**BIO 400 – 01 – Special Topics Molecular Biology**

Tentative Syllabus – Spring 2024

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TEXT Krebs *et al*. 2018. Lewin’s Gene 12 ISBN: 9781284104493. Jones & Bartlett

COURSE DESCRIPTION

A study of the synthesis, function, and regulation of biologically important macromolecules (DNA, RNA, and proteins). Discussion topics will include PCR, recombinant DNA technology, DNA sequencing, ChIP assays, , epigenetics, , and cancer Prerequisite: BIO 344, or permission of instructor.

COURSE OBJECTIVES

1) Compare the basic principles of inheritance in detail at the molecular, cellular and organismal levels, beyond the scope of Biol 344 (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) Design molecular-based experiments using the scientific method.

ATTENDANCE POLICY

Class attendance is **expected**. See the *Student Handbook* for a complete description of the attendance policy.

The provisions of this syllabus may be added to, deleted from, or modified at the discretion of the instructor. Advanced notice will be given in the case of such an event.

ACADEMIC DISHONESTY

1. Cheating. Cheating includes buying, stealing, or otherwise fraudulently obtaining copies of examinations or scantrons for the purpose of improving one’s grade or academic performance. During examinations or in-class work, it includes receiving oral information from others and referring to unauthorized notes or other written information. In addition, copying from others, either during an examination or in the preparation of homework assignments, is a form of cheating.
2. Responsibility. Anyone who knowingly assists in any form of academic dishonesty shall be considered equally guilty as the student who accepts such assistance. Students should not allow their work to be copied or otherwise used by fellow students, nor should they sell or give unauthorized copies of examinations or scantrons to other students.

DISABILITIES STATEMENT: Campbellsville University is committed to reasonable accommodations for students who have documented physical and learning disabilities, as well as medical and emotional conditions. If you have a documented disability or condition of this nature, you may be eligible for disability services. Documentation must be from a licensed professional and current in terms of assessment. Please contact the Coordinator of Disability Services at 270-789-5192 to inquire about services.

EMERGENCY CONTACT INFORMATION

In the event of an emergency, please contact campus security @ (270)403-3611.

HARASSMENT REPORTING STATEMENT (Title IX)

Campbellsville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires all responsible employees, which includes faculty members, to report incidents of sexual misconduct shared by students to the University's Title IX Deputy Coordinator: Rusty Watkins at 1 University Drive, UPO Box 944, rdwatkins@campbellsville.edu or 270-789-5047. Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence may be found at [www.campbellsville.edu/titlelX](http://www.campbellsville.edu/titlelX).

EVALUATION

**1. Determination of grade:**

 Exam 1 20

 Exam 2 20

 Exam 3 20

 Final Exam 20

 Term Paper\*\* (see below) 10

 Class Presentation\*\*\* (see below) 10

 Class Participation\*\*\*\* (see below) 5

 TOTAL 105

A: 90 – 100

B: 80 – 89

C: 70 – 79

D: 60 – 70

F: < 60

**1. EXAMINATIONS:** There will be **4 examinations** over lecture material given during the semester. Examinations 1, 2, 3, and the Final Exam **WILL** be given on the dates specified. Any question format may be expected on the exams. Examinations will be primarily based on information presented in the lecture session. Each exam, however, will also contain information that will be drawn from textbook readings and handouts that may not have been directly covered in lecture. Thus, it is to your benefit to read the assigned chapters in your textbook.

**\*\*2. Term Paper:** Each student will be required to write a ten (10) page term paper on any current topic in molecular biology. However, I must approve the topic by **February 1st**. The student should follow the format of a review article: ex, The Journal of Molecular Biology

(<https://www.elsevier.com/journals/journal-of-molecular-biology/0022-2836/guide-for-authors>)

The paper should include an introduction (usually historical) and a review of the current literature pertaining to the topic. A bibliography must be included in the paper and the student should follow the format guidelines required by the Genetics Society of America, as it appears in the journal Genetics. The paper should also include a brief description of future experiments. For example, if the topic of interest is human genetic cloning, a future experiment may describe an application of this technology in mice in order to study the cloning strategy in a well-defined developmental system. I want to emphasize that there are no strict guidelines for this part of the term paper. I want you to be creative in your thinking, but you need to follow basic scientific reasoning.

**\*\*\*3. Discussion Topic:** The last lecture periods will consist of discussion topics. Each discussion lecture period will consist of one or two discussion topics. A class member will lead each discussion topic. **One week prior to her/his discussion session,** the discussion leader will give to each member of the class a copy of a recent scientific article pertaining to the topic of discussion. I strongly suggest that you pick a recent peer-reviewed scientific article related to your term paper. The article cannot be a review article! During the discussion session, the student will lead a 10 minute discussion on the topic of that article. There are no formal ground rules for this discussion and the discussion leader is not required to talk for the entire period. It is expected that the discussion leader will present a brief (5 minute) introduction of the topic, and then ask if there are any questions about the paper of interest. The questions can range from an “I do not understand this technical procedure” to “what would be the next logical experiment which a scientist might design in order to test a scientific hypothesis”. The discussion leader is expected to have Microsoft **POWERPOINT** slides of all figures and/or tables from the scientific article, and the discussion leader has the authority to call on members of the class. I will make comments if/when necessary, but I expect the class to discuss the topic thoroughly in the 10 minutes with minimal input from me. Remember that it is my experience that you learn molecular biology by “talking molecular biology”. In short, I expect full participation from each member of the class.

**\*\*\*\*4. Class Participation:** I expect full participation from each member of the class. **Each student can earn up to 5 points for class participation!** (Note: If you do not actively participate in class, you will receive zero points for class participation!)

BIO 400 – Tentative Lecture Schedule

Part 1 Genes and Chromosomes Wednesday January 10th- February 2nd

Chapter 1 Genes Are DNA and Encode RNAs and Polypeptides
Chapter 2 Methods in Molecular Biology and Genetic Engineering
Chapter 3 The Interrupted Gene
Chapter 4 The Content of the Genome
Chapter 5 Genome Sequences and Evolution
Chapter 6 Clusters and Repeats
Chapter 7 Chromosomes
Chapter 8 Chromatin
**Exam 1 Friday February 2nd**

Part 2 DNA Replication and Recombination February 5th-Friday March 1st
Chapter 9 Replication Is Connected to the Cell Cycle
Chapter 10 The Replicon: Initiation of Replication
Chapter 11 DNA Replication
Chapter 12 Extrachromosomal Replicons
Chapter 13 Homologous and Site-Specific Recombination
Chapter 14 Repair Systems
Chapter 15 Transposable Elements and Retroviruses
Chapter 16 Somatic DNA Recombination and Hypermutation in the Immune System

**Exam 2 Friday March 1st**

Part 3 Transcription and Posttranscriptional Mechanisms March 4th-March 29th
Chapter 17 Prokaryotic Transcription
Chapter 18 Eukaryotic Transcription
Chapter 19 RNA Splicing and Processing
Chapter 20 mRNA Stability and Localization
Chapter 21 Catalytic RNA
Chapter 22 Translation
Chapter 23 Using the Genetic Code

**Exam 3 Friday March 29th**

Part 4 Gene Regulation April 1st-April 26th
Chapter 24 The Operon
Chapter 25 Phage Strategies
Chapter 26 Eukaryotic Transcription Regulation
Chapter 27 Epigenetics I
Chapter 28 Epigenetics II
Chapter 29 Noncoding RNA
Chapter 30 Regulatory RNA

**Final Exam April 29th-May 3rd**

**Discussion Topics: To be determined.**