

LeTourneau University

BIOL 4404 Cell Biology

Course Syllabus

Objective: This course focuses on understanding the eukaryotic cell from molecular, physiological, and microscopic approaches. Topics will include: gene expression, the nucleus, membrane dynamics, intracellular compartments, cell signaling, the cytoskeleton, cell division, multi-cellular tissue development and remodeling, and cancer. The lab exercises and experiments will include molecular and histological study and each student will demonstrate proficiency in microscopy, tissue staining, and two contemporary molecular techniques (PCR and gel electrophoresis). The subject matter and sequence of the lecture and laboratory are nearly independent except that both are focused on the study of the eukaryotic cell. All of these topics will be explored from a Christian Theistic world view and students will be encouraged to pose questions and seek answers.

Christian Leadership Distinctives

- **Discovering Purpose** - Students will expand their understanding of the design of cellular function at the microscopic and molecular level. This should allow an increased understanding of the intelligent design of creation as well as an appreciation of mankind's place within the cosmos.
- **Grounding Values** - Students will examine historical and contemporary bioethical issues as related to molecular and cell biology. In some cases they should see that greater knowledge of the science does not resolve moral dilemmas and ultimately the answer lies in our values and beliefs. As appropriate and related to molecular and cell biology, the instructor will integrate Christian faith and Biblical Truth to relevant moral dilemmas in the biological sciences.
- **Broadening Knowledge** - The students will be challenged to master the knowledge objectives of this course from a Christian worldview. The general scope of the course is standard, senior level, molecular cell biology. Laboratory exercises and experiments are designed to build practical laboratory skills at a higher level of sophistication and understanding.
- **Deepening Skills** - The student will learn additional skills for using microscopes including drawing representation so observations, staining and preserving prepared tissues and other biological materials, measuring and interpretation of cell growth, in vitro fertilization of frog eggs, centrifugation to prepare mitochondria for enzymatic assays, PCR to specifically multiply DNA and gel electrophoresis to verify the PCR product. Generally students are each expected to work individually to acquire all of the skills.
- **Collaborative Service** - Students will experience limited collaboration in the laboratory portion of this course and no service-learning.

Instructor: Dr. A.G. Jarstfer (jārst-fūr), Professor of Biology
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Office Hours: T F 2:00 to 3:00 p.m.; TH 1:30 to 2:30 p.m., **OR by appointment**

Periods: Lecture, MWF 9:20 p.m. until 10:15 a.m.
Laboratory, M 2:35 to 4:55 p.m. AND as necessary to complete experiments

Locations: Lecture: Glaske C106
Laboratory: Glaske S103

Required Texts: Molecular *Biology of the Cell, 4rd Ed.*
ISBN 0-8153-3218-1
Alberts, Johnson, Lewis, Raff, Roberts and Walter
Garland Science, Taylor and Francis Group, New York, 2002

Required Materials:

Eye protection

Policies:

This a senior-level course and the student is expected to be proactive and work with less supervision.

Lecture attendance is to your advantage and is required. I will NOT give quizzes on the assigned readings; however, *reading your assigned material before the lecture greatly increases your learning* as I will not necessarily lecture the chapters to you, but will seek to emphasize the important material and supplement it with additional materials. Check your reading assignments on the list provided and on the Blackboard course site. Failure to attend 75% of the class meeting times will result in failure of this course regardless of grades earned in this class.

Laboratory attendance is required and none of the labs may be made up. Many of the lab materials are time sensitive and thus must be used within strict limits. In advance of any excused absence, you must arrange with the instructor a way to complete the exercises and learn the material. Some assignments will need to be completed on your own time, yet each lab session may not require your presence during that entire time. It is your responsibility to complete the requirements by the due dates.

Grading: The grades for the lecture and laboratory are combined.

