

IBMS 6401	Cellular & Molecular Basis of Biomedical Sciences and Technology I	Credit Hours: 4
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Semester: Fall	Year: 2026	
Class Mondays, 2pm-6pm	Class Location: B12.1	
Day/Time:		

Instructor of Record: Dr. Chris Holmquist

Office: CBMR, Lab B2
Office Phone: 903-877-8555
E-Mail: Christopher.Holmquist@UTTyler.edu
Office Hours: Anytime arranged by email.

Course Description: A graduate-level course designed to provide an advanced and critical understanding of molecular biology including nucleic acid structure and function, DNA replication, transcription, translation, gene expression, gene regulation and thermodynamics.

Prerequisite: None

Co-requisite: None

Goals of Course & Course Objectives:

Course Objectives:

1. To understand, communicate, and discuss fundamental and more advanced cellular and molecular biology principles presented in the course.
2. To critically think about the fundamental and more advanced cellular and molecular biology principles presented in the course.
3. To begin to develop the ability to express sound and rational hypotheses to extend beyond our current understanding of the cellular and molecular biology principles presented in the course.

Student Learning Outcomes (Course Competencies):

1. The student will demonstrate mastery of the fundamental and advanced cellular and molecular biology principles presented in the course.
2. The student will demonstrate the ability to critically think about the fundamental and advanced cellular and molecular biology principles presented in the course.
3. The student will demonstrate the ability to develop sound and testable hypotheses concerning and extending our current knowledge of the fundamental and advanced cellular and molecular biology principles presented in the course.
4. The student will demonstrate the ability to review and discuss relevant literature and its significance.

Course Assessment/Methods of Evaluation:

Student understanding will be evaluated with comprehensive examinations of a purely subjective nature covering each topic in detail, evaluations of quizzes, homework assignments, and class participation.

- **Examinations (50%):** There will be two comprehensive exams (a midterm and a final). These two exams will be of a subjective format based on preceding modules and are each worth 25% of the final grade. Both of these are take-home exams.
- **Quizzes/Assignments (10%):** There will be eight (8) short quizzes/assignments (in-class or online). The lowest score will be dropped, and the remaining will be combined and be worth 10% of the total grade.
- **Class Participation (20%):** This will be based on attendance, participation in class polls, discussions, and assignments.

- **Literature Hour Participation (20%):** This will be based on participation as well as on reading of the assigned paper.

Assignment/Exam/Quiz Submission Policy:

Students are expected to turn in all class assignments, exams and quizzes on time.

Assignments submitted more than twenty-four (24) hours after the stated due date, without prior arrangements approved by the instructor of record or course faculty, shall receive a maximum possible grade of ninety percent (90%).

Faculty may assign a lower grade based on the quality of submitted work, delay in submission, and additional course-specific grading considerations.

Attendance:

Students are expected to attend all classes. Students will be allowed to miss 1 class without penalty. Additional absences will be handled as follows:

2 absences	Lose 20% of class participation grade
3 absences	Lose 30% of class participation grade
4 absences	Lose 40% of class participation grade
5+ absences	Student will have to remediate in class participation

Students will be considered absent if they arrive more than 15 minutes after the start of class without prior instructor approval.

Emergencies

In the event of an emergency or sickness, the student **MUST** contact me and/or the Program Director (Dr. Ikebe for the IBMS PhD) by email no later than the day of the expected absence. Failure to do so will result in the absence being counted as 2 absences, resulting in a 10% decrease in this category of the class grade.

Linked Program Learning Outcomes:

The student learning outcomes listed above address the following Integrated Biomedical Sciences Program PLO domains:

- PLO1 - Core Knowledge domain
- PLO3 - Scholarly domain
- PLO4 - Professionalism domain

Textbook:

Biochemistry (4th Edition), by Donald Voet and Judith G. Voet, © John Wiley & Sons, Inc., 2011; ISBN 978-0-470-57095-1.

