COURSE INFORMATION

- **Course number and title:** BCHM 60501-Macromolecules
- **CRN:** 15564
- **Meeting times:**
  
  Lecture: Monday/Wednesday/Friday 10:30-11:20 AM, LILY G420  
  
  **Course Credit hours:** 3.00
- **Course Brightspace page:** [https://purdue.brightspace.com/d2l/home/49565](https://purdue.brightspace.com/d2l/home/49565)

INSTRUCTOR:

- **Professor Frederick Gimble**  
  office:  BCHM 10  
  TEL:  4-1653  
  e-mail:  fgimble@purdue.edu

  Office hours: By appointment via WebEx or Zoom

LECTURE TA:

- **Mr. Trevor Boram**  
  office:  BCHM 5  
  TEL:  4-9284 (laboratory)  
  e-mail:  tboram@purdue.edu

  Office hours: By appointment via WebEx or Zoom

COURSE DESCRIPTION

A typical BCHM 60501 class includes students from a variety of departments, graduate programs, and scientific backgrounds. In this course we will explore the properties of proteins and nucleic acids from the perspective of the basic principles that underlie macromolecular structure. In the post-genomic age, we can use sequence analyses to predict protein and nucleic acid structure and to give clues as to their functions. Students will learn the basic concepts behind these techniques. Students will become familiar with methods used to determine the three-dimensional structures of macromolecules, and learn how to critically evaluate the accuracy of such structures. We will explore special topics in macromolecular science, including membrane proteins, CRISPR Cas genome modification and ribozymes, from structural and mechanistic perspectives.

DEPARTMENTAL LEARNING OUTCOMES ADDRESSED BY THIS COURSE

- BCHM 60501 students will be able to describe the chemical structures of the building blocks of biological macromolecules, including amino acids and nucleic
acids.

• BCHM 60501 students will demonstrate knowledge of the higher order structures of proteins and nucleic acids and be able to define the molecular forces that stabilize them.

• BCHM 60501 students will acquire information literacy: the ability to locate, evaluate and utilize information in the disciplines of biochemistry and molecular biology that is required for research, data analysis, and communication.

TEXTEBOOKS

Proteins: Structures and Molecular Properties (Thomas E. Creighton) no ebook
Biophysical Chemistry of Nucleic Acids and Proteins (Thomas E. Creighton) Online
Physical and Chemical Basis of Molecular Biology (Thomas E. Creighton) Online
Protein Structure and Function, Primers in Biology (Gregory A. Petsko and Dagmar Ringe
Introduction to Protein Structure (Carl Branden and John Tooze)
Structure and Mechanism in Protein Science: A guide to Enzyme Catalysis and
Protein Folding (Alan Fersht).
Nucleic Acids: Structures, Properties and Functions (Bloomfield, Crothers,
Tinoco)

Some of the course material is taken from these texts but it is not required to purchase them. The Purdue libraries cannot make print reference materials available, but some might be checked out. Two of the texts (shown in bold) are available online through the Purdue Library website.

BRIGHTSPACE

The syllabus for the course, lecture notes, and grading keys for problem sets and exams will be available via the Purdue University Brightspace site: https://mycourses.purdue.edu/

ASSESSMENT

Exams are not cumulative.
The grading for this course will be as follows:

Problem sets 180 points
Class Presentations/written summary 80 points
Exam 1 180 points
Exam 2 180 points
Final Exam 180 points

GRADING SCALE

The cutoff values for letter grades are as follows:

720 points A
640 points B
560 points C
480 points D
479 points and below F

Missing an exam will result in a grade of 0 being recorded. Any request to be excused from an exam should include documentation (request from academic advisor, etc.) explaining why the exam was or will be missed. The decision to allow a makeup exam is at the discretion of the instructor. Assignments that are received 1-24 hours after the
time due will incur a 40% deduction and no points will be given after 24 hours.

If you have any disagreements with the grading of the exams, please consult the grading key first and then submit your paper to the lecture TA or instructor along with a written description of your concerns.

Requests for re-grades must be submitted no later than the end of the second class period after the graded test or assignment has been returned.

EXTRA CREDIT

There will be no opportunity for extra credit unless discussed explicitly during class.

OBTAINING EXTRA HELP

Dr. Gimble and the course teaching assistant will be available to answer your questions by e-mail or by arranging a virtual meeting.

