

**USKEGEE UNIVERSITY
COLLEGE OF ENGINEERING
CHEMICAL ENGINEERING DEPARTMENT
Fall 2026**

COURSE: CENG 400 – Introduction to Biochemical Engineering
SCHEDULE: MWF 10:00 – 11:00; Room: 151
INSTRUCTOR: Dr. Shamim Ara Begum
OFFICE: 516 Luther Foster Hall
TELEPHONE: ext. 8795
FAX: (334) 724-4188
E-MAIL: sbegum@tuskegee.edu
OFFICE HOURS: MW: 9:00 - 10:00, 11:00 – 12:00, 2:00 - 4:30; F: 11:00 – 12:00
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 = 90 - 100
	Homework/Quizzes	20%		B = 80 - 89
	Attendance &			C = 70 - 79
	Participation	10%		D = 60 - 69
	Exams	40%		F = 0 -59
	Final Exam	20%		

COURSE POLICIES:

An excused absence allows students to make up any missed work without late penalties, provided that proper documentation is submitted. In the event of an excused absence, makeup assignments (tests, quizzes, homework, term paper/design problems etc.) 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. In the case of an unexcused absence, students are not allowed to make up any missed work. In addition, the student will receive zero credit for class attendance and participation.

Students must **arrive at 10:00 a.m. and remain in class for the entire class period** to receive attendance credit. Students who arrive late or leave before the end of class **will not receive attendance credit for that class session.**

Detailed policies on Attendance, Absenteeism, and Tardiness are provided later in the syllabus.

It is critical that all homework, quizzes, and exams be completed on time.

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.

Quizzes may or may not be announced.

Final exam will be done in the exam book given by the instructor in **pen**.

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

For close book exam, one/two pages formula sheet is allowed. However, formula sheets, which include any steps to solve the problem will be cancelled.

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

Food of any kind, including chewing gum, is not allowed in class.

Students are not allowed to talk with each other during lecture, quizzes, exams, and final exam. If there is an emergency, students need to go outside of the class to talk for maintaining a better learning environment in the classroom.

Students are not permitted to work on assignments for other courses during class.

All **electronic devices** must be **turned off and put away** during quizzes, examinations, and final examinations. Failure to comply will be considered a form of cheating. All **electronic devices** must also be **turned off and put away** during class to avoid disruptions, unless otherwise authorized by the instructor. Detailed cell phone policies are provided later in the syllabus.

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

COVID Policy:

“Excuses related to **Covid infection** as well as exposure have to be received from the Dean of Students office. Students should request the excuse for absence from the Dean of Students office as soon as they become aware of covid infection or exposure. Students may request a classes missed memo by completing this form (<https://forms.gle/4ozusHX2tTCUW4yK6>) and then contact the Office of the Dean of Students and Student Conduct (334) 727-8421, via e-mail

THarper@Tuskegee.edu or by going into the office located in suite 203 Tompkins Hall."

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)
- Bioreactor Design and Operation (Session: 21 - 33)
- Exam 2*
- **Term Paper/Design Due**
- Product Recovery and Purification (Session: 34 - 42)
- Exam 3*
- Final exam

Note: *Tentative

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.

Tuskegee University Policy on Attendance, Absenteeism, and Tardiness

Guidance for Students, Faculty and Staff

Tuskegee University recognizes that regular class attendance and active participation are essential to academic success, student engagement, and professional development. Faculty members are responsible for establishing, communicating, and consistently enforcing attendance expectations in accordance with Tuskegee University policies, academic regulations, and applicable federal requirements.

Attendance and Absenteeism

Students are expected to attend all scheduled classes, laboratories, clinicals, practica, performances, and other required instructional activities. Attendance policies and related grading implications must be included in every course syllabus at the beginning of each academic term.

Attendance is considered a component of academic performance at Tuskegee University. Attendance expectations and related academic consequences are institutional requirements and are subject to consistent enforcement across all instructional areas.

Attendance policies must be clearly stated in the course syllabus, including grade reductions or penalties associated with excessive absences. Attendance policies must be enforced consistently for all students enrolled in the course. Approved accommodations and protected absences, including those related to disability accommodations under the Americans with Disabilities Act (ADA), Title IX matters, religious observances, military obligations, or University-sponsored activities, must be honored in accordance with University policy. Faculty members are expected to maintain accurate attendance records in compliance with institutional and federal reporting requirements.

