Course syllabus and information

Course information

Biochemistry and Molecular Biology 462 (BMB462) - Advanced Biochemistry II
9:10 -10:00 a.m..; MWF
Spring semester 2026
In-person; E100 Veterinary Medical Center
Course site via D2L (d2l.msu.edu)

Contact Information

Instructor Information	**Lectures**	**Office and Office Hours**
Dr. Kevin Haudek Course coordinator haudekke@msu.edu *(must include "BMB462" in subject line)* 517-353-4377	10-18	219 Biochemistry Bldg. Office hours: Mondays 1-2 p.m. Wednesdays 10:15-11:15 a.m. Or by email appointment *Zoom link by request*
Dr. Carol Wilkins mindockc@msu.edu *(must include "BMB462" in subject line)*	1-9	502B Biochemistry Office hours (in-person) during Unit 1: TBA Or by email appointment *Zoom link by request*
Dr. Robert Quinn quinnrob@msu.edu *(must include "BMB462" in subject line)*	19-27	116B Biochemistry (Lab 120 BCH) Office hours (in-person) during Unit 3: TBA Or by email appointment
Dr. Tommy Vo votommyv@msu.edu *(must include "BMB462" in subject line)*	28-38	410B Biochemistry Office hours (virtual) during Unit 4: Tuesdays 10-11 a.m Or by email appointment *See D2L for Zoom link*
George Kusi-Appiah kusiapp2@msu.edu *(must include "BMB462" in subject line)*	Teaching Assistant	Reviews: TBA

Course Materials

Required

- Nelson, D.L. and Cox, M.M. Lehninger Principles of Biochemistry, 7th or 8th ed. (2017 / 2021). W.H. Freeman, New York. 1172 pages. *Paper or electronic versions are acceptable.*
- Access to Macmillan Achieve (www.achieve.macmillanlearning.com); an online homework system integrated with an electronic version of the textbook.

Using the older version of the textbook is an option, but if you elect to do so, you are responsible to match the required reading pages/sections appropriately.

- i>clicker Cloud account

Recommended

- The study guide associated with the Lehninger textbook (*The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry: Study Guide and Solutions Manual* by Marcy Osgood and Karen Ocorr) is an optional resource for this course, but many students have found it helpful in the past.
- Previous students have found another book that explains the chemistry and sequence of reactions in biochemical pathways very helpful:
- Wilkins, Carol A. Understanding Biochemical Pathways: A Pattern-Recognition Approach., 2nd ed. (2021) Cognella, Inc. 226 pages.

Course Objectives

BMB 462 is the second semester of the undergraduate series, BMB 461-462, which provides students with an introduction to biochemistry at the advanced undergraduate level. It is designed primarily for students majoring in Biochemistry or closely related fields. BMB 462 is a three credit course that continues the study of metabolism begun in BMB 461 and then examines the transmission and expression of the genetic material in bacterial and eukaryotic cells. At the conclusion of this course, successful students will be able to:

• Explain the roles of common membrane components and predict how the membrane will change based on changes in these components.

• Explain how signals are transduced in cells, categorize specific parts of signal transduction cascades based on general signal transduction principles, and predict how changes in a signaling system will alter the signaling process.

• Discuss the processes used to metabolize lipids, amino acids, and nucleotides, explain the function of individual reactions in these processes, and connect these processes with central metabolic pathways.

• Explain the mechanisms used to regulate cellular metabolism and predict how changes in these regulatory mechanisms will impact cellular metabolism.

• Explain the roles of nucleotides and nucleic acids in cells based on the structures of these molecules and predict how changes in these structures alter their functions.

• Explain how biomolecules store and transfer information and how this information is recognized and used by cells.

• Diagram the processes used to synthesize, repair, and recombine DNA and compare the structure and function of key proteins involved in these processes.

• Diagram the processes used to create various cellular RNAs and compare the structure and function of key proteins involved in these processes with proteins used to synthesize, repair, and recombine DNA.

• Diagram the processes needed to synthesize and target proteins and discuss the structure and function of key molecular machines involved in these processes.

• Explain how gene expression is regulated using classic examples of gene regulation as models, categorize specific examples of regulation by general regulatory mechanism, and predict how changes in a regulatory system will alter gene expression.

• Design a basic DNA cloning experiment incorporating the general processes used in cloning DNA.