CLASS ATTENDANCE

Attendance Policy during COVID-19: Students should stay home and contact the Protect Purdue Health Center (496-INFO) if they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus. In the current context of COVID-19, in-person attendance will not be a factor in the final grades, but the student still needs to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment or the ability to take an exam. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email, through Brightspace, or by phone. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor’s department because of circumstances beyond the student’s control, and in cases of bereavement, quarantine, or isolation, the student or the student’s representative should contact the Office of the Dean of Students via email or phone at 765-494-1747. Our course Brightspace includes a link on Attendance and Grief Absence policies under the University Policies menu.

ACADEMIC GUIDANCE IN THE EVENT A STUDENT IS QUARANTINED/ISOLATED

If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email or Brightspace. We will make arrangements based on your particular situation. The Office of the Dean of Students (odos@purdue.edu) is also available to support you should this situation occur.
PROTECT PURDUE PLAN

The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, wearing a mask in classrooms and campus buildings, at all times (e.g., no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining proper social distancing with peers and instructors (including when entering/ exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights.

ACADEMIC MISCONDUCT

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue’s policies with regard to academic misconduct can be found at http://www.purdue.edu/studentregulations/student_conduct/regulations.html

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of
Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

“Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own
Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

Purdue's Honor Pledge was developed by students to advance a supportive environment that promotes academic integrity and excellence. It is intended that this pledge inspires Boilermakers of all generations to stay "on track" to themselves and their University. “As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue.”

NOTICE OF COPYRIGHT PROTECTION OF COURSE MATERIALS

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally.

Notes taken in class are, however, generally considered to be “derivative works” of the instructor’s presentations and materials, and they are thus subject to the instructor’s copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose.

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor’s control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

ON-LINE COURSE EVALUATIONS

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. On Monday of the fifteenth week of classes, you will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.
NON-DISCRIMINATION POLICY

Purdue University’s non-discrimination policy will be upheld in this classroom. Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

In this course, each voice in the classroom has something of value to contribute. Please take care to respect the different experiences, beliefs and values expressed by students and staff involved in this course. We support Purdue's commitment to diversity, and welcome individuals of all ages, backgrounds, citizenships, disability, sex, education, ethnicities, family statuses, genders, gender identities, geographical locations, languages, military experience, political views, races, religions, sexual orientations, socioeconomic statuses, and work experiences.

For more information, see http://www.purdue.edu/purdue/ea_eou_statement.html.

MENTAL HEALTH

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765) 494-6995 or http://www.purdue.edu/caps/ after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

