BI 416 Cellular & Molecular Biology Lecture Syllabus
University of Guam, Spring Semester 2023

Units: 3

Lecture Schedule: Room Sc101**;** Tuesdays and Thursdays; 9.30 A.M to 10.50 A.M.

Instructor: *Shubir Ghosh, Ph.D.,* Professor of Molecular Biology & Biochemistry, Natural Sciences, UOG

Office Location & Hours:

Sc223; By Appointment: M, W, T, Th: 9 – 9.30 AM; 4 - 5 PM
E-Mail: sghosh@triton.uog.edu

UOG Moodle: All students are required to register with UOG's Moodle service – please use only an active E-Mail address where you can be contacted. Students should check Moodle every week for the latest updates. All material related to the course will be uploaded on Moodle – handouts, PowerPoints, exam schedule, exam reading list, announcements, etc. Students should send electronic correspondence to the Instructor directly to: sghosh@triton.uog.edu (not through Moodle); the best way to contact Instructor is immediately before or after class.

Catalog Course Description & Prerequisites:

This course focuses on the advanced molecular cell biology approaches including recombinant DNA technology, advanced microscopy, protein interaction technologies, and model in vivo & in vitro experimental systems that have led to an unprecedented level of understanding of the structure and function of the cell, the fundamental unit of life. Student will learn to find rational explanations and unifying concepts from a large and rapidly evolving body of knowledge, in order to understand the mechanism by which the cell functions as well as the molecular basis of disease. Principle topics include cellular macromolecules & regulatory factors, membrane structure & membrane transport, cell nucleus & gene expression, cell signaling, the immune system, and cancer biology. This course prepares students for careers in bio-medical research, medicine, biotechnology & agriculture related industry. The lab, BI416L must be taken concurrently. Prerequisites: CH102, CH102L, CH103, CH103L, BI315 & BI315L. Corequisite: BI416L

Required Textbook:

Cell and Molecular Biology: Concepts & Experiments, 9th Edition by Gerald Karp, Wiley Pub.

Publishers CD-ROM and/or online resources for animations on the cellular moleular processes that will be discussed in class.

In the class the Instructor will show selected video microscopy clips and animations.

Computer/Cell Phone/Electronic Devices:

Please do not use electronic devices during Lecture class for personal work – distracts the Instructor & students.

All electronic devices (cell phones, laptops, etc.) are to be kept away during quizzes and exams. Only regular scientific calculator is allowed during quizzes/exams. Thank You.

Course Philosophy/Class Participation:

Participation in classroom activities is an integral part of academic activities and importantly enhances student learning. **Model Questions - both written and verbal - will be given "in class" as part of lecture discussions** to assist students with learning and preparing for exams. **This "in-class" exercise will be helpful for the student in passing the course.**

Methods for Evaluation and Grading:

- There will be four examinations for the course – three Midterm exams, **Exam 1 Parts A & B**; **Exam 2**, and a **Final Exam**.

***Please Note: Exam 1 for the course focuses on Chapter 4 of the required textbook - this chapter serves as an anchor for learning of molecular cell biology for the entire semester. Therefore, Exam 1 becomes consequential in determining student Final grade for the course.**

The nature of the questions generally will be:

- Factual/conceptual review questions
- Thought (analytical) questions
- problems based on experimental data
- questions involving explaining and providing diagrams/graphs for a process, analyzing data, proposing a mechanism, etc.

The format of the Questions:

- Multiple-choice
- "Written" type
- Figures, Graphs, & Schematic Diagrams

Sample Questions & Answers:

- Sample Questions will be provided "in the class" - both verbal and written - and the appropriate answers expected will be discussed immediately after. Please do not hesitate to contact Instructor if you have any questions regarding the nature of the exams and the answers expected from students.

Homework:

- Online Book Companion site by Wiley Publishers

- Selected Questions provided at the end of the Chapter in the Textbook (select only those on topics covered in the class - question numbers will be provided). A "Reading List" will be provided to help with studying for the exams.

