beginning of class, so makeup arrangements can be made. The only other valid excuses for missing an exam are: death in the family, violent illness, or accident. In such cases: (1) you must provide evidence of some kind (eg. note from health center), **and** (2) you must reschedule **within 24 hours** after the deadline.

E-mail: Students are expected to check their University e-mail regularly for information from the university and/or instructor. If you are using an e-mail account other than your campus account to contact me, be sure your full name is included in the message

Electronic Devices: Cell phones must be turned **off** and **not** displayed during class, lab or exam. No other communication or musical devices are allowed. Students needing a foreign language dictionary during exams may use one with permission from instructor.

Academic Conduct: You are responsible for the honest completion and representation of your work and for the respect of others' academic endeavors. Any act of cheating, plagiarism, or academic misconduct is subject to the penalties outlined in UWS Chapter 14. For more information: **http://www4.uwsp.edu/natres/nres701/plag.pdf**

Extra Help: request a Zoom meeting via email for extra help. Form study groups with your classmates. Students with a disability requiring accommodations should register with the Disability and Assistive Technology Center in the Learning Resource Center (the Library) and contact me at the beginning of the course.

Lecture PPTs: Lecture PowerPoints will be provided on Canvas before each lecture. Please print off and bring to lecture, so you can take notes directly on each slide. Although it is provided for your convenience, it could inadvertently be used as a passive way to study; Students who just read over the PowerPoint slides before exams typically earn a "C-" or below in this course. Therefore, I recommend you read your textbook after each lecture to reinforce your understanding of that material. Read especially the paragraphs and captions pertaining to the images shown in lecture while writing your own notes. Then, after we complete a chapter in lecture, try answering practice questions provided on D2L. I also recommend each week to make up study-guide sheets. To keep up with the material, I recommend you 1) study from your study-guide sheets that you made before each exam and 2) make sure you understand the answers to each practice question and 3) come up with your own questions from each slide and have a Q&A study time with your peers. The best way to grasp the material is to form study groups with your classmates.

Suggested Study Habits:

It is often observed that people learn more when they encounter and interact with subject material in different ways.

The following scale presents representative measures of how we might learn through different forms of interaction.

You learn:
10% of what we **read**
20% of what we **hear**
30% of what we **see**
40% of what we **see & hear**
50% of what we **write**
60% of what is **discussed**
70% of what we **experience**, and
95% of what we **teach**

Before each class:

a) Read the textbook chapters and summary sections that pertain to the info in the lecture slides (PowerPoint). While reading, take notes on the side of each slide to help clarify the information discussed in class. These notes can be used as lecture slide guide sheets.

Before the exam:

a) **Rewrite your notes!** For each lecture, continue developing your lecture slide guide sheets and write out the information that was covered for each slide. Try to describe any images/figures on the slide in your own words. Try to do this for each lecture BEFORE the next lecture. Then read it over once to see the whole picture or overall theme of that lecture. When appropriate, make a table of info to help compare concepts.
b) **Anticipate exam questions.** Come up with 1-2 questions of your own from each slide to quiz yourself later. Definitions, short answers, problems, and comparisons are all good types of questions.
c) **Study your notes.** At the end of each week you will have made lecture slide guide sheets that include your notes for that material. Before the week's lectures, read over your lecture slide guide sheets and highlight only the information you could not remember.
d) **Focus your studies.** Before the exam you will have made a set of lecture slide guide sheets with the information you need to reinforce already highlighted. Focus on this highlighted material one or two days before the exam. Reread, highlight info that you are having trouble learning or remembering and say it out loud, to yourself, with another person from class, a friend or study group.
e) **Practice questions.** Dr C will provide practice questions on Canvas prior to each exam. Come up with your own answers and discuss them with someone from class.
f) **Teach your peers.** Form a study group and discuss possible answers to questions each person in the group came up with from each lecture slide. If you can teach it to another person, then you know it!

The night before the exam:

a) **Value your sleep.** Being wakeful and well rested can help your performance on the exam. Be sure to get a good night's sleep before the exam. Cramming at the expense of sleep is not the best method.
b) **Try to relax.** Study hard, but also seek ways to reduce your stress. Take breaks to help refocus your mind.

At least 6 hr/week study time:

a) A good grade can result from **reading** the text and your notes, **listening** to lectures, **seeing** the words and figures, **writing** and **rewriting** notes from class, the **experience** of answering questions from the chapters or provided, and **discussing** topics with another person (saying it out loud).
b) Your grade should reflect the amount of cumulative effort you put into your studying. Remember, for every hour of lecture, you should allot two hours of designated studying time. In other words, for each exam you should be spending about 10-15 hrs studying! It isn't possible to effectively achieve that 1-2 days before an exam.

If you can teach it to another person, then you know it! "**The best way to learn is to teach!**"

Laboratory Reports:

Genetic researchers generally perform multiple experiments on a daily basis. Therefore, it is very important that researchers keep excellent records of their experimental findings in laboratory notebooks. Lab books are a form of documentation of work that was performed and reported in published manuscripts. Your lab reports will be based on a revised version of a manuscript, whereas all detail of the introduction and methods sections will be omitted. However, the discussion and conclusion sections will be greatly emphasized. In order to keep accurate records during each lab investigation, it is critical that you document everything you do in a lab notebook. Although it will not be graded, it will help you to keep organized notes about each lab and collect the data for your reports.

Lab Reports are to be typed, 12 pt font, 1 inch margins all around, with nothing handwritten.