Students who accumulate four (4) or more unexcused absences in any enrolled course, including Orientation, will have their final course grade reduced by one letter grade. For laboratory-, clinical-, practicum-, studio-, and field-based courses, the consequences of excessive unexcused absences, including grade reduction, course failure, or administrative withdrawal, will be determined by the respective academic department in accordance with established course requirements and accreditation standards.

Continued unexcused absences beyond the four-absence threshold may result in additional grade reductions, course failure, or administrative withdrawal, as deemed appropriate and consistent with Tuskegee University policies and procedure.

The following standards apply to all courses:

Tardiness

Tardiness is defined as arriving any time after the hour. Students are expected to arrive on time and remain for the duration of all class sessions and instructional activities.

Repeated tardiness or exiting class during instructional periods is considered disruptive to the instructional environment and adversely affects academic engagement, professionalism, and classroom continuity.

Faculty members will document repeated tardiness as part of attendance records. Three (3) incidents of tardiness will be considered equivalent to one unexcused absence, unless otherwise required by specialized program accreditation standards. Repeated tardiness may result in reductions in participation, professionalism, or engagement grades. Students may be denied entry after instruction, examinations, laboratories, performances, clinical activities, or other time-sensitive instructional experiences have begun.

Faculty members are expected to address excessive tardiness through direct communication with students and may refer students to Academic Advising, Counseling Services, Accessibility Services, Student Affairs, or other appropriate support offices when necessary. Tardiness policies must be applied consistently and in accordance with approved accommodation, excused absences, and applicable federal and institutional reporting guidelines.

Financial Aid and Academic Participation

In accordance with federal regulations established by the U.S. Department of Education, students who cease attending classes and fail to demonstrate academic participation may be reported as unofficial withdrawals. Such determinations may require Tuskegee University to adjust or return a portion of the student's Federal Financial Aid under Return to Title IV (R2T4) regulations.

Excessive absences will adversely affect a student's ability to maintain Satisfactory Academic Progress (SAP), which is required to remain eligible for Federal Financial Aid.

Faculty members are expected to maintain accurate attendance documentation and report excessive absences to Department Chairs and appropriate University offices in a timely manner.

Student Responsibilities

Students are expected to attend classes regularly, arrive on time, and participate fully in all required instructional activities. Students are also responsible for reviewing and complying with attendance and tardiness policies stated in each course syllabus.

Examples of Excused Absences

Excuse absences include circumstances that are documented, unavoidable, approved by the University, or protected under institutional or federal policy. All excused absences must be supported by official documentation and should be submitted in advance whenever possible, such as in cases involving scheduled medical appointments, Tuskegee University-sponsored activities, religious observances, military service obligations, or jury duty.

Examples may include:

- **Personal illness or medical emergency**
- **Serious illness or death of an immediate family member**
- **Medical appointments that cannot be scheduled outside of class time**
- **University-sponsored activities or official University business**
- **Religious observances**
- **Military service obligations**
- **Jury duty or court appearances**
- **Approved disability-related accommodation.**
- **Title IX-related circumstances**
- **Extreme weather emergencies or natural disasters experienced by the University Community**
- **Documented transportation accidents or emergencies**
- **Internship, clinical, or academic activities approved by the University.**

Students are expected to be proactive and notify their instructor via email of any excused or unexcused absence, while copying their Academic Advisor and Reach Advisor on the correspondence. Written documentation supporting the absence must be submitted to the appropriate advisor(s) within five (5) business days of the student's return to class. Faculty members will not accept documentation submitted after this deadline.

In cases involving extenuating circumstances that prevent timely submission, students are expected to notify their instructor and advisor(s) as soon as reasonably possible.

Examples of Unexcused Absences

Unexcused absences include absences that are undocumented, avoidable, or unrelated to approved institutional exceptions. Examples may include:

- **Oversleeping**
- **Missing class due to work schedule conflicts**
- **Vacations or personal travel not approved by the University.**
- **Social events or entertainment activities**
- **Membership Intake requirements for Local, State and National Organizations**
- **Leaving class early without permission**
- **Routine errands or appointments that could be scheduled outside class time.**

- **Non-emergency transportation issues without documentation**
- **Failure to provide required documentation for absence.**
- **Repeated tardiness resulting in missed instructional time.**
- **Weddings**

Repeated unexcused absences will result in academic consequences in accordance with Tuskegee University and course attendance policies.