Course Content & Schedule:**08/24 – INTRODUCTION**

Course description, format and grading policies.

MODULE 1: Review and important thermodynamic concepts.

- Prokaryotes/Eukaryotes (Chapter 1; pp3-19, 26-28, 34-37)
- Aqueous solutions (Chapter 2; pp40-45)
- Thermodynamic Principles (Chapter 3; pp58-59)
- **Quiz 1 on Module 1 on CANVAS (due before next class)**

08/31 – MODULE 2: Nucleic Acid Structure

- Theory and properties (Chapter 5)
- Applications
- Nucleic acid purification (Chapter 6; pp156-159)
- Nucleic acid sequencing (Chapter 7; pp176-185)
- Nucleic acid synthesis (Chapter 7; pp209-214)
- Literature Hour (1 hour): Link to selected paper on Canvas
- **Quiz 2 on Module 2 available on CANVAS (due before next class)**

09/07 – LABOR DAY – no class**09/14 - MODULE 3: Enzymes & Biotechnology**

- Review of enzyme function and regulation (Chapter 13; pp469-480)
- Restriction enzymes
- Polymerases
- Literature Hour (1 hour): Link to selected paper on Canvas

09/21 – MODULE 4: DNA Topology (part 1)

- Double helix (Chapter 29)
- Base pairing
- Methylation
- Circular/linear
- Supercoiling
- Literature Hour (1 hour): Link to selected paper on Canvas
- **Take Quiz 3 on Modules 3 & 4 before next class**

09/28 – MODULE 5: DNA Replication (part 1)

- Review of Module 4
- Chapter 30
- In-class discussion problem as practice for the mid-term
- Participation in discussion and assignment will count as Quiz 4
- Literature Hour (1 hour): Link to selected paper on Canvas

10/05 – DNA Replication (part 2)

- We will do another in-class exercise and discussion.
- Participation in discussion and assignment will count as Quiz 5.
- **No literature hour this week**

10/12 – Review of Modules 1-5.

- **Midterm exam will be available on CANVAS at end of class. It will be on Modules 1-5 and is a take-home, open-book exam).**

10/19 – MODULE 6: Reverse Transcriptase.

- Chapter 33 – Viruses (pages 40-52)
- Literature Hour (1 hour): Link to selected paper on Canvas

10/26 – **MODULE 7:** Transcription.

- Prokaryotic Transcription - Chapter 31 (pages 1260-1283)
- Eukaryotic Transcription - Chapter 34 (pages W88-W121)
- Literature Hour (1 hour): Link to selected paper on Canvas
- **Take Quiz 6 on Modules 6 & 7 before next class**

11/02 – **MODULE 8:** Transcriptional Regulation (part 1)

- Prokaryotic control systems Repressors vs Activators
- *E. coli lac* operon
- Other operons & applications in biotechnology
- Literature Hour (1 hour): Link to selected paper on Canvas
- **Take Quiz 7 on Module 8 (Prokaryotic transcriptional regulation) before next class**

11/09 – **MODULE 8:** Transcriptional Regulation (part 2)

- Eukaryotic control systems
- Enhancers and other elements
- Transcription assays
- Participation in discussion and assignment will count as Quiz 8.
- Literature Hour (1 hour): Link to selected paper on Canvas

11/16 – **MODULE 9:** Translation (part 1) – Chapter 32, pages 1338-1395

- How to read DNA
- tRNA and tRNA Synthetases
- Literature Hour (1 hour): Link to selected paper on Canvas

11/23 – **THANKSGIVING BREAK** – no class

11/30 – **MODULE 9:** Translation (part 2)

- Ribosomes
- Toeprinting
- Literature Hour (1 hour): Link to selected paper on Canvas
- *Final exam will be available for download on CANVAS at end of this class.*
 - Covering MODULES 6-9; take-home, open book.
 - **Due by 11:59 pm Friday 12/11**

12/07 – **FINALS WEEK: Final exam due on CANVAS by 11:59 pm on Friday 12/11**

Other Class Policies:

Attendance:

Regular or punctual attendance is expected. If a student misses a class or lab, the student is responsible for obtaining any information distributed during those times. Make-ups are possible only under certain instances (labs cannot be made up). Arrangements for any make-ups and/or missed labs should be discussed directly with the instructor for that day's class.