ACCESSIBILITY AND ACCOMODATIONS

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.
DISCLAIMER

This syllabus is subject to change.
<table>
<thead>
<tr>
<th>Lecture/Date</th>
<th>Instructor</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. August 24</td>
<td>Gimble</td>
<td>Introduction to BCHM60501/Elements of protein structure, Pymol</td>
</tr>
<tr>
<td>2. August 26</td>
<td>Gimble</td>
<td>Elements of protein structure: Introduction, Primary, Secondary structure</td>
</tr>
<tr>
<td>3. August 28</td>
<td>Gimble</td>
<td>Elements of protein structure: Tertiary structure</td>
</tr>
<tr>
<td>4. August 31</td>
<td>Gimble</td>
<td>Elements of protein structure: Quaternary structure</td>
</tr>
<tr>
<td>5. September 2</td>
<td>Gimble</td>
<td>Elements of protein structure: protein sequence analysis structure prediction</td>
</tr>
<tr>
<td>6. September 4</td>
<td>Gimble</td>
<td>Elements of protein structure: Protein stability</td>
</tr>
<tr>
<td>7. September 7</td>
<td>Gimble</td>
<td>Elements of protein structure: Protein folding and stability</td>
</tr>
<tr>
<td>8. September 9</td>
<td>Gimble</td>
<td>Elements of protein structure: Protein Folding <strong>Student Presentations</strong></td>
</tr>
<tr>
<td>9. September 11</td>
<td>Gimble</td>
<td>Amyloids</td>
</tr>
<tr>
<td>10. September 14</td>
<td>Gimble</td>
<td>Elements of protein structure-Determining structure</td>
</tr>
<tr>
<td>11. September 16</td>
<td>Post</td>
<td>Elements of protein structure-Determining structure</td>
</tr>
<tr>
<td>12. September 18</td>
<td>Gimble</td>
<td>Elements of protein structure-Determining structure</td>
</tr>
<tr>
<td>13. September 21</td>
<td>Gimble</td>
<td>Membrane proteins <strong>PS #2 due</strong></td>
</tr>
<tr>
<td>14. September 23</td>
<td>TBA</td>
<td>Optional Review TBA <strong>Student Presentations</strong></td>
</tr>
<tr>
<td>15. September 25</td>
<td>Hall</td>
<td>Proteomics</td>
</tr>
<tr>
<td>16. September 28</td>
<td>Exam 1</td>
<td>No class <strong>Exam 1: 8:00-10:00 pm LILY 3118</strong></td>
</tr>
<tr>
<td>17. September 30</td>
<td>Hall</td>
<td>Post-translational modifications</td>
</tr>
<tr>
<td>18. October 2</td>
<td>Hall</td>
<td>Proteins and Introduction to proteomics</td>
</tr>
<tr>
<td>19. October 5</td>
<td>Gimble</td>
<td>Binding and physical interaction methods</td>
</tr>
<tr>
<td>20. October 7</td>
<td>Gimble</td>
<td>Synthetic Biology</td>
</tr>
<tr>
<td>21. October 9</td>
<td>Boram</td>
<td>Non-natural amino acids in proteins</td>
</tr>
<tr>
<td>22. October 12</td>
<td>Gimble</td>
<td>Flexdate</td>
</tr>
<tr>
<td>23. October 14</td>
<td>Gimble</td>
<td>Synthetic Biology</td>
</tr>
<tr>
<td>24. October 16</td>
<td>Gimble</td>
<td>Synthetic Biology</td>
</tr>
<tr>
<td>25. October 19</td>
<td>Gimble</td>
<td>Synthetic Biology</td>
</tr>
<tr>
<td>26. October 21</td>
<td>Gimble</td>
<td><strong>Student Presentations PS #3 due</strong></td>
</tr>
<tr>
<td>27. October 23</td>
<td>Gimble</td>
<td>Nucleic acid chemical properties</td>
</tr>
<tr>
<td>28. October 26</td>
<td>Gimble</td>
<td>RNA structure and structure prediction</td>
</tr>
<tr>
<td>29. October 28</td>
<td>Gimble</td>
<td>RNA secondary and tertiary structure</td>
</tr>
<tr>
<td>30. October 30</td>
<td>Gimble</td>
<td>RNA secondary and tertiary structure</td>
</tr>
<tr>
<td>31. November 2</td>
<td>Gimble</td>
<td><strong>Exam 2: 8:00-10:00 pm LILY 3118</strong></td>
</tr>
<tr>
<td>32. November 4</td>
<td>Gimble</td>
<td>Unusual nucleic acid structures</td>
</tr>
<tr>
<td>33. November 6</td>
<td>Gimble</td>
<td>Unusual nucleic acid structures</td>
</tr>
<tr>
<td>34. November 9</td>
<td>Gimble</td>
<td>Protein-nucleic acid interactions</td>
</tr>
<tr>
<td>35. November 11</td>
<td>Gimble</td>
<td>mRNA splicing</td>
</tr>
<tr>
<td>36. November 13</td>
<td>Gimble</td>
<td>RNA silencing</td>
</tr>
<tr>
<td>37. November 16</td>
<td>Gimble</td>
<td>Riboswitches <strong>PS #4 due</strong></td>
</tr>
<tr>
<td>38. November 18</td>
<td>Gimble</td>
<td>Riboswitches</td>
</tr>
<tr>
<td>39. November 20</td>
<td>Gimble</td>
<td>CRISPR-Cas</td>
</tr>
<tr>
<td>40. November 23</td>
<td>Gimble</td>
<td>CRISPR-Cas</td>
</tr>
<tr>
<td><strong>November 25/27</strong></td>
<td><strong>Thanksgiving-No Class</strong></td>
<td></td>
</tr>
<tr>
<td>41. November 30</td>
<td>Gimble</td>
<td>CRISPR-Cas (online)</td>
</tr>
<tr>
<td>42. December 2</td>
<td>Gimble</td>
<td><strong>Student Presentations</strong></td>
</tr>
<tr>
<td>43. December 4</td>
<td>Gimble</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**FINAL EXAMINATION-Date and time to be announced**