Grading Criteria:

1. **The "written questions" will be "thought-based" - so please frame an answer specifically addressing the question with specific mechanisms and experimental evidence - "using learning objectives discussed in class & textbook".**

2. **In the "written component", students must provide indepth answers to the thought/problem-solving based questions accompanied by figures, models, molecular explanation, design of experiments, graphs, analysis & interpretation of data, etc (as appropriate). The questions will require answers based on applying knowledge of the cellular/molecular process.**

3. **The "written component" answers will be given points based on scientific logic/specific detailed explanation and precision. Incomplete/incoherent/wrong answers will not receive any score. Generic key words and sentences will not suffice.**

4. **Note: Please do not start writing an essay style textbook description of a process as your answer. Minimum credit will be given for such an answer for a "thought-based" question - the answer will be considered incomplete.**

Important: Exam Grading and Scoring Guide:

5. **Please note that all written-type questions should be answered with sufficient scientific detail (explanation, mechanisms, hypothesis, experimental data, applications, implications) using proper language (scientific & grammer) and accompanied by diagrams, models, and, graphs, when appropriate.**

6. **Generic Answers will not suffice. For example:** A 10 point question asks for DNA technology approach to detect a specific mutant cell. The appproach is PCR-based. If a student simply answers "PCR" not addressing the question directly – then a score of 2/10 will be given. If the answer is a generic description of PCR and a few more lines of extraneous material without specifically addressing the question posed – then a score of 4 /10 will be given. An attempt to address the question using the PCR aproach will receive a score of 7/10 – satisfactory but inadequate. A score of 8 is good but signifies that the answer is missing a/few significant detail/s or the answer includes incorrect facts – not a confident answer. A score of 9/10 is excellent.

***Please Address all questions that you may have regarding Nature of Exams, & Grading policies by the first two weeks of the semester.**

Grading Table:

Letter Grade	Percent
Grade A+:	**98 - 100%**
Grade A:	**93 - 97%**
Grade A-:	**90 - 92%**
Grade B+:	**87 - 89%**
Grade B:	**83- 86%**
Grade B-:	**80 - 82%**
Grade: C+:	**77 - 79%**
Grade C:	**70 - 76%**

***Note: No "Incomplete" Grade will be given for this course**

Students can evaluate their performance on the basis of the scores receieved for the two midterm exams during the semester (in advance of the last day for add/drop). The average class score and highest scores for every exam will be provided.

Please Note:

- A **pre-exam review** of the material for the exam will be conducted prior to the exam. The lecture exam may be held during the lab class – students will be notified of the schedule as the class progresses.
- Typically it will take **two weeks to grade exams**.
- A **post-exam review** will be held to discuss the exam. The scoring rubrics will be provided. Students should return their exams after the review.
- **Students should not take the exams out of the classroom or take photos or verbally disclose the test to others.**
- The exams will be available throughout the semester for student review during office hours.
- **Students can evaluate their performance on the basis of the scores receieved for the two midterm exams during the semester (in advance of the last day for add/drop).**

- **No questions regarding grades will be accepted once the Final grade is provided. Grades are based on the scoring rubrics and grading policy. <u>However, the student is encouraged to "request a review of their exam performance & grade" if they feel that an error may have inadvertently been made - please send Instructor an E-Mail.</u>**

  Important:

  An "A" grade reflects robust performance in the written exams".

COVID Statement:

The University of Guam is experiencing continued disruption to delivery of instruction during the global coronavirus pandemic. The University will follow executive orders and may be forced to close again, causing more modifications as the semester progresses. All changes will be posted on the UOG website, www.uog.edu.

- Contact OIT for technical support at 735–2630 or oit@triton.uog.edu
- Contact the Triton Advising Center at 735–2271 or tac@triton.uog.edu
- Contact Isa Psychological Services center at 735–2883 or isa@triton.uog.edu

In face to face courses, wearing masks and social distancing is required. Anyone who has a fever, or any other symptom, should stay home. If you do not comply with these directions, you will be asked to leave, and if you do not, class will be cancelled.
Patience, respect, and cooperation are needed from all of us to persist through these uncomfortable times.

Disability Statement, Special Accommodations (ADA):

In accordance with the Americans with Disabilities Act (ADA) of 1990 and the Rehabilitation Act of 1973, the University of Guam does not discriminate against students and applicants on the basis of disability in the administration of its educational and other programs. The University offers reasonable accommodations for a student or applicant who is otherwise qualified, if the accommodation is reasonable, effective and will not alter a fundamental aspect of the University's program nor will otherwise impose an undue hardship on the University, and/or there are not equivalent alternatives. Students are expected to make timely requests for accommodation, using the procedure below*. If appropriate, the University may choose to consult with such individuals, at or outside the University, to provide expertise needed to evaluate the request for accommodation. Each student bears the responsibility for initiating and then documenting a disability-related request for accommodation in the manner requested in this Policy.
[*full text at:www.uog.edu/dynamicdata/EqualEmploymentOffice.aspx?siteid=1&p=66]

If you are a student with a special need who will require an accommodation(s) to participate in this course, please contact me privately to discuss your specific needs. You will need to provide me with documentation concerning your need(s) for accommodation(s) from the EEO/ADA Office. If you have not registered with the EEO/ADA Office, you should do so immediately at 735-2244/2971/2243 (TTY) to coordinate your accommodation request. For more information visit: http://www.uog.edu/administration/office-of-the-president/eeoadatitle-ix-office