Course Expectations of Students

BMB462 is a rigorous, fast-paced, advanced biochemistry course. This course will be a fully in-person course which requires attendance of synchronous sessions. Important course content will be delivered at these sessions, as well as points earned for in-person participation. Although class sessions will be recorded, this is not intended to be an asynchronous course. Students that complete the course routinely comment that it is one of the most challenging and rewarding classes at MSU. Habits of previously successful students include studying before or after every lecture, completing homework assignments regularly before the posted deadline, forming study groups and attending review sessions. By examining the textbook and course schedule, you will find that the course covers a lot of material each lecture and week.

Assessments

Your final grade in BMB 462 will be calculated based on the assessment types listed in the table below, weighted according to the indicated percentages. Detailed descriptions of each assessment are provided in subsequent sections. Students may earn up to 0.5% extra credit by completing optional online quizzes or surveys available during the last week of class. Information about these assessments will be posted in D2L. The purpose of this bonus is to allow students who are within 0.5% of a specific grade cutoff an opportunity to achieve a higher grade. No other extra credit opportunities will be offered in the course.

Assessment	**Weight**	**Date or information**
Exam I	20%	
Exam II	20%	
Exam III	20%	
Exam IV	20%	April 28; per university final exam schedule
In class clickers	5%	Used during every lecture session with each day weighted equally; drop lowest 10 scores at end of semester
Online homework	15%	Weekly assignments; drop lowest 3 scores at end of semester

Exams

Exams will contain a mixture of multiple choice, true/false, calculation and free response questions at the instructor's discretion. Each exam contributes to your final course score based on the percentage indicated above. Exam answer sheets will be provided for all students. Midterm exams will be held in the same room and class time as lectures.

To ensure fairness, we have developed a set of rules. You will enter the room through the specified door(s) and will be assigned to a seat by the instructor or test proctor. Once you are in the room, refrain from talking to your classmates. You must not open the exam until instructed to do so. You will get warnings approximately 15 min and 5 min prior to the end of the exam. Filling in any part of the exam after time has been called is considered cheating and will be dealt with accordingly! When

finished, you should put all portions of the exam into the appropriate boxes at the front of the room. You should not talk until you have left the room and/or all of the exams are collected. A copy of the exam with key will be posted when grades are available. Deadlines for reviewing your exam for errors will be given after each exam.

Calculators without Wi-Fi capabilities will be allowed on some exams. Instructors will announce before each exam whether calculators will be allowed or not for each exam. Calculators with Wi-Fi capabilities, cellphones, and other Wi-Fi devices *may not be used* during the exams. To encourage higher order learning, you may bring one handwritten, double-sided 5 in. x 8 in. notecard to the exams with notes or equations you deem important. You will be provided with the proper notecard in the week preceding an exam by the instructor. You must use the notecard provided to write your exam notes. The notes must be hand written (i.e. not typed or photocopied), and you must prepare your own note card. Thus, exams will de-emphasize simple memorization of facts. However, you should realize that your note sheets are limited in size and that there is a tradeoff between the amount of material written on those sheets and your ability to efficiently locate it during exams. A well-organized note sheet is a supplement to a solid understanding of the material rather than a replacement for it.

In class clickers

This course will use the iClicker Cloud app during lecture both to assess your knowledge of some basic course content and to facilitate active learning. The iClicker app should be registered to your MSU email account. If you do not register your clicker before the first midterm exam, you will not receive credit for previous clicker questions. *There are no make ups for points associated with clickers, for any reason including failed connection by the iClicker Cloud app.* You must attend class and use your iClicker to receive points. Having a friend use your iClicker app/device or participating in clicker questions while not in the classroom is a breach of academic integrity and will be treated as such. Through the semester, there may be unannounced attendance checks to verify in-person attendance and participation via clickers.

During a typical lecture you will have one or more opportunities to answer questions using the clicker. You will receive ½ of a point for sending in any answer and an additional ½ of a point for sending in the correct answer. Some questions are designed to generate discussion and may not have a single correct answer. In this case, you will receive one point for any answer. Each day of clicker points counts the same in your final grade, regardless of the number of questions in that day. At the end of the semester your lowest ten days will be dropped from your grade. Because of this, you can miss class occasionally for emergencies, illness, religious days, or other commitments without seriously impacting your clicker scores. These drops also cover technological problems, like poor connection and app or battery failure. Clicker points for the entire semester are worth 5% of your final grade. It is your responsibility to understand the feedback lights on your clicker or app and verify that your answers are received. If you need to re-register your clicker app or there are problems with your clicker grade in D2L, please notify the TA immediately.

Online homework

Homework for BMB 462 is delivered through Achieve. Information about how to register for this site and find the correct course will be delivered during the first week of class. Make sure to follow registration instructions closely. These homework assignments cover some of the key concepts you need to know but are not designed to be exhaustive.

