

**CHEM 517: Applied Biochemistry and Biotechnology  
Course Syllabus, Fall 2023**

**Instructor: Dr. Thomas West**

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**Office Hours:** MTWR 10:30 am-11:45 am or by appointment

**COURSE MATERIALS**

**Required Text Book:** Basic Biotechnology, 3<sup>rd</sup> Edition, Cambridge University Press, Authors: Colin Ratledge and Bjorn Kristiansen (eds.). ISBN: 978-0-521-54958-5

**COURSE DEFINITION**

This is an online course that explores the use of biotechnology through biochemical applications. The course examines the relationship between applied biochemistry and the field of biotechnology from various perspectives.

**CREDITS:** 3 Course Credits

**PREREQUISITES OR CO-REQUISITES:** Basic knowledge of biochemical principles.

**COURSE DESCRIPTION**

This is a one-semester course that serves as an introduction to the use of biochemistry principles in biotechnology. The course topics will be presented along with examples where it will be demonstrated how the field of biochemistry is critical to a variety of biotechnological applications including the synthesis of biologically important products.

**STUDENT LEARNING OUTCOMES**

The main objectives of this course are to provide a basic foundation and understanding of biotechnology from a biochemical perspective. By the end of this course, the students will have a better understanding of the applications of biochemistry in the field of biotechnology for the production of commercially-important specialty chemicals and medically-related biochemicals.

**Student Learning Outcomes (SLO)**

At the completion of this course students will be able to:

- Understand the basic biochemistry principles involved in biotechnology.
- Understand the use of genetic engineering in biotechnology.
- Comprehend the biotechnological synthesis of bioproducts.
- Learn why biotechnology is important to sustainable chemistry.
- Describe the importance of biotechnology to plant biology.
- Understand the basic business principles important to biotechnology.
- Communicate the importance of enzymes to biotechnology.
- Communicate the importance of immunology to biotechnology.

**ATTENDANCE POLICY**

All students are expected to view the online lectures on a regular basis in D2L. According to the TAMU-Commerce Procedure A13.02, if a student has excessive absences, the instructor may drop the student from the course. The instructor will only excuse an absence if the student provides, with appropriate document, an excusable reason allowed by the TAMU-Commerce Procedure A13.02.

**COURSE REQUIREMENTS****Exams**

There will be three equally weighted online exams (22%) given with the online final exam being worth 16% of the final grade. The students will be expected to be available and prepared for the online exams at the specified times. *Missing an exam will result in a 0 score for that exam unless due to illness as documented by a doctor's note and the student notifies the instructor of the illness before the exam (e-mail, phone message, etc.).* Make-up exams will not be given ordinarily. The exams will contain a mix of objective and subjective question (multiple-choice questions, true-false questions, long (explanation) questions, short (formulas and definitions) questions and graphical/diagrammatic questions.

**Reading assignments**

There will be (3) reading assignments composed of reading (2) journal articles. Each graduate student will provide a 1 page synopsis/analysis of each journal article (2 pages/assignment). The reading assignments are as follows:

**Reading Assignment 1 (due September 11):**

Roberts, I. N. and Oliver, S. G. (2011) The yin and yang of yeast: biodiversity research and systems biology as complementary forces driving innovation in biotechnology. *Biotechnology Letters* 33(3):477-487. doi: 10.1007/s10529-010-0482-7

Goel, A., Wortel, M. T., Molenaar, D. and Teusink, B. (2012) Metabolic shifts: a fitness perspective for microbial cell factories. *Biotechnology Letters* 34(12):2147-2160. doi: 10.1007/s10529-012-1038-9

**Reading Assignment 2 (due October 9):**

Wendisch, V. F. (2020) Metabolic engineering advances and prospects for amino acid production. *Metabolic Engineering* 58:17-34. doi: 10.1016/j.ymben.2019.03.008

West, T. P. (2017) Microbial production of malic acid from biofuel-related coproducts and biomass. *Fermentation* 3(2):14. doi: 10.3390-fermentation/3020014.

**Reading Assignment 3 (due November 6):**

West, T. P. (2022) Production of the polysaccharide pullulan by *Aureobasidium pullulans* cell immobilization. *Polysaccharides* 3(3):544-555. doi: 10.3390/polysaccharides3030032

Hossain, N., Mahlia, T. M. I. and Saidur, R. (2019) Latest development in microalgae-biofuel production with nano-additives. *Biotechnology for Biofuels* 12:125. doi: 10.1186/s13068-019-1465-0

**Each 2 page synopsis/analysis of each reading assignment will represent 6% of the final grade.**

### Grading

**For students enrolled in CHEM 517, your final grade will be based on your performance in 3 exams (each exam 22%), 3 reading assignments (total of 18%) and the final exam (16%).** Grading will be based on a standard percentage scale: 100-90 = A; 89-80 = B; 79-70 = C; 69-60 = D; 59-below = F. Dishonest scholarship will earn an automatic zero (0) and initiate prosecution to the fullest extent. Incomplete grades may be given only if the student has a current average <sup>3</sup>70% and is precluded from completion of the course by a documented illness or family crisis. **Extra credit assignments will NOT be provided during this course. The last day to drop with a Q grade is Thursday, November 2.**

Category	Grade Value of each Category
Reading Assignments	18 points
Three Exams	66 points
Final Exam	16 points
<b>Total Points</b>	<b>100 points</b>

## TECHNOLOGY REQUIREMENTS

### LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:

<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

LMS Browser Support:

[https://documentation.brightspace.com/EN/brightspace/requirements/all/browser\\_support.htm](https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm)

## ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or [helpdesk@tamuc.edu](mailto:helpdesk@tamuc.edu).

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

## COMMUNICATION AND SUPPORT

The best way to communicate with the instructor is via e-mail: [thomas.west@tamuc.edu](mailto:thomas.west@tamuc.edu).

### Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

## COURSE AND UNIVERSITY PROCEDURE/POLICIES

### COURSE SPECIFIC PROCEDURES

#### Syllabus Change Policy

The syllabus is a guide. Circumstances and events may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

### UNIVERSITY SPECIFIC PROCEDURES

#### Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the **Student Guidebook**.

<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: <https://www.britannica.com/topic/netiquette>

#### TAMUC Attendance

For more information about the attendance policy please visit the Attendance webpage and Procedure 13.99.99.R0.01.

<http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>

<http://tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf>

## Academic Integrity

Academic Integrity Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

Undergraduate Academic Dishonesty 13.99.99.R0.03

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

Graduate Student Academic Dishonesty 13.99.99.R0.10

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.pdf>

## ADA Statement

### Students with disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

### Office of Student Disability Resources and Services

Texas A&M University-Commerce

Gee Library, Room 162

Phone: (903) 886-5150 or (903) 886-5835

Fax: (903) 468-8148

E-Mail: [StudentDisabilityServices@tamuc.edu](mailto:StudentDisabilityServices@tamuc.edu)

Website: Office of Student Disability Resources and Services

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

Please advise the instructor of any special problems or needs at the beginning of the semester.

## Counseling Services Statement

The Counseling Center at A&M-Commerce, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit [www.tamuc.edu/counsel](http://www.tamuc.edu/counsel)

## Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race,

color, religion, sex, national origin, disability, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity or gender expression will be maintained.

### Campus Concealed Carry

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations. For a list of locations, please refer to (<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>) and/or consult your event organizer). Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

### COURSE CALENDAR

All dates and assignments are tentative and subject to change.

Date	Unit	Topic/Textbook Chapter
Week 1 (Week of 8/28)	<b>Unit 1</b>	Syllabus and course requirements; Introduction to biotechnology-Chapter 1.
Week 2 (Week of 9/4)	<b>Unit 2</b>	Introduction to Biotechnology-Chapter 1; Biochemistry and physiology of growth-Chapters 2, 3 and 6.
<b>First Reading Assignment</b>		<b>Due Monday, September 11</b>
Week 3 (Week of 9/11)	<b>Unit 3</b>	Biochemistry and physiology of growth-Chapters 2, 3 and 6.
<b>Exam 1 (Monday, September 18)</b>		
Week 4 (Week of 9/18)	<b>Unit 4</b>	Genetic engineering-Chapters 4 and 5
Week 5 (Week of 9/25)	<b>Unit 5</b>	Genetic engineering-Chapters 4 and 5; Bioreactors-Chapter 7; Chapter 9- Downstream processing-Chapter 9; Process control-Chapter 10.
Week 6 (Week of 10/2)	<b>Unit 6</b>	Process economics, Chapter 11; Process optimization, Chapter 12; Business of biotechnology-Chapter 13.
<b>Second Reading Assignment</b>		<b>Due Monday, October 9</b>
Week 7 (Week of 10/9)	<b>Unit 7</b>	Amino acids, Chapter 14; Organic acids-Chapter 15.
<b>Exam 2 (Monday, October 16)</b>		
Week 8 (Week of 10/16)	<b>Unit 8</b>	Microbial polysaccharides and single cell oils-Chapter 16; Antibiotic production-Chapter 18; Enzyme biotechnology-Chapter 20.

Week 9 (Week of 10/23)	<b>Unit 9</b>	Microbial polysaccharides and single cell oils-Chapter 16; Antibiotic production-Chapter 18; Enzyme biotechnology-Chapter 20; Biofuels & Biomass cultivation; Environmental applications-Chapter 17.
Week 10 (Week of 10/30)	<b>Unit 10</b>	Biofuels, biomass cultivation, environmental applications-Chapter 17
<b>Third Reading Assignment</b>		<b>Due Monday, November 6</b>
Week 11 (Week of 11/6)	<b>Unit 11</b>	Biotransformation and immobilization-Chapter 24.
<b>Exam 3 (Monday, November 13)</b>		
Week 12 (Week of 11/13)	<b>Unit 12</b>	Recombinant proteins of high value-Chapter 21.
<b>Week 13 (Week of 11/20)</b>		<b>No Class-Thanksgiving Break</b>
Week 14 (Week of 11/27)	<b>Unit 13</b>	Plant cell biotechnology-Chapter 23; Insect and mammalian cells culture-Chapter 22.
Week 15 (Week of 12/4)	<b>Unit 14</b>	Immunochemical applications-Chapter 25.
<b>Final Exam (Wednesday, December 13 )</b>		