



**BIOT 5222**

**Advanced Metabolism**

**Credit Hours: 2**

**Semester:** Spring

**Year:** 2023

**Class Day/Time:** Tuesdays, 9am-11am

**Class Location:** BMR 113

**Instructor of Record:** Dr. Mitsuo Ikebe

Office: BMR 104.1

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Office Hours: Thursday between 4 to 5 P.M, and any other time with a prior appointment.

**Course Description:** The primary objective of this course is for the student to gain an understanding of the metabolic processes in prokaryotes and eukaryotes, and how metabolism is affected by membranes, enzymes, substrates and other metabolites. Student will also learn basic concepts in membrane transport, signal transduction, and molecular physiology (muscle physiology, vascular physiology, pulmonary physiology, blood clotting and cancer), and how errors in metabolic processes lead to diseases.

**Prerequisite:** BIOT 5312

**Co-requisite:** BIOT 5222L

**Goals of Course:**

1. To be able to communicate and discuss fundamental metabolic processes.
2. To be able to communicate and discuss structural and functional aspects of sugars and membranes, and their cellular functions.
3. To be able to communicate and discuss the basic theory and practice of enzymology and enzyme kinetics.
4. To be able to understand and discuss basic concepts of membrane transport and signal transduction.
5. To be able to understand mechanisms of muscle contraction, circulation, lung function, and cancer development.
6. To be able to know and discuss about various cell types present in blood, their genesis and function, and to communicate and discuss the molecular basis of blood coagulation.
7. To be able to communicate and discuss how errors in metabolic process leads to development of various diseases.

**Student Learning Outcomes (SLO or “course objectives”):**

1. The student will have overview of various metabolic pathways, and the importance of metabolic pathways in health and disease, and understand how errors in various metabolic processes result in various diseases.
2. The student will be able to describe the characteristics of a biological membrane and its components.
3. The student will be able to describe the general characteristics of polysaccharides and the effect of polysaccharides on expression of recombinant proteins in various expression systems.
4. The student will be able to describe and apply Michaelis-Menton kinetics in the context of an enzyme.
5. The student will be able to discuss the principles of action of various enzymes, methods for regulation of enzyme, and methods of measuring enzyme activity.
6. The student will be able to understand how ions pumps in the membrane will work and their role in solute transport across the membrane.

7. The student will be able to describe inside-out and outside-in signal transductions processes and provide examples.
8. The student will be able to describe mechanisms of various types of muscle contraction, molecular mechanism of Ca<sup>2+</sup> handling, and transmission of nerve impulse to the effector organ.
9. The student will be able to describe similarities and differences among various blood cell types, and their specific roles in blood physiology.
10. The student will be able to describe blood clotting reactions.
11. Students will be able to understand the relationship of metabolism and development of various diseases including cancer, vascular and pulmonary diseases.

#### **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, class participation, and formal exams. Students who successfully complete the course will demonstrate a thorough understanding of fundamental metabolic, cellular and enzymological principles used in biotechnology, including basic background information, theory and application.

**Grading is proportional to number of class hours.** Each lecture class will have **100 points (excluding attendance)**. Grading criteria may vary each module, based on the instructor's preference and may include quizzes, assignments etc. If multiple modes of grading are used, the instructor should indicate the weight of each exam mode before the administration of the exam.

- **Lecture Examinations:** There will be two non-comprehensive exams (a midterm and a final). These two exams will be of a subjective format based on preceding lectures and are their worth is proportionate to number of lecture classes covered for the exam in the final grade calculation. If a specific lecture/module has also other forms of grading, the grading component for those modules in the comprehensive exam will be subtracted to include other grading points in the final grade calculation.
- **Quizzes:** There may be short in-class quizzes. The grade worth for these quizzes will be determined by the specific lecturers. These grades will be taken into consideration using pre-assigned weightage in determining the mid-term and final-exam grade.
- **Home work.** The instructor may choose to give home work/assignment to the specific lecture class/module. These assignments may be graded. The specific lecturer will determine the grade worth for this before assigning the homework.
- **All documents have to be typed, and handwritten documents are not acceptable.**
- **Class Participation and Attendance: Punctual attendance is critical. It is critical to sign (legibly) the sign-up sheet for each class to record your attendance. Students are expected to be in attendance for the majority of the class time. If not, students will not get full-credit for attendance. Tardiness of more than 30 min may not get full credit. (20% of grade)**
  - A grade of less than a B may result in loss of Graduate Assistantships.
  - No grades will be withheld for completion of work except in extreme circumstances.

**Work such as take home EXAM and other assignments turned in late will lose 5% (1 day late), 10% (2-3 day late), 20% (4-7) and 30%(7-14) of the points possible. Reports turned in more than two weeks late will not be accepted.**

### **Linked Program Learning Outcomes:**

The student learning outcomes listed above address the following Biotechnology Program PLOs:

- PLO2 - The student will demonstrate mastery of basic and advanced biotechnology methods.
- PLO4 - The student will demonstrate independent and critical thinking skills integrated with the ability to utilize multiple informational resources.
- PLO5 - The student will explain the principles, mechanisms, and interrelatedness of both in vivo and in vitro biochemical, molecular biological, and genetic processes.

### **Textbook:**

Biochemistry (4th Edition), by Donald Voet and Judith G. Voet, © John Wiley & Sons, Inc., 2011; ISBN 978-0-470-57095-1. Please note that, some of the lessons may not be in the textbook.

### **Course Content:**

Enclosed on a separate sheet.

## **Other Class Policies**

### **Attendance:**

Regular or punctual attendance is expected (**20 points per attendance**). 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 policies on Misconduct in Research and Other Scholarly Activity 05.00. 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.

### **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 provision of accommodations 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.

Program:	Master of Science in Biotechnology
Degree:	MS
Department:	Cellular and Molecular Biology
School:	Medical Biological Sciences
Course:	<b>BIOT5222/522L – Advanced Metabolism</b> (and associated lab)

Area	Marketable Skill*
<b>TASKS</b>	Maintain accurate laboratory records and data.
	Design molecular or cellular laboratory experiments, oversee their execution, and interpret results.
	Perform laboratory procedures following protocols.
<b>TECHNOLOGY SKILLS</b>	Analytical or scientific software; Graphics or photo imaging software - GraphPad, ImageJ, Adobe; Office suite software - Microsoft Office
<b>SKILLS</b>	<b>Critical Thinking</b> — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
	<b>Writing</b> — Communicating effectively in writing as appropriate for the needs of the audience.
<b>ABILITIES</b>	<b>Written Comprehension</b> — The ability to read and understand information and ideas presented in writing.
	<b>Written Expression</b> — The ability to communicate information and ideas in writing so others will understand.
<b>WORK ACTIVITIES</b>	<b>Documenting/Recording Information</b> — Entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.
	<b>Getting Information</b> — Observing, receiving, and otherwise obtaining information from all relevant sources.
	<b>Processing Information</b> — Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.
	<b>Updating and Using Relevant Knowledge</b> — Keeping up-to-date technically and applying new knowledge to your job.
<b>WORK CONTEXT</b>	Wear Common Protective or Safety Equipment such as Safety Shoes, Glasses, Gloves, Hearing Protection, or PPE.
	Importance of Being Exact or Accurate

\*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](http://www.onetonline.org))