The homework problems over the course of the entire semester are worth a total of 15% of your final grade. Weekly homework assignments will typically be due on Monday evenings. Due dates may

vary during exam weeks, holidays or academic breaks. Please check Achieve regularly to confirm assignment deadlines. At the end of the semester, your three lowest homework scores will be dropped. Your overall homework grade will be based on the average percentage correct from the remaining assignments. Because of this policy, no deadline extensions or make up opportunities for homework will be offered for any reason, including illness, technical issues or personal commitments.

You are encouraged to work together on homework problems and help each other learn how to solve these problems but you must log on and solve your own homework problems to receive credit. Posting or sharing of homework answers, at any website, is not allowed, is a breach of academic integrity, and will be treated as such.

There may also be *optional* homework assignments that will neither be collected nor graded, but completing them will help you prepare for the exams. There are also questions in the textbook at the end of each chapter, and you should incorporate these questions into your studies. The answers to these questions are provided in the back of the book. Working in groups on all of the optional problem sets is encouraged as a highly valuable study strategy.

Make-up Policy

There will be no makeup or adjustments to clicker scores or online homework for days you miss class or deadlines, except in the case of an unexpected and extended illness. There will be no makeup or adjustments to clicker scores or online homework for any technological problem that is not system wide. Each of the assignments (e.g. clickers & homework) has several low scores dropped at the end of the semester to address occasional student absences (for any reason, including occasional illness). Students do not need to provide documentation in order to receive these dropped scores. In the case of an extended (>7 day) illness, including absences due to COVID-19 or required isolation, students must notify the instructor before or during the absence and must be able to supply relevant documentation as requested by the instructor. When these extended absences have been verified, instructors will suggest possible accommodations for these cases. With the exception of extended technical problems originating in the Macmillan Achieve system, there are no extensions on homework deadlines. For observances of religious holidays, certain adjustments can be made to move a scheduled exam date, or exemptions for in-class clicker points and, occasionally, homework assignments. <u>You must notify an instructor of conflicting religious observances for the semester during the first two weeks of the semester</u> and meet to discuss what exemptions may be possible in a given case.

Exam absence

Scheduled exam dates are provided in the course schedule. If you will miss an exam due to travel to/from an academic or professionally-related event, an MSU sponsored event or religious observance <u>which can be anticipated in advance you must contact your instructor at least one week prior to the exam date to determine if you are eligible for alternate exam arrangements</u>.

If you unexpectedly miss an exam due to extenuating and unforeseen circumstances, such as significant illness (e.g. COVID-19) or death of a loved one, you must contact your instructor within 24 hours of the missed exam.

In order to be considered for make up exam arrangements, it is your responsibility to provide adequate documentation as requested by the instructor. This may include medical documentation of medical testing results and/or medical visits. You may or may not be eligible for a make up exam based solely on the discretion of the instructor(s). In some cases a point penalty may be assessed to your make

up exam score for absences without sufficient documentation, absences without sufficient notice or a delay in taking the make up exam beyond the original date suggested by the instructor. If the instructor determines that you are not eligible for alternate exam arrangements and you do not/did not take the exam, you will earn a 0 on the exam. Multiple missed exams in a semester without proper documentation and/or arranged planning will result in increased point penalties, including being assigned a score of 0 on a missed exam.

For grief absences students should complete: https://reg.msu.edu/StuForms/Stuinfo/GriefAbsenceForm.aspx to notify the Associate Dean or designee of their college. The associate dean or designee will work with the student to determine the length of the absence and will notify faculty of the absence period.

Make-up exams are administered at the instructor's convenience, typically within 48 hours of the original exam or as soon as medically allowed and may be scheduled without consulting students. Make-up exams typically are somewhat similar to classroom exams, although make up exams may consist of more free response, essay and calculation questions or vary point distribution between question types. Instructors retain the right to offer completely multiple choice question or completely essay question makeup exams.

Grading Criteria

This grading scale shows the percentage you must earn at the end of BMB462 to guarantee a particular grade. We have used this scale in previous semesters with good success. If there is a significant disruption or change to the course due to an unforeseen disruption in the semester, the instructors may revisit or adjust the scale. This will be done on a class-wide basis, not for individual students. Your overall course grade percent will be rounded to the nearest tenth. Grades for graduate students will be determined from the undergraduate distribution.