Your grade will be based on the number of points earned from Exams, Lab quizzes, Lab Deliverables, and Journal Article Critiques and Discussions. The Final Exam will be comprehensive. Exams will be a combination of short answer, essay, interpretation of figures, and definitions. Each exam will include extra credit questions from the same material.

Remember, only graduating seniors that are on the approved list and earning an 81% or higher in this class may be exempt from the final exam in this class. You must verify with the instructor that you meet the requirements for this exemption; do not assume exemption.

A = 100-91%; B =90-81%; C =80-71%; D = 70-61%; F = below 60%

4 Unit Exams = 400 pts

1 Final Exam = 100 pts

Journal Article Discussion and Critique = 100 pts

5 Lab Quizzes = 100 pts

Lab Deliverables = 160 pts

Diagnosed and documented disabilities. Students enrolled in an institution of higher education are required to self-identify if they would like to request academic support services on the basis of a disability. LeTourneau University encourages a student with a disability to self-identify after admission and to provide required documentation to the Dean of Student Services. Through self-identification and the utilization of appropriate academic services, it is assumed that academic progress must be made. Students needing facility adjustments must notify the Dean of Student Services at 903.233.3130.

Electronic Devices - Cell phones should be turned off during class. PDAs, notebook computers, and other electronic devices may be used in class only for taking class notes. The use of these electronic devices for other purposes such as games, email, web browsing, and DVD viewing will not be permitted.

Project Details

Journal Article Discussions and Critiques Due Date April 10th

Rationale: in the sciences we present new knowledge in the form of refereed journal articles. Professionals are expected to be able to read these and glean the new information from these articles as well as judge the validity and value of these units of knowledge discovery. In graduate school you may be asked to do this same thing each week and in research you

will develop competency in your narrow field by constantly doing this process with your peers' work. More and more medical professionals are involved in clinical and basic biomedical science research to improve the delivery of care to their patients, so they also must be competent in careful reading newly published work. So, now is the time to get a taste of this.

Each student will be assigned the reading of all three papers. However, only one article will be assigned to you to thoroughly read and critique. Those assigned to the same paper will work together to present the paper to the whole class on the assigned day.

To accomplish this each of you should start by answering the basic Bradford-Hill questions (i.e. Why did they start?, What did they do?, What did they find?, and What does it mean?). Then assess the paper for how well the authors communicated these to you. Also, judge whether they provided valid background, sufficient methods and references to other's methods, statistical model and analysis, presentation of data to support claims of findings, and a discussion that considers the relevance of the current work and how it compares to the work of others in the field.

The discussions will happen during a lab session, and each student will be expected to contribute meaningful comments during the dialogue. The assigned group will lead the discussion with a 15 minute presentation of the paper. Then the entire class will join the discussion by asking questions. Your critique for your assigned paper will be due at the end of each discussion without exception. To receive credit you must be present for the discussion and turn in your paper at that time.

Lab Quizzes

Five quizzes will be focused on the material noted in the lab topic sequence. Each will be worth 20 pts and will be completed at the beginning of the lab period. Subject matter for the quizzes will be both conceptual and practical.

The topics are:

1. Microscope use, ocular and stage micrometers
2. Staining theory and practice
3. Frog Embryology
4. Centrifugation theory and practice
5. PCR theory and practice

Lab Technique Deliverables

1. (15 pts) Scale drawing of Amoeba or Paramecium
Graded for neatness, proportional representation of subject, and correctness of scale

2. (30 pts) Redi-stained slides

Two slides (15 pts each) graded for neatness, quality of stain, and labeling. You should include the name of the subject material, date of preparation, and your name. You will stain one animal specimen and one plant specimen.

3. (15 pts) Blood Smear slide
Graded for neatness and quality of stain (intensity of stain and evenness of smear)

4. (100 pts) Lab Report Summaries/Results

Yeast cell growth curve and results interpretation (2 double-spaced pages maximum)
PCR product photograph of gel and results interpretation (2 double-spaced pages maximum)