Family Educational Rights And Privacy Act (FERPA):

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. These rights for students, parents and school officials can be viewed at:**http://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html**

Tobaccco-Free/Smoke-Free Campus:

Pursuant to Board of Regents Resolution No. 13-24, the University of Guam (UOG) has a total ban on the sales, smoking and the distribution and use of tobacco and tobacco-based products on the UOG Campus, and properties. The purpose of

this policy is to protect the public health and welfare by prohibiting smoking and the use of tobacco products or simulated smoking devices, including but not limited to E-cigarettes, on the UOG campus and properties; to guarantee the right of nonsmokers to breathe smoke-free air, while recognizing that the need to breathe smoke-free air shall have priority over the desire to smoke; and to encourage a healthier, more productive living/learning environment for all members of our University community.

UOG is a tobacco-free campus. Thank you for not using tobacco products on campus, and for helping make UOG a healthy learning and living environment. For more information visit: http://www.uog.edu/smoke-free-uog

Academic dishonesty:

The University of Guam takes plagiarism very seriously.

Please pay attention to the following class exam rules that will be taken:

Closed book, closed cellphone/electronic devices, closed dialog.
Tests should not be taken out of room.
Tests should be returned back to the Instructor after a post exam review is conducted (cell phones/cameras should be kept away during the review).
Seating arrangement will be determined randomly by the Instructor – students will be asked to relocate to a different location in the classroom – typically please maintain a gap between students.

All assignments and tests must be your own work. The term "**plagiarism**" includes, but is not limited, to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials. Plagiarizing in your assignments or cheating on tests will result in reporting to the administration. If you are not sure what plagiarism is and how to avoid it in using sources for your work, see www.indiana.edu/~wts/pamphlets/plagiarism.shtml - but be careful when paraphrasing not to change the meaning of scientific information. Answers you write on the tests must come only from in your head or the information supplied in the test papers; anything else is cheating. The term "**cheating**" includes, but is not limited to: (1) use of any unauthorized assistance in taking quizzes, tests, or examinations, e.g., looking at other students' answers, using crib notes (including electronic), getting information from another person via any kind of communication; (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or (3) the acquisition, without permission, of tests or other academic material belonging to a member of the University faculty or staff. If you need to use an electronic translator, you must discuss this with me in advance.

Lecture Syllabus:

Chapter 1: **An *"Introductory overview"* of Cells and Molecular Cell Biology Research**
Chapter 2: **Basic Cell Chemistry; Macromolecules; Structure, Shape and Information -*"Introductory overview"***
Chapter 18: **Fundamental Techniques in Molecular Cell Biology - *"Introductory overview"***
Chapter 4: **Cell Membrane and Membrane Excitability**
Chapter 7: **Interactions between cells and their environments**
Chapter 8: **Protein Sorting and Transport**
Chapter 9: **The Cytoskeleton and Cell Movement**
Chapter 12: **The Cell Nucleus, Chromosomes and Control of Gene Expression**
Chapter 14: **The Cell Cycle and Regulation**
Chapter 15: **Cell Signaling and Signal Transduction**
Chapter 16: **Cancer Biology**
Chapter 17: **The Immune Response**

EXAMINATION SCHEDULE:

You will be notified at least two weeks in advance of the exact exam dates, as the course progresses.
The Instructors Learning philosophy is not to fix a specific date since this would result in rushing of the material in the class. The Instructor believes in students learning as completely as posssible within the time-frame, and conducting a pre-exam review prior to the exam.

First Exam Parts A & B: Two weeks advance notice will be given

Second Exam: Two weeks advance notice will be given

Final Exam: UOG Finals Week

Important Remarks for Lecture Course:

- **"PROPER CONDUCT & DECENT LANGUAGE AT ALL TIMES".**
- Students need to regularly read the textbook in order to understand the material presented in the class. The Textbook includes an Interactive Student Tutorial CD and companion website for preparing for exams.
- The Textbook provides "Student learning Objectives" for all the topics presented. The exam questions will primarily focus on these objectives.
- **Students are encouraged to actively participate in class lecture discussions without hesitation. There is no "silly question" in this course**

Student Learning Outcomes (SLOs):