Grade	Percentage
4.0	≥ 87.0
3.5	≥ 77.0
3.0	≥ 69.0
2.5	≥ 60.0
2.0	≥ 52.0
1.5	≥ 45.0
1.0	≥ 40.0
0.0	< 39.9

Honors option

Students may elect to take BMB462 with an H-option provided they obtain a grade of 3.0 or higher in the course. The honors option consists of finding research articles and writing a term paper that address an unsolved biochemical question related to a topic covered in the course. Students interested in the honors option should check D2L during the first week of class for more information and deadlines.

Attendance policy

This course follows the General University Attendance Policy. If you feel sick, have symptoms of illness, or have a confirmed case of a communicable disease (e.g. COVID-19), *please stay home and isolate*. Attendance itself is not a required component of the course, although students that attend class regularly perform better in the course and students are able to earn in-class clicker points on every non-exam day. There may be unannounced attendance checks to verify clicker participation. If you miss a class, it is expected that students learn the material covered in class that day on their own. See the Make-Up Policy section for information about missing graded assessments and class days missed due to illness.

Course Management Software

We will use D2L to post lecture handouts, lecture recordings, grades, and other general course information. We will use the news feature and the e-mail feature in D2L to provide information about the course. It is expected that students are regularly checking D2L for updates about the course.

Achieve will be used for online homework assignments. There are help resources within this system to help you learn how to use and navigate the assignments. More information about how to register for the system will be delivered during the first week of class.

Resources

This course extensively uses Desire2Learn (D2L) for the posting of lecture material. Students are expected to check these sites regularly for newly posted material. As members of a learning community, students are expected to respect the intellectual property of course instructors. All course materials presented to students are the copyrighted property of the course instructor and/or textbook publisher. As such you may not post the recordings or other course materials online or sell or distribute them to anyone not enrolled in the class without the advance written permission of the course instructor and, if applicable, any students whose voice or image is included in the recordings. Any student violating this restriction may face academic disciplinary sanctions.

Lecture Learning Materials

Learning materials for a given day in the course will be posted on D2L in advance of each day. These learning resources are designed to aid your study of the material, note taking during lecture and reading the text. They are not a substitute for reading the textbook. It is highly recommended that you bring these materials to class and read the assigned reading in the text prior to lecture.

Course Recordings

Audio-video recordings of lectures may be posted when available. However, **BMB 462 is not an online course, and these recordings are not a substitute for attending class** or taking notes. Recordings may be incomplete, of poor quality, or entirely unavailable due to technical issues or instructor discretion. Additionally, recordings may begin only after announcements (e.g., exam details) have been made.

Previous Exams

Exams from a few previous semesters will be posted on D2L. Please note that some of these exams may be from semesters when exam policies or course schedule differed from the current semester. The exam keys will be posted no later than three days prior to each exam date.

Instructor review sessions

There will be scheduled exam review sessions led by a course instructor before each scheduled exam. These review sessions take the form of "question and answer" sessions, where students should come prepared to ask questions about course material. The exact dates, times and locations of these review sessions will be announced before each exam.

Extra course help

Students are strongly encouraged to use the optional TA-led review sessions, instructor-led exam review sessions and visit the regularly scheduled office hours for help in the course. For students desiring

additional help, potential course tutors can be found at:
https://bmb.natsci.msu.edu/undergraduate/tutoring.aspx

Accommodations

Michigan State University is committed to providing access and inclusion in all programs, services and activities. Disabled persons should contact the Resource Center for Persons with Disabilities at 517-884-RCPD or by visiting RCPD's website to request accommodations. RCPD analyzes disability related barriers the student experiences as well as course objectives and design when making determinations. Additional communication between the student, instructor, and RCPD specialist may be necessary to ensure an accessible classroom experience. Please send your Accommodation Letter to the course coordinator as soon as possible so we can ensure proper facilitation of accommodation. Letters for this class should be submitted by email during the first week of class or within one week of receiving an accommodation letter. Accommodations are not required to be provided prior to course faculty receiving the letter.

Academic Honesty

The Spartan Code of Honor states, "As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do." In addition, Article 2.III.B.2 of the Student Rights and Responsibilities (SRR) states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." This course adheres to and strictly enforces the policies on academic honesty as specified in General Student Regulations 1.0: Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. Students found cheating on an exam will receive a zero for that exam and an academic misconduct report will be filed with the university. Course faculty may decide to impose additional penalties (e.g. zero in the course) or conditions (e.g. assigned seat) based on the severity or situational context of the misconduct on an exam.

