

**TUSKEGEE UNIVERSITY
COLLEGE OF ENGINEERING
CHEMICAL ENGINEERING DEPARTMENT
Fall 2021**

COURSE: CENG 400 – Introduction to Biochemical Engineering
SCHEDULE: MWF 11 am - 12 pm
INSTRUCTOR: Dr. Shamim Ara Begum
OFFICE: 522E Luther Foster Hall
TELEPHONE: ext. 8795
FAX: (334) 724-4188
E-MAIL: sbegum@tuskegee.edu
OFFICE HOURS: MW: 10:00 -11:00 and 1:00 - 3:30; Th: 9:30 -12:30
TEXT: Bioprocess Engineering 3rd ed. by Shuler, Kargi and Delisa

CATALOG DESCRIPTION

Introduction to biochemical and microbiological applications to commercial and engineering processes, including fermentation, enzymology, ultra filtration, food and pharmaceutical processing and resulting waste treatment, enzyme kinetics, cell growth, energetic and mass transfer.

COURSE OBJECTIVES:

Objectives		Tasks	
1	Develop an understanding of biological basics and enzyme kinetics	1	Demonstrate an appreciation for the terminology of biology essential to the biochemical engineer
		2	Demonstrate an appreciation for the terminology and history of enzymology
		3	Apply Michaelis-Menten Kinetics and the Lineweaver-Burk plot to extract enzyme kinetics parameters
2	Understand genetic engineering	3	Demonstrate an appreciation for the terminology of genetic engineering
		4	Determine the DNA products from PCR techniques
3	Design bioreactors	5	Demonstrate an appreciation for the terminology of bioreactors
		6	Determine the products from a bioreaction
		7	Calculate growth rates and other relevant biochemical engineering parameters for various organisms
4	Understand product purification and recovery	8	Demonstrate an appreciation for the terminology and tools for bioreactor product purification and recovery
		9	Calculate cell death rates and other relevant parameters for sterilization processes

COURSE OUTCOMES:

Outcomes	1	2	3	4	5	6	7
Objective 1	X						
Objective 2	X						
Objective 3	X		X				X
Objective 4	X						

1. An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering solutions and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

PREREQUISITES: CENG 360 (Chemical Reaction Engineering)

HOURS: 3 credit hours

GRADING:

Criteria:	Term Paper/Design	10%	Scale:	A = 86 - 100
	Homework/Quizzes	20%		B = 80 - 85
	Attendance &			C = 70 - 79
	Participation	10%		D = 60 - 69
	Exams	40%		F = 0 -59
	Final Exam	20%		

NOTE:

Final letter grades may be curved at the instructor's discretion.

COURSE POLICIES:

Students are expected to join the meetings at 11 am. It will be considered as an attendance for the class. If a student is late, he/she will be considered as late and will not receive attendance point for that class.

If students are unable to attend a meeting or miss any assignment, it is their responsibility to present a written valid excuse to the instructor. Valid excuses include serious illness, death in the

immediate family, and participation in University-sponsored events. Any other excuse will be evaluated by the instructor. An excused absence allows students to make up any work they missed without any late penalties. Failure to contact the instructor and present her with a valid excuse will result in an unexcused absence. An unexcused absence means that any homework/term paper/design problems they missed can be turned in for 25% deduction in a week of the missed due date.

In the event of an excused absence, make up assignments (tests, quizzes, homework, term paper/design problems) must be done by the next class meeting following the date of the excused absence (unless scheduled with the instructor). Student is responsible for his/her own missed assignments. Student will receive a full credit for class participation for an excused absence.

Students need to submit their homework/design etc. by themselves. They should not give their homework/design etc. to another student to submit to the instructor. The instructor will not accept this type of submission.

Homework will be assigned on the blackboard and are due at the beginning of class on the due date.

Students are responsible to check the blackboard regularly for any assigned homework and announcements.

Quizzes may or may not be announced.

No make-up exams or retests will be taken without a valid written excuse.

Final exam will be held on the day which will be scheduled by the university.

Cheating will not be tolerated. Any student caught cheating will get a zero for that assignment.

The instructor has the right to establish the rules and regulations for the classroom for it to be a conducive place for teaching and learning. The classroom is the place for the beginning of professional training.

Effective Spring 2012 ALL Instructional Administrators, Faculty, Staff and Students are REQUIRED to use Blackboard.

Effective Spring 2018, the outlook 365 (tuskegee.edu) email system at Tuskegee University is REQUIRED for all instructional administrators, faculty, staff and students.

Additional policies will be issued, if they are necessary.

Course Outline

- What is a Bioprocess Engineer? (Session: 1)
- An Overview of Biological Basics (Session: 2 - 6)
- Term Paper/Design Outline Due
- Enzymes (Session: 7 - 12)
- Exam 1
- Genetic Engineering (Session: 13 - 20)
- Exam 2
- Bioreactor Design and Operation (Session: 21 - 33)
- Exam 3
- **Term Paper/Design Due and Presentation**
- Product Recovery and Purification (Session: 34 - 42)
- Exam 4
- Final exam

STATEMENTS OF COE EXPECTATIONS REGARDING STUDENTS' ACADEMIC PROFICIENCY

Academic excellence is a tradition of the Tuskegee University College of Engineering, (COE). Students and faculty must collectively and proactively guard this tradition. The college hereby renews its commitment to the tradition by stating as follows:

1. Students are expected to develop self-confidence through acquisition of in-depth knowledge in all subjects through, as a minimum:
 - a. Studying to understand rather than studying to get by.
 - b. Challenging oneself to solve problems independent of textbooks or formulae sheets
 - c. Attempting diverse and multiple problems, multiple times, for depth and breadth of knowledge
2. Students are expected to be self-motivated through setting their own goals & schedules, spending time to study, and sharing their knowledge with peers.
 - a. Students should invest a minimum of two hours of study-time per week for every credit hour taken.
 - b. Students should seek or establish environments that encourage positive social interaction and engages in active learning.
3. COE is committed to providing support systems to students for higher achievement through the following avenues:
 - a. Direct access to instructors
 - b. Archives of faculty recorded course lectures
 - c. Dedicated peer tutors by fellow students at all academic levels
 - d. Periodic visits by alumni and industry subject matter experts
 - e. Opportunities for local and national academic related competitions

4. All COE students are expected to take advantage of all support systems. Students are particularly expected to adopt the notions of “self-confidence through knowledge acquisition” and “self-motivation to bring out best in self” as the COE fundamental culture for success.