COURSE SLOs	PLOs*	ILOs*	Assessment Method
1. To define and describe fundamental concepts in the functioning of the cell	**1,2**	**1,2,3**	Exams Verbal/Written Quizzes Homework problems
2. To define the relationship between molecular structure and cellular function	**1,2**	**1,2,3**	Exams Verbal/Written Quizzes Homework problems
3. To define the dynamic character of cellular organelles	**1,2**	**1,2,3**	Exams Verbal/Written Quizzes Homework problems
4. To define the use of chemical energy in running cellular activities and ensuring accurate macromolecular biosynthesis	**1,2,3**	**1,2,3**	Exams Verbal/Written Quizzes Homework problems
5. To define the unity and diversity at the macromolecular and cellular levels	**1,2**	**1,2,3**	Exams Verbal/Written Quizzes Homework problems
6. To define and elaborate the molecular mechanisms that regulate cellular activities	**1,2,3**	**1,2,3**	Exams Verbal/Written Quizzes Homework problems
7. To learn and apply mathematical equations, where appropriate, in understanding cellular functions.	**1,2,3**	**1,2**	Exams Verbal/Written Quizzes Homework problems
8. To elaborate the key moelcular cell biology experimental approaches and research methodologies that allow conclusions to be made in investigating cellular function, including recombinant DNA technology, advanced microscopy, protein interaction technologies, and model in vivo & in vitro experimental systems.	**1,2,3,4,6**	**1,2,3,5**	Exams Verbal/Written Quizzes Homework problems Lab work & Reports
9. To elaborate on the human perspective in investigating cellular function by describing the disruption of activities at the cellular and molecular level that leads to disease.	**1,2,5,6,7**	**1,3,4,5**	Exams Verbal/Written Quizzes Homework problems
10. To describe the importance of basic research as the pathway to understanding and eventually treating most human disorders and in biotechnology.	**1,2,5,7**	**1,3,5,7**	Exams Verbal/Written Quizzes Homework problems

*Please see below for a list of Program and Institutional Learning Outcomes

Program Learning Outcomes:

BI PR-1: Disciplinary Knowledge and Skills

A. Graduates have advanced understanding of the nationally recognized core competencies in biology. Students taking biology for GE will have a basic grasp of some of these concepts, especially those relating to the interface of science and society and will advance their scientific literacy. Students contribute to the public good by using their knowledge and skills in internships, research, and volunteering, and in responsible use of natural resources and technology.

B. Graduates use their knowledge and skills to solve problems in ecology, genetics, molecular biology, systematics, and evolution. They can apply their knowledge and skills to locally important issues such as island biogeography, conservation, and endangered species problems; they are also prepared to address broader questions such as biomedical research. They apply elements of thought and intellectual standards to problem solving and effectively judge the usefulness and accuracy of external sources of information.

C. Graduates approach scientific questions using scientific criteria and know how these criteria differ from those in other disciplines and other worldviews.

D. Graduates and GE students have metaknowledge of the diverse ways in which scientists in varous disciplines think and work, and how these ways differ from and are useful to public policy making.

BI PR-2: Interdisciplinary Knowledge and Skills

Graduates apply relevant concepts from chemistry and physics to biology problems; they approach problems in terms of interdisciplinary teams, where appropriate, aware of how other branches of biology and other sciences could be used to "come from the question"

BI PR-3: Quantitative Skills

Graduates apply numerical methods in collection/analysis of data. They formulate testable hypotheses and create effective experimental designs using their knowledge, understanding, & practical experience of scientific instruments and statistics.

BI PR-4: Research Skills for Laboratory and Field

Graduates are competent in basic biology procedures and safety in the laboratory and field.

BI PR-5: Communication Skills

Graduates use scientific literature and diagrams as a source of information, properly cite sources and avoid plagiarism, and use computer software to create text and graphics to communicate results effectively through print and oral presentations. They take initiative in searching for relevant sources in the scientific literature and assess evidence in writing scientific proposals and reports.

BI PR-6: Digital Literacy

Graduates have experience with contributing to and using large databases in bioinformatics, environmental sciences, and biological collections and have the general knowledge and confidence to mine "big data" sources.

BI PR-7: Professionalism

Graduates follow ethical principles involved in science, ranging from integrity and honesty to authorship criteria; ownership of samples and data; appropriate manipulation of data and images; and (where appropriate) ethical issues in human subject and animal research.

Institutional Learning Outcomes:
ILO-1: Mastery of Critical Thinking and Problem Solving
ILO-2: Mastery of Quantitative Analysis
ILO-3: Effective Oral and Written Communication
ILO-4: Understanding and Appreciation of Culturally Diverse People, Ideas and Values in a Democratic Context
ILO-5: Responsible Use of Knowledge, Natural Resources, and Technology
ILO-6: An Appreciation of the Arts and Sciences
ILO-7: An Interest in Personal Development and Lifelong Learning