

## Course syllabus and information

### Course information

Biochemistry and Molecular Biology 462 (BMB462) - Advanced Biochemistry II

9:10-10:00 a.m.; MWF

Spring semester 2021

Online synchronous sessions via Zoom

Course site via D2L (d2l.msu.edu)

### Contact Information

Instructor Information	Lectures	Office and Office Hours
<b>Dr. Kevin Haudek</b> Course coordinator Phone: 353-4377 <a href="mailto:haudekke@msu.edu">haudekke@msu.edu</a> (must include BMB462 in subject line)	9-15	219 Biochemistry Office hours by Zoom (check D2L for link): Mondays 3-4 p.m. Eastern Tuesdays 9-10 a.m. Eastern Or by email appointment
Dr. Lee Kroos <a href="mailto:kroos@msu.edu">kroos@msu.edu</a> (must include BMB462 in subject line)	25-36	422A Biochemistry Office hours by Zoom (check D2L for link) by email appointment
Dr. Robert Quinn <a href="mailto:quinnrob@msu.edu">quinnrob@msu.edu</a> (must include BMB462 in subject line)	16-24	116B Biochemistry Office hours by Zoom (check D2L for link) by email appointment
Dr. Carol Wilkins <a href="mailto:mindockc@msu.edu">mindockc@msu.edu</a> (must include "BMB462" in subject line)	1-8	502B Biochemistry Office hours by Zoom (check D2L for link)
Elise Rivett <a href="mailto:rivettel@msu.edu">rivettel@msu.edu</a> (must include "BMB462" in subject line)	Teaching Assistant	Reviews via Zoom: TBD (check D2L for link)

### Course Materials

#### Required

- Nelson, D.L. and Cox, M.M. Lehninger Principles of Biochemistry, 7<sup>th</sup> ed. (2017). W.H. Freeman, New York. 1172 pages. *Paper or electronic versions are acceptable.*
- Access to Sapling Learning (www.saplinglearning.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., 1<sup>st</sup> ed (2018) Cognella, Inc. 167 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 structure 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 online course which requires attendance of synchronous sessions. Important course content will be delivered at these sessions, as well as points earned for student participation. Portions of exams will be given during normally scheduled class times. Although class sessions will be recorded, this is not intended to be an asynchronous course. Asynchronous course activities include completing weekly homework assignments, completing weekly quizzes, personal studying and completing a take home portion of the exam.

## **Assessments**

Your grade in BMB 462 will be determined by your performance on the following assessments and weighted by the percentage indicated:

<b>Assessment</b>	<b>Weight</b>	<b>Date or information</b>
Exam I	16%	Feb 6-8
Exam II	15%	Feb 26-28
Exam III	17%	March 26-28
Exam IV	20%	April 25 & 26 and University final exam schedule: April 27
In class clickers	5%	Used during every synchronous lecture session with each day weighted equally; drop lowest 6 scores at end of semester
Weekly Quizzes	17%	About twelve over semester; drop lowest 2 scores at end of semester
Online homework	10%	Weekly assignments; drop lowest 2 scores at end of semester

Additional information about each of these assessments is given below. A total of 0.5% bonus can be earned for completion of optional online quizzes and course surveys, usually offered at the end of the course. The purpose of the extra credit is to give you the opportunity to ensure that if you are within 0.5% of a cutoff for a particular grade for the course that you will earn the higher grade. Please check D2L for announcements about these opportunities. No other bonus opportunity or extra credit is offered in this course.

### *Exams*

Exams will consist of two parts. One part will be taken online via D2L and consist of a mixture of multiple choice, true/false, matching, etc. This part of the exam will be given during a normal class session schedule at the course time. The other part of the exam will be a “take home” exam that can be

worked on off-line over a few days. This part of the exam will contain calculation, drawing, free response, etc. questions. Both parts will contribute to your exam total. Check the university's final exam schedule for details on the final exam day and time.

Exams are expected to be individual efforts. No sharing of answers or questions is allowed; nor is consulting with other students, unless explicitly allowed.

Scientific calculators *will be allowed* on all exams. You can use either a stand alone calculator and/or an online calculator. To encourage higher order learning, you are encouraged to produce a one page summary of important points from each unit for use on the exam. However, you should realize that your note sheet is 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 i-clickers via iClicker Cloud during lecture both to assess your knowledge of some basic course content and to facilitate active learning. Clickers should be registered through D2L during the first week of class; instructions are posted there. If you do not register your clicker before the Exam I, you will not receive credit for previous clicker questions. *There are no make ups for points associated with clickers, for any reason.*

During a typical lecture you will have one or more opportunities to answer questions using the clicker. You will receive one point for participating for each clicker question. 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 six days will be dropped from your grade. Because of this, you can miss class occasionally for emergencies, religious days, or other commitments without seriously impacting your clicker scores. These drops also cover technological problems, like poor connection and app failure.

