

CHEM 4500K: Methods in Nucleic Acid and Protein Biochemistry

4500K section 01 (4 credit hours)

Fall 2021

Instructor:

Prof. Thomas Leeper, SL3006, tleeper@kennesaw.edu

Location: SL2035

Days & Times: TR 11:00am – 12:15pm and Thursday 12:30pm – 3:15 pm

Office Hours: SL3006, Monday & Thursday 10 am to 11 am, email in advance to confirm a 15-minute slot.

Textbook: None. See material posted to d2l.kennesaw.edu for this course, in particular the Lab Manual.

Description: Prerequisite: (CHEM 3501 and CHEM 3501L), and (BIOL 3300 and BIOL 3300L).

This class is an integrated lecture and laboratory *course-based undergraduate research experience* covering the isolation, characterization and analysis of DNA, protein expression and purification, site-directed mutagenesis, electrophoresis, protein-protein interactions, journal article writing, and statistical treatment of data.

Course learning outcomes: As part of this course, you will...

1. ...propose site directed amino-acid mutations to answer a question based upon a known protein structure.
2. ...perform site directed mutagenesis of plasmid DNA using primers designed by you.
3. ...validate your mutagenized DNA with electrophoresis and Sanger sequencing.
4. ...express and purify your mutant protein with a quality & quantity suitable for NMR and enzymology.
5. ...diagram the inhibition properties and/or the rate of enzyme kinetics for your mutant protein.
6. ...prepare individual laboratory reports documenting project progress at various stages.
7. ...document results and procedures for the project in a professional-style laboratory notebook.
8. ...collaboratively write a publication quality research article and submit for peer review to a journal.

Grading:

26% of grade determined by two laboratory report grades, i.e. 13% each.

30% of grade determined by contribution to the journal article writing/submission exercise.

20% of grade will be based upon notebook grading, two collections for 10% each.

24% of grade is based upon ~weekly quizzes and/or prelabs (~12), ~ 2% each.

Grading scale (rounding down): A ≥90.0% B ≥80.0%, C ≥70.0%, D ≥60.0%

Quizzes: There will be up to twelve short quizzes taken during the first few minutes of each class during the semester. These will assess knowledge and understanding of project objectives but also will have questions to provide opportunities for brief self-reflection on learning gains and laboratory skills competency. Completion of a final guided reflection of your research experience will substitute for the lowest quiz grade. This final reflection will address educational value, connectedness to other courses, integrative problem solving, and values growth.

Lab Groups: You will be assigned to groups of three or four students. These groups will be the same throughout the rest of the semester but may be rearranged should a need arise such as multiple students from one group dropping the course. Your reports are to be written individually, but data is obviously shared between members of your group. For the journal article writing, I will assign sections to each group although you will have influence in this process. You are all expected to contribute to the writing process, and you will be asked to peer evaluate each of your fellow group members' participation, which will count toward your article writing grade. In extreme cases, a group may be allowed to ask a member to leave the group or switch to another group due to disruptive behavior or lack of participation; students who leave a group might need to work independently.

Strategies for success in this course: You must prepare for each laboratory period by reading the relevant sections in the lab manual and review posted materials prior to entry to the lab space. Be prepared to make mistakes, but to learn from them. Work to master techniques early to ensure procedural precision and accuracy and to avoid the need to repeat experiments unnecessarily. Divide up the labor with your partner(s) to enable rapid progress but check in with them to ensure shared responsibility. Realize that thousands of students have learned the procedures you will use (so they are doable!) but that the questions you are asking are novel and

have not been investigated before. Practice writing and give yourself twice as much time as you *think* you need; write a section and then (re)edit it for the same amount of allotted time. Recognize that quality >>> quantity.

Tentative Schedule (alignment with course learning outcomes indicated with the color-coded superscripts):