Therefore, unless authorized by your instructor, you are expected to complete all course assignments, with the exception of homework and in-class clicker questions, without assistance from any source. Students who violate MSU academic integrity rules may receive a penalty grade, including a failing grade on the assignment or in the course. In extremely rare cases, faculty may consider a make up assignment to replace (in part or in whole) the original assignment on which cheating was discovered. *Using multiple clicker apps/devices to send in answers for classmates who are not present or using the clicker app while not in-person attendance is considered academic dishonesty.*

SPLS

Michigan State University takes seriously the opinion of students in the evaluation of the effectiveness of instruction and has implemented the SPLS (Student Perception of Learning Survey) process to gather student feedback. This course utilizes the SPLS system, and you will receive an e-mail sometime near the end of semester reminding you fill out the survey at your convenience. You have the option on the online SPLS form to decline to participate in the evaluation of the course.

Possible changes to course during semester

Instructors may adjust the order or coverage of topics due to time constraints, with updates communicated via D2L and/or email. In the event of major disruptions, course policies, structure, or schedule may change in accordance with university guidelines. A revised syllabus and/or schedule will be provided, and instructors will promptly communicate changes and be available to answer questions.

Date	Lec. #	Topic	Reading Pages	Instructor
12-Jan	1	Course Introduction and Fatty Acids	341-346	Wilkins
14-Jan	2	Lipid Structures and Properties	346-356	Wilkins
16-Jan	3	Lipid Catabolism	601-621	Wilkins
19-Jan		MLK Jr. Day - University Closed		
21-Jan	4	Lipid Catabolism	601-621	Wilkins
23-Jan	5	Fatty Acid Anabolism	744-760	Wilkins
26-Jan	6	Fatty Acid Anabolism	744-760	Wilkins
28-Jan	7	Membrane Structure and Properties	367-385	Wilkins
30-Jan	8	Membrane Structure and Properties	367-385	Wilkins
2-Feb	9	Membrane Transport	385-403	Wilkins
4-Feb	10	Glycerolipid and Sphingolipid Anabolism	760-770	Haudek
		Optional Q and A by Instructor TBA		
6-Feb		**Exam I:** Lectures 1-9		
9-Feb	11	Cholesterol Metabolism	771-788	Haudek
11-Feb	12	Amino Acid Metabolism	626-644	Haudek
13-Feb	13	Amino Acid Metabolism	795-805; 817-822	Haudek
16-Feb	14	Signaling	408-428; 433-446	Haudek
18-Feb	15	Signaling	408-428; 433-446	Haudek
20-Feb	16	Metabolic Integration	842-867	Haudek
23-Feb	17	Metabolic Integration	842-867	Haudek
25-Feb	18	Nucleotide Chemistry and Metabolism	263-269, 294-296, 823-838	Haudek
		Optional Q and A by Instructor TBA		
27-Feb		**Exam II:** Lectures 10-18		
3/2 to 3/6		Spring Break		
9-Mar	19	DNA Structure	269-275, 885-898	Quinn
11-Mar	20	DNA and Chromosome Structure	269-275, 885-898, 898-910	Quinn
13-Mar	21	Chromosome Structure	898-910	Quinn
16-Mar	22	DNA Replication	914-930	Quinn
18-Mar	23	DNA Replication	914-930	Quinn
20-Mar	24	DNA Replication	914-930, 988-995	Quinn
23-Mar	25	DNA Repair & Recombination	930-955	Quinn
25-Mar	26	DNA Repair & Recombination	930-955	Quinn
27-Mar	27	DNA Techniques	283-293	Quinn
		Optional Q and A by Instructor TBA		
30-Mar		**Exam III:** Lectures 19-27		
1-Apr	28	RNA Structure & Function	31-33; 273-278; 883-884	Vo
3-Apr	29	Transcription	960-967; 1060-1061	Vo
6-Apr	30	Transcription	967-972	Vo
8-Apr	31	Transcription	967-972	Vo
10-Apr	32	RNA Processing	972-976; 995-1001	Vo
13-Apr	33	RNA Processing	977-988	Vo
15-Apr	34	Translation	1005-1012; 1015-1024	Vo
17-Apr	35	Translation	1028-1041	Vo
20-Apr	36	Protein Targeting and Degradation	1041-1050	Vo
22-Apr	37	Regulation of Gene Expression	1054-1065	Vo
24-Apr	38	Regulation of Gene Expression	1065-1075	Vo
		Optional Q and A by Instructor TBA		
4/28/2026		**Exam IV:** Lectures 28-38 **(12:45 - 1 :45 pm) E100 Vet Med**		