Tuskegee University remains committed to supporting student success while upholding academic integrity, instructional continuity, institutional accountability, and compliance with federal and accreditation standards.

Tuskegee University Cell Phone Policy

To maintain a professional and productive learning environment, students are expected to give their full attention during class.

1. Cell phones and other personal electronic devices must be silenced and stored before class begins unless otherwise authorized by the instructor.
2. The use of cell phones during class for texting, social media, gaming, web browsing, or making or receiving calls is prohibited.
3. Electronic devices may be used only for course-related activities when expressly authorized by the instructor.
4. If an emergency requires you to answer a call or message, quietly leave the classroom before using your device and return with minimal disruption.
5. Unauthorized use of electronic devices may result in a verbal warning, being directed to put the device away, or, for repeated violations, being asked to leave the classroom and/or being marked absent in accordance with University policy and the course attendance policy-which may adversely impact your final grade for the class and likewise lead to a disciplinary referral to the Office of the Dean of Students.
6. During quizzes, tests, and examinations, the use of cell phones, smartwatches, meta watches, earbuds, or other electronic devices is strongly prohibited unless approved as a documented accommodation or specifically required for the assessment. All such devices must be in airplane mode/turned off and placed in the student's backpack/purse or another location designated by the instructor before the assessment begins.

Professional courtesy and respect for your classmates and instructor require your full attention during class. Minimizing distractions promotes an environment that supports learning, engagement, and academic success for all students

Tuskegee University Dress Code Policy for Students

The purpose of this policy is to provide students with general dress coded parameters. It is not intended to be overly prescriptive but is designed to ensure decorum appropriate to a university environment.

Students are expected to maintain a professional appearance that supports a respectful learning environment and reflects the standards of their intended profession. Appropriate attire is required for all classes, laboratories, simulations, presentations, field experiences, cafeteria and other professional activities/settings.

The following expectations apply:

1. Clothing should be clean, neat, and appropriate for an academic and professional setting. Attire that is excessively revealing, excessively tight, transparent, or otherwise inconsistent with a professional environment is not appropriate or any other apparel or appearance that may be distracting in the classroom (as deemed by the administration) is not permitted. Examples include, but are not limited to, clothing that exposes the midriff, chest, undergarments, tops that show cleavage or excessive portions of the chest, back or sides.
2. Hats, bonnets, head scarves, caps, hoods, durags, bandanas, sunglasses, and other non-religious or non-medically required head coverings should be removed while in the classroom or cafeteria unless they are required for documented medical, religious, cultural, or University-approved purposes.
3. Clothing displaying profanity, discriminatory language, sexually explicit content, or images or messages promoting violence, illegal drugs, alcohol, tobacco, or other inappropriate material is prohibited.
4. Pants, skirts, dresses, and shorts should be worn in a manner that is appropriate for a professional educational environment. Clothing should fit properly and not expose undergarments or other private areas. Excessively short shorts, swimsuit bottoms, body suits, sleeveless undershirts, and similar casual garments are not appropriate for professional classroom settings. T-shirts worn as dresses and sagging pants are not permitted. Baggy or loose fitting pants must be worn with a belt that fits around the waist.
5. Undergarments must be worn in an appropriate manner and not visible. Clothing with rips, tears, and/or holes that expose underwear or inappropriate parts of the body are not permitted..
6. Footwear must be appropriate for the instructional setting. No bedroom shoes or skates allowed in the classroom or cafeteria setting.
7. Faculty may establish additional dress requirements for courses involving laboratories, clinical experiences, internships, field placements, simulations, or presentations to ensure compliance with professional, accreditation, safety, or agency standards.

Students who do not comply with the course dress expectations will be asked to correct the issue before participating in class activities. Repeated failure to adhere to the dress expectations may result in being asked to leave the class for that session and may be addressed in accordance with applicable course and University policies.

Questions or disputes about the appropriateness of a particular mode of dress for the time, occasion or place should be referred to the Dean of Students.

Additional policies will be issued, if they are necessary.