Aug. 17 th	Session 1: Bioinformatics and primer design for SDM on laptop computers. ^(1,2,7)
Aug. 19 th	Session 2: PCR for SDM, and <i>dpn1</i> treatment. ^(2,3,7)
Aug. 24 th	(Free day, ACS meeting; possible online content)
Aug. 26 th	Session 3: Agarose gel, bacterial transformation, and “reading” lecture ^(2,3,4,7)
Aug 30 th , “afterhours”	<i>Quick trip into lab to inoculate cells...</i>
Aug. 31 st	Session 4: Miniprep and nanodrop quantitation. ^(2,3,7)
Sept. 2 nd	Session 5: Agarose gel, sequencing setup, transformation into BL21(DE3) ^(3,4,7)
Sept. 7 th	Lecture on protein expression/purification and media prep. ^(4,7)
Sept 8 th , “afterhours”	<i>Quick trip into lab to inoculate cells...</i>
Sept 9 th	Session 6: ¹⁵ N labeled protein expression and buffer prep. ^(4,7)
Sept 10 th , “afterhours”	<i>Trip into lab to centrifuge cells...</i>
Sept. 14 th	Paper writing lecture and makeups. ^(6,7,8)
Sept. 16 th	Session 7: Lysis, centrifugation, IMAC, dialysis, and Bradford. ^(4,7)
Sept 17 th , “afterhours”	<i>Quick trip into lab to change dialysis buffer and add protease...</i>
Sept. 21 st	Session 8: Tag clearing, concentration. ^(4,7)
Sept. 23 rd	Session 9: Protein gels, nanodrop quantitation, and NMR sample submission. ^(4,7)
Sept. 28 th	Lecture on paper writing and interpreting protein NMR. ^(5,6,8)
Sept. 30 th	Session 10: hydrolase inhibition assays. ^(4,5,7)
Oct. 5 th to Nov. 18 th	Makeup days, journal article preparation, and submission. ⁽⁸⁾
Nov. 23 rd and 25 th	Thanksgiving Break
Nov. 30 th and Dec. 2 nd	Article revisions. ⁽⁸⁾
Dec. 7 th	Final revised article submission. ⁽⁸⁾

Important Due Dates:

September 21 st	First report due online: results of mutagenesis. ⁽⁶⁾
Oct. 5 th	Notebook due for 1 st grading. ⁽⁷⁾
Oct. 14 th	Second report due online: results of protein expression. ⁽⁶⁾
November 11 th	Draft sections of journal article writing assignment due. ⁽⁸⁾
Nov. 16 th	Compiled draft of journal article writing assignment due. ⁽⁸⁾
Nov. 18 th (or TBD)	Final version of journal article writing assignment due. ⁽⁸⁾
Dec 7 th (finals)	Notebooks due for final grading. ⁽⁷⁾

[Links to KSU policies relating to accessibility, etiquette, withdrawals, copyright, privacy, and misconduct here:](https://cia.kennesaw.edu/instructional-resources/syllabus-policy.php)
<https://cia.kennesaw.edu/instructional-resources/syllabus-policy.php> (continued on the next 3 pages, online only)

Disabilities: If you require an accommodation based upon a disability, you must contact the Student Disability Services located in the Carmichael Student Center in Suite 267, during the 1st-class week. [Policy link here.](#)

Academic honesty: The academic honesty policy is given in the student handbook; summarized below. If you fail to adhere to this policy, you will be held accountable. Cheating is considered a serious offense.

Academic Integrity Statement (Required): Every KSU student is responsible for upholding the provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. Section II of the Student Code of Conduct addresses the university’s policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to university materials, misrepresentation/falsification of university records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the Department of Student Conduct and Academic Integrity (SCAI), which includes either an “informal” resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct’s minimum one semester suspension requirement. See also <http://www.kennesaw.edu/scai/content/ksu-student-code-conduct>.

Disruption of Campus Life Statement: It is the purpose of the institution to provide a campus environment, which encourages academic accomplishment, personal growth, and a spirit of understanding and cooperation. An important part of maintaining such an environment is the commitment to protect the health and safety of every member of the campus community. Belligerent, abusive, profane, threatening and/or inappropriate behavior on the part of students is a violation of the Kennesaw State University Student Conduct Regulations. Students who are found guilty of such misconduct may be subject to immediate dismissal from the institution. In addition, these violations of state law may also be subject to criminal action beyond the University disciplinary process.

KSU Web Accessibility Policy Statement: Federal law Section 508 Subsection 1194.22 of the Rehabilitation Act and the Board of Regents (BOR) of the University System of Georgia (USG) Web Accessibility Guidelines require that all web content meet the federal government's accessibility guidelines. As such, KSU complies with USG guidelines. University accessibility assistance is provided by several offices as noted below. Staff in these offices work to accommodate requests for access or assistance with access as soon as possible in order to either accommodate the request or identify an effective alternative for the requestor.

Student Support Services: Student Disability Services, 470-578-2666, studentdisability@kennesaw.edu

Student Technology Assistance: UITS, 470-578-3555, studenthelpdesk@kennesaw.edu

Third Party Technology Assistance: UITS, 470-578-6999, service@kennesaw.edu

KSU Reasonable Accommodations Policy: Students with qualifying disabilities under the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act who require "reasonable accommodation(s)" to complete the course may request those from Office of Student Disability Services. Students requiring such accommodations are required to work with the University's Office of Student Disability Services rather than engaging in this discussion with individual faculty members or academic departments. If, after reviewing the course syllabus, a student anticipates or should have anticipated a need for accommodation, he or she must submit documentation requesting an accommodation and permitting time for a determination prior to submitting assignments or taking course quizzes or exams. Students may not request retroactive accommodation for needs that were or should have been foreseeable. Students should contact the office as soon as possible in the term for which they are seeking accommodations. Student Disability Services is located in the Carmichael Student Center in Suite 267 on the Kennesaw campus or Building A in Suite 160G on the Marietta campus. Please visit the Student Disabilities Services website for more information, or call the office at 470-578-2666 (Kennesaw campus) or 470-578-9111 (Marietta campus).