They will be graded based on completeness, proper interpretation of data, correctness of answers to questions in discussion, and ideas on optimizing results (improving protocol).

Use the following format:

Title, Group #, and **Names** of your partners

Purpose: State the reason for doing the experiment (1-2 sentences)

Hypothesis: State your hypothesis that you are testing. Place in purpose section in lab reports.

Methods: In sentence form, ONLY include the general headings of each part of each investigation from your lab manual. You are basically citing your manual. Therefore, there is no need to write the detailed protocols over again. However, include any changes in the methods you may have performed.

Results: Summarize your data. Include labeled gel images, tables, graphs, DNA sequences, DNA fingerprints, genetic trees. Describe procedural problems that may have occurred. Include answering any questions from the results section of each investigation. Do not rewrite the questions.

Discussion: In paragraph form, answer the questions addressed in the discussion section of each investigation. Do not answer all of the questions using one long paragraph. Use separate paragraphs when addressing different topics. If you did not get PCR products, then discuss what could have gone wrong with your experiment and give suggestions on how to improve your technique and/or adjust the protocol, etc.

Conclusion: Interpret your results according to those expected and why unexpected results may have occurred. State how the exercise addressed the purpose stated above. State how your work relates to broader questions in genetics and any conclusions you can draw relating to your stated hypothesis. If you were to continue this project, what would be the next step? What questions need further explanation?

References: Include any that you used besides your lab manual.

MOLECULAR BIOLOGY SCHEDULE

Week	Date	Topic	Chapter (Lab)
1	9/2	No Lab	Read Ch 1&2
2	9/6	Labor Day (No Class)	
	9/8	Syllabus, Chemical Basis of Information	3
	Sep 8&9	*Intro to Gel Electrophoresis Lab,* *Prepare 1X TAE buffer, Pour Gel*	*(1)*
3	9/13	Protein Structure	4
	9/15	Protein Function / Nucleic Acid Structure	5 & 6
	Sep 15&16	*Gel Electrophoresis: run gel & analyze*	*(1)*
4	9/20	DNA & RNA Structure	6
	9/22	Studying Genes: PCR & DNA Fingerprinting	7
	Sep 22&23	**GEL ELECTROPHORESIS (*1*) REPORT Due** *Collect Ticks from Lake Jonas Trail*	
5	9/27	**EXAM I**	[3 – 6]
	9/29	Studying Genes: DNA Sanger Sequencing & NGS	7
	Sep 29&30	*Collect Ticks from Lake Jonas Trail*	
6	10/4	Studying Genes: Cloning, Blotting & Screening	7
	10/6	Transgenics & CRISPR	7
	Oct 6&7	*DNA Isolation*	*(2a)*
7	10/11	Genetic Engineering of Plants	7
	10/13	Microarray Technology, Chromosome Architecture	7 / 10
	Oct 13&14	*Finish Quantifying Tick DNA,* *Multiplex-PCR for Borrelia & Babesia,* *1st PCR for Anaplasma*	*(2a)* *(2b)* *(2c)*
8	10/18	DNA Replication	11
	10/20	Modes of DNA Replication, DNA Spontaneous Mutation	11 / 12
	Oct 20&21	**DNA ISOLATION LAB REORT Due** *Pour Gel, 2nd PCR for Anaplasma*	*(2c)*

Week	Date	Topic	Chapter (Lab)
9	10/25	**EXAM II**	[7, 10, 11]
	10/27	DNA Induced Mutation	12
	Oct 27&28	*Run Gel to detect Pathogen + Ticks,* *Purify positive samples, Cycle-sequence*	*(2c)* *(3a)*
10	11/1	DNA Repair, Immunoglobulin Genes	12 / 14
	11/3	Transcription	15
	Nov 3&4	**TICK-BORNE PATHOGENS REPORT (*2b&2c*) Due** *Purify Cycle-Seq Products, Prepare for Sequencing,* *Allele-specific PCR of human genes of your choice*	 *(3b)* *(4a)*
11	11/8	RNA Processing	16
	11/10	RNA Processing	16
	Nov 10&11	*Pour Gel,* *Edit Pathogen Sequences, BLAST to Identify Species,* ***PATHOGEN SEQUENCES REPORT (3c)*** ***Due at end of lab***	*(4a)* *(3c)*
12	11/15	**EXAM III**	[12, 14,15,16]
	11/17	The Genetic Code / Translation of Protein	17 / 18
	Nov 17&18	*Run gel & Identify Your Genotypes,* *Purify 1 PCR Product, Cycle Seq in Both Directions*	*(4a)* *(4b)*
13	11/22	Translation of Protein	18
	11/24	No Lecture	
	Nov 24&25	No Lab (Thanksgiving Break)	
14	11/29	Regulation of Gene Expression	19
	12/1	Lac Operon	20
	Dec 1&2	**HUMAN GENOTYPES REPORT (*4a*) Due** *Purify Cycle-Seq Products, Prepare for Sequencing*	*(4b)*
15	12/6	Prokaryotic Gene Regulation: Trp & Ara Operons / Lambda Phage Lytic Cycle	20
	12/8	Genetic Control of Lambda Phage	20
	Dec 8&9	*Identify Alleles Based on DNA Sequence Analysis* ***GENOTYPE SEQUENCES REPORT (4b)*** ***Due at end of lab***	*(4b)*
EXAM IV [Ch 17-20] **Tuesday Dec 14; 2:45 – 4:45 pm; CBB 135**			