Academic Honesty:

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

Cheating

Dishonesty of any kind involving examinations, assignments, alteration of records, wrongful possession of examinations, and unpermitted submission of duplicate papers for multiple classes or unauthorized use of keys to examinations is considered cheating. Cheating includes but is not limited to:

- Using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class.
- Falsifying or inventing any information, including citations, on an assigned exercise.
- Helping or attempting to help another in an act of cheating or plagiarism.

Plagiarism

Plagiarism is presenting the words or ideas of another person as if they were your own. Materials, even ideas, borrowed from others necessitate full and complete acknowledgment of the original authors. Offering the work of another as one's own is plagiarism and is unacceptable in the academic community. A lack of adequate recognition constitutes plagiarism, whether it utilizes a few sentences, whole paragraphs, articles, books, audio-visual materials, or even the writing of a fellow student. In addition, the presentation of material gathered, assembled or formatted by others as one's own is also plagiarism. Because the university takes such misconduct very seriously, the student is urged to carefully read university policy [Sec. 8-802. Academic Dishonesty](#). Examples of plagiarism are:

- Submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another.
- Submitting a work that has been purchased or otherwise obtained from an Internet source or another source.
- Incorporating the words or ideas of an author into one's paper without giving the author due credit.

AI (Artificial Intelligence) Policy:

UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.

Use of AI is not permitted in this course at all.

To best support your learning, you must complete all graded assignments by yourself to assist in your learning. Doing your own work, without human or artificial intelligence assistance, is best for your efforts in mastering course learning objectives. This exclusion of other resources to help complete assignments includes artificial intelligence (AI). Refrain from using AI tools to generate any course context (e.g., text, video, audio, images, code, etc.) for any assignment or classroom assignment.

Adding/Dropping:

The official deadline for adding and dropping courses is as published in the academic calendar ([Registrar Withdrawal webpage](#)). However, students are strongly encouraged to meet with their graduate advisor or the Program Coordinator prior to adding/dropping courses. Movement into and out of classes after the 4th class day requires approval of the Program Director. Each student is responsible for their own enrollment status with the university.

Disability Accommodations:

UT Tyler HSC abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, which mandate reasonable accommodations be provided for students with documented disabilities. If you have a disability and may require some type of instructional and/or examination accommodations, please contact me early in the semester so that I can provide or facilitate the provision of accommodations

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you may need. If you have not already done so, you will need to register with the Student Services Office (located on the main campus). You may call 903-566-7079 for more information.

A listing and description of all student policies can be found here: [Manual of Policies and Procedures for Student Affairs](#).

MARKETABLE SKILLS FOR YOUR RESUME/CV

Program:	Master of Science in Biotechnology
Degree:	MS
Department:	Cellular and Molecular Biology
School:	Medicine
Course:	BIOT5312 – Molecular Biochemistry

Area	Marketable Skill*
SKILLS	Reading Comprehension — Understanding written sentences and paragraphs in work-related documents.
	Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
	Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
ABILITIES	Written Comprehension — The ability to read and understand information and ideas presented in writing.
	Oral Comprehension — The ability to listen to and understand information and ideas presented through spoken words and sentences.
	Inductive Reasoning — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
WORK ACTIVITIES	Updating and Using Relevant Knowledge — Keeping up-to-date technically and applying new knowledge to your job.
	Getting Information — Observing, receiving, and otherwise obtaining information from all relevant sources.

*All marketable skills listed for this course and program were drawn from the Knowledge, Skills, and Abilities identified by the US Department of Labor and Statistics for “Biological Technicians” and “Molecular and Cellular Biologists” as published on O*Net Online (www.onetonline.org)