KSU Enrollment Management/Course Attendance Policy: Students are solely responsible for managing their enrollment status in a class; nonattendance does not constitute a withdrawal.

KSU Military Withdrawals Policy: Kennesaw State students who are called to active duty or who are deployed during the term may be eligible for a military withdrawal. Students who withdraw for military reasons will receive a WM grade in all courses and receive a refund of tuition and mandatory fees and a pro rata refund of other fees. Students who would like to withdraw for military reasons must submit a copy of their official orders to the Registrar's office. Military withdrawals do not count as part of the eight (maximum) allowed withdrawals.

Copyright Law: It is the responsibility KSU faculty and students to respect the rights of copyright holders and complying with copyright law. The University System of Georgia recognizes that the exclusive rights of copyright holders are balanced by limitations on those rights under federal copyright law, including the right to make a fair use of copyrighted materials and the right to perform or display works in the course of face-to-face teaching activities.

The University System of Georgia facilitates compliance with copyright law and, where appropriate, the exercise in good faith of full fair use rights by faculty and staff in teaching, research, and service activities. The University System of Georgia ensure compliance with copyright law in the following ways. The USG informs and educates students, faculty, and staff about copyright law, including the limited exclusive rights of copyright holders as set forth in 17 U.S.C. § 106, the application of the four fair use factors in 17 U.S.C. § 107, and other copyright exceptions. The USG develops and makes available tools and resources for faculty and staff to assist in determining copyright status and ownership and determining whether use of a work in a specific situation would be a fair use and, therefore, not an infringement under copyright law; The USG facilitates use of materials currently licensed by the University System of Georgia and provides information on licensing of third-party materials by the University System; and The USG identifies individuals at the University System and member institutions who can counsel faculty and staff regarding application of copyright law.

Protecting Students' Privacy (FERPA): Students have certain rights to privacy. These rights are mandated by federal policy. Leaving their work in an unsecured area such as outside your office door (unless agreed upon with each student) means that the students' names and grades and possibly social security numbers are accessible to everyone. Additionally, research papers can be taken and used by other individuals. It is recommended that you permit students to retrieve their work from your office if you don't return it to them in class. Information should not be made public in any way in which a

student's grades, social security number, or other personal information may be identified. Grade information may be shared with members of the KSU community who also have a legitimate educational interest in student success (e.g. academic advisors or members of the Behavioral Response Team). Faculty may be asked to provide early alert information if there is a concern that a student is at risk, academically or otherwise.

As a member of the Kennesaw State University community of scholars, I understand that my actions are not only a reflection on myself, but also a reflection on the University and the larger body of scholars of which it is a part. Acting unethically, no matter how minor the offense, will be detrimental to my academic progress and self-image. It will also adversely affect all students, faculty, staff, the reputation of this University, and the value of the degrees it awards. Whether on campus or online, I understand that it is not only my personal responsibility, but also a duty to the entire KSU community that I act in a manner consistent with the highest level of academic integrity. Therefore, I promise that as a member of the Kennesaw State University community, I will not participate in any form of academic misconduct.

The Student Handbook contains information regarding Rights Pertaining to Student Records, and FERPA specific details are available on the Registrar's website.

Privacy in the Education Process. A key requirement of the formal evaluation process is the protection of individual privacy rights concerning educational grading. The University's online learning system and email system is designed to prevent unauthorized individuals from gaining access to sensitive information or information protected by federal or state law. Consequently, faculty and students are strongly encouraged to only communicate regarding course matters through the University's designated technology learning system.

KSU Sexual Misconduct Policy: In accordance with federal and state law including, Title IX of the Education Amendments of 1972 ("Title IX") and Title VII of the Civil Rights Act of 1964 (Title VII), the University System of Georgia (USG), including Kennesaw State University, prohibits discrimination on the basis of sex in any of its education programs or activities or in employment. The USG is committed to ensuring the highest ethical conduct of the members of its community by promoting a safe learning and working environment. To that end, Kennesaw State University follows USG Board of Regents Policy Manual, Section 6.7. See <https://equity.kennesaw.edu/titleix/title-ix.php>.