Clicker points for the entire semester are worth 5% of your final grade. It is your responsibility to understand your device and verify that your answers are received. You must attend class and use your clicker to receive points: having a friend use your clicker is a breach of academic integrity and will be treated as such. If you need to replace or re-register your clicker or there are problems with your clicker grade in D2L, please notify the TA immediately.

### *Weekly Quizzes*

There will be a weekly quiz given through D2L each week there is not an exam. These quizzes will cover material from the current course week and help to gauge your mastery of the material for the exam. Each quiz will contain approximately 10 questions, of multiple choice, T/F, or matching formats, for example. Quizzes will be opened only for a little time each weekend and will have a time limit. Quizzes are expected to be an individual effort; consulting with other students in any form is prohibited and a breach of academic honesty. Correct response given during quizzes are awarded a point; incorrect answers are awarded zero points. Your two lowest scores for quizzes will be dropped at the end of the semester. The remaining quizzes will be worth 17% of your final grade.

Quizzes are expected to be individual efforts. No sharing of answers or questions is allowed; nor is consulting with other students.

### *Online homework*

Homework for BMB 462 is delivered through SaplingLearning ([www.saplinglearning.com](http://www.saplinglearning.com)). 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 covers 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 10% of your final grade. There will be a homework assignment due each week. Most of the time, the due date will be on Monday night with the exception of exam weeks, when the due date will be adjusted. It is your responsibility to check SaplingLearning regularly to find when each assignment is due. At the end of the semester, your lowest two homework scores will be dropped. Your average percentage correct on each of the remaining assignments unit will be used to determine what percentage you earn for your overall homework grade. Because we are dropping some of your homework scores, there will be no deadline extensions or make-up points offered for any reason. This includes, but is not limited to, illness, technical/computer issues, vacations, etc.

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 make-up or adjustments to clicker scores or online homework for days you miss class or deadlines, except in the case of an unexpected, severe and extended illness (> 7 days). There will be no make-up 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 a few low scores dropped at the end of the semester to address occasional student absences (for any reason, including 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, 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.

### *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 which can be anticipated in advance you must contact your instructor more than one week prior to the exam to determine if you are eligible for alternate exam arrangements.

If you unexpectedly miss an exam due to extenuating and unforeseen circumstances, such as significant illness 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. 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. 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.

For grief absences students must notify the Associate Dean or designee of their college of the need for a grief absence and must provide appropriate verification. 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. The policy on grief absence is described here: <https://reg.msu.edu/ROInfo/Notices/GriefAbsence.aspx>.

Make-up exams are administered at the instructor's convenience, typically within 48 hours of the original exam and may be scheduled without consulting students. Make-up exams typically consist of essay and calculation questions but instructors retain the right to offer multiple choice makeup exams or exams of mixed formats.

## Grading Criteria

This grading scale shows the percentage you must earn at the end of BMB462 to guarantee a particular grade. Your overall course grade percent will be rounded to the nearest tenth. Grades for graduate students will be determined from the undergraduate distribution.

### *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 (see <https://ombud.msu.edu/classroom-policies/>). 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.

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

## 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.

SaplingLearning 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. As such you may not post the recordings or other course materials online 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 Notes*

Lecture notes will be posted on D2L in advance of the lectures. These notes contain most figures discussed during lecture and are designed to aid your note taking during lecture and while reading the text. They are not a substitute for reading the textbook. It is highly recommended that you print these lecture notes and read the assigned reading in the text prior to lecture, taking notes while you read. Then bring your notes to lectures to help fill in areas that were confusing to you when you first read them in the text.

### *Course Recordings*

When possible, audio-video recordings of the lectures will be provided on D2L. The purpose of these recordings is to allow review of lectures as you study. **BMB 462 is a synchronous online course**, which expects regular attendance. Any recordings are not a substitute for attending lectures and taking notes. Some lectures may not be available or may be of poor quality due to technical difficulties. In such cases, there may be no recording or a truncated recording posted and students should refer to the assigned textbook pages.

### *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/> .

## Accommodations

Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at [rcpd.msu.edu](http://rcpd.msu.edu). Once your eligibility for an accommodation has been determined, you will be issued a Verified Individual Services Accommodation ("VISA") form. Please present this form to Prof. Haudek at the start of the term and/or two weeks prior to the accommodation date. Requests received after this date may not be honored.