KSU Course Withdrawal Policy: Students may withdraw from one or more courses any time before the last week of the semester. Summer withdrawal dates vary according to the part of term in which the student is enrolled. However, as of fall 2004, students will be allowed a maximum of eight total withdrawals if they enter KSU as a freshman. Transfer students will be allowed one withdrawal per fifteen credit hours attempted, for a maximum of eight. Students who choose to pursue a second degree at KSU will be allowed two additional withdrawals. Students who entered KSU before fall 2004 will be allowed one withdrawal per fifteen credit hours attempted for a maximum of eight after the institution of this policy. As part of the Kennesaw State University and Southern Polytechnic State University Consolidation process, SPSU students will have eight withdrawals available beginning Fall Semester 2015.

Students who exceed the maximum number of withdrawals will receive a grade of "WF" for any subsequent withdrawals. To completely or partially withdraw from classes at KSU, a student must withdraw online through Owl Express. Students who officially withdraw from courses before the last day to withdraw without academic penalty will receive a grade of "W" and receive no credit. Students who officially withdraw after the last day to withdraw without academic penalty and before the last week of classes during the semester or who have exceeded the maximum number of withdrawals will receive a grade of "WF," which will be counted as an "F" in the calculation of their grade point average. The only exceptions to these withdrawal regulations will be for instances involving unusual circumstances, which must be fully documented. Students may appeal to the Academic Standing Committee for consideration of unusual circumstances. Exact withdrawal dates are published in the official academic calendar. Students who simply stop attending classes without officially withdrawing usually are assigned failing grades. Students will receive refunds only when they withdraw from ALL their classes and only by the schedule outlined in the University System refund policy. In specific circumstances when a student experiences an extreme emergency during the term, the student may qualify for an Administrative Emergency Withdrawal. That process is coordinated through the Office of the Dean of Students and information is available at <http://deanofstudents.kennesaw.edu/resources/withdrawal.php>.

KSU Graduate Course Auditing Policy (Graduate Courses Only): Auditing of courses will be permitted for regularly enrolled graduate students, as well as on a space-available basis for those who hold a graduate degree from Kennesaw State. Auditing courses is not allowed in the Coles Doctor of Business Administration, the Coles Executive MBA, the Master of Science in Conflict Management (MSCM), the Master of Science in Information Systems (MSIS), or any of KSU's Master of Education (M.Ed.) programs. Students must have completed all prerequisites necessary for the course to be audited and are expected to complete all course requirements as noted on the course syllabus. A student may audit no more than 6 credit hours of graduate course work in a given term.

The grade of "V" will be given for successfully completed audited courses. This grade will have no effect upon the student's grade-point average, and students will not be permitted to have the audit grade changed at any future date. Audited courses will not count toward degree completion for any of KSU's graduate programs. The permission to audit form, available in the Office of the Registrar, must be submitted before the end of final registration. The form must be signed by the Graduate Program Director of the program offering the course to be audited. Audited courses count at full value in

computing the student's course load and fees. The student's name will appear on the official class rolls of the courses audited, as well as the student's approved schedule of courses. No credit is granted for audited courses, and students are not permitted to change to or from an auditing status except through the regular procedures for schedule changes.

Academic Feedback: Institutional Chief Academic Officers will encourage faculty to clarify for students, at the beginning of each course, the basis on which grades will be determined and to provide timely academic feedback as the course progresses (BOR Academic and Student handbook policy 2.18).

Netiquette: Communication Courtesy: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats.

Inclement Weather Policy: During the course of the year, Kennesaw State University may decide to close campus or operate on a delayed schedule in cases of inclement weather. The University will announce campus closures and delayed schedules in several ways. The cell phone number on file with the university will automatically receive KSU Alerts, so make sure your information in OwlExpress is accurate at all times. An email will also be sent to your university account. In addition, announcements will be made by a notice on the Kennesaw State University home page.

Course Delivery: KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

COVID-19 illness: If you are feeling ill, please stay home and contact your health professional. In addition, please email your instructor to say you are missing class due to illness. Signs of COVID-19 illness include, but are not limited to, the following:

- Cough
- Fever of 100.4 or higher
- Runny nose or new sinus congestion
- Shortness of breath or difficulty breathing
- Chills
- Sore Throat
- New loss of taste and/or smell

COVID-19 vaccines are a critical tool in "Protecting the Nest." If you have not already, you are strongly encouraged to get vaccinated immediately to advance the health and safety of our campus community. As an enrolled KSU student, you are eligible to receive the vaccine on campus. Please call (470) 578-6644 to schedule your vaccination appointment or you may walk into one of our student health clinics.

For more information regarding COVID-19 (including testing, vaccines, extended illness procedures and accommodations), see KSU's official [Covid-19 website](#).

Masks: While masks are no longer mandated on campus, you are strongly encouraged to wear a mask when in class if you have not received a COVID-19 vaccination.