## 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. (See [Spartan Life: Student Handbook and Resource Guide](#) and/or the MSU Web site: [www.msu.edu](http://www.msu.edu).)

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. *Using multiple clickers to send in answers for classmates who are not present is considered academic dishonesty.*

## SIRS

Michigan State University takes seriously the opinion of students in the evaluation of the effectiveness of instruction, and has implemented the SIRS (Student Instructional Rating System) process to gather student feedback. This course utilizes the "online SIRS" system, and you will receive an e-mail sometime during the last two weeks of class asking you to fill out the SIRS at your convenience. As a reminder to be sure to fill out the SIRS evaluation form, the final grade for this course will not be accessible on STUINFO during the week following the submission of grades for this course unless the SIRS online form has been filled out. You have the option on the online SIRS form to decline to participate in the evaluation of the course.

Date	Lec. #	Topic	Lehninger Pages	Instructor
11-Jan		Read, Review, Reflect		
13-Jan		Read, Review, Reflect		
15-Jan		Read, Review, Reflect		
18-Jan		<b>MLK Jr Day - No classes</b>		
20-Jan	1	Lipid Structures and Properties	361-374	Wilkins
22-Jan	2	Lipid Structures and Properties	374-376; 381-384	Wilkins
25-Jan	3	Membrane Structure and Properties	387-405	Wilkins
27-Jan	4	Membrane Structure and Properties	387-405	Wilkins
29-Jan	5	Membrane Transport	405-431	Wilkins
1-Feb	6	Fatty acid Oxidation	649-668	Wilkins
3-Feb	7	Ketone body synthesis	668-670	Wilkins
5-Feb	8	Fatty Acid Synthesis	811-826	Wilkins
6-Feb&7-Feb		<b>Take Home Exam I</b>		
8-Feb		<b>Online Exam I: Lectures 1-8</b>		
10-Feb	9	Glycerolipid and Sphingolipid Anabolism	826-836	Haudek
12-Feb	10	Cholesterol Metabolism	837-854	Haudek
15-Feb	11	Amino Acid Metabolism	675-705	Haudek
17-Feb	12	Amino Acid Metabolism	859-872 ; 880-887	Haudek
19-Feb	13	Signaling	437-466; 467-475	Haudek
22-Feb	14	Signaling & Metabolic Integration	467-475; 907-939	Haudek
24-Feb	15	Metabolic Integration	907-939	Haudek
26-Feb		<b>Online Exam II Lectures: 9-15</b>		
27-Feb&28-Feb		<b>Take Home Exam II</b>		
1-Mar	16	Nucleotide Chemistry and Metabolism	279-285; 310-313; 888-902	Quinn
3-Mar		<b>Break day; No Wed classes</b>		
5-Mar	17	Nucleotide Chemistry and Metabolism	279-285; 310-313; 888-902	Quinn
8-Mar	18	DNA Structure	29-39; 285-299; 955-956	Quinn
10-Mar	19	Chromosome Structure	957-981	Quinn
12-Mar	20	DNA Replication	987-1005	Quinn
15-Mar	21	DNA Replication	987-1005	Quinn
17-Mar	22	DNA Replication	987-1005; 1063-1074	Quinn
19-Mar	23	DNA Repair & Recombination	1005-1016; 297-300	Quinn
22-Mar	24	DNA Repair & Recombination	1016-1031	Quinn
24-Mar	25	RNA Structure & Function	34-35; 290-295; 955-956	Kroos
26-Mar		<b>Online Exam III: Lectures 16-24</b>		
27-Mar&28-Mar		<b>Take home Exam III</b>		
29-Mar	26	Transcription	1035-1042	Kroos
31-Mar	27	Transcription	1042-1047	Kroos
2-Apr	28	RNA Processing	1047-1063; 1070-1074	Kroos
5-Apr	29	RNA Processing	1047-1063	Kroos
7-Apr	30	Translation	1077-1085	Kroos
9-Apr	31	Translation	1088-1101	Kroos
12-Apr	32	Translation	1101-1113	Kroos
14-Apr	33	Protein Targeting and Degradation	1114-1123	Kroos
16-Apr	34	Regulation of Gene Expression	1127-1138	Kroos
19-Apr	35	Regulation of Gene Expression	1138-1147	Kroos
21-Apr	36	Regulation of Gene Expression	1147-1160	Kroos
23-Apr		<b>Break day; No Fri classes</b>		
25-Apr&26-Apr		<b>Take home Exam IV</b>		
27-Apr		<b>Online Exam IV: Lectures 25-36 (12:45- 2:45 p.m.)</b>		