

PURDUE UNIVERSITY  
**FORT WAYNE**  
Department of Biology

**Proteins: Structure and Function**

**BIOL 55110**

Fall 2022

Aug 22 - Dec 16, 2022

Credits: 3

ONLINE (Asynchronous)

**Instructor: Dr. Jaiyanth Daniel**

Preferred Pronouns: He/ him/ his

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Office Hours: WebEx; By appointment

[Dr. Daniel's Webpage \(Click here\)](#)

**Course Description**

This course will explore the fascinating world of proteins which are the nanomachines that are indispensable to life because of their catalytic and structural functions. Students will learn the principles governing protein function and get an integrated view of proteins at the molecular, cellular and systemic level. Students will gain understanding of how enzymes work, how proteins make molecules move inside cells and transmit signals. Molecular biological techniques used for studying proteins will also be taught. Case studies that highlight specific proteins in recent peer-reviewed scientific review articles written by experts will be used to reveal insights into relationships between protein structure and function.

**Prerequisites and Required Materials**

- **BIOL 21800 Genetics and Molecular Biology**

**Course Access**

Students should come prepared to class ready to fill in the notes and add important points throughout the lecture. Class participation is expected and will be assessed throughout the semester. This is an upper-level course meant for seniors and graduate students. Therefore, all students are expected to demonstrate/ learn advanced skills in understanding and evaluating information related to molecular biology.

**Course Goals**

1. Introduce students to the basics of protein structure.
2. Teach students about the functional aspects of proteins.
3. Instruct students about protein dynamics.

4. Explain the processes by which proteins move molecules in cells.
5. Educate the learners about signal transduction and proteins.
6. Teach students about molecular machines.
7. Explain the multienzyme complexes in cells.
8. Instruct students about techniques for studying proteins.

## Learning Objectives

When you complete this course, you will be able to:

1. Define a protein and describe the structural aspects of proteins.
2. Outline the dynamics of protein molecules.
3. Explain the mechanisms by which proteins make things move in cells.
4. Describe the roles of proteins in signal transduction processes in cells.
5. Explain how proteins control intracellular trafficking inside cells.
6. Describe techniques used to study proteins.

## Learning Resources & Texts

### Reading Material:

Instructor will provide research review articles for primary reading material for this course.

### Recommended (not required) Textbook:

“**How Proteins Work**” by Mike Williamson; 2012 edition. ISBN 978-0-8153-4446-9

### Course Details:

This is an upper-level course meant for seniors and graduate students. Therefore, all students are expected to demonstrate/ learn advanced skills in understanding and evaluating information related to molecular biology.

## Virtual Office Hours

I will be available (by appointment) through WebEx for discussing any questions you might have regarding the course content in lectures, study guides and assignments. Please email me to fix an appointment.

[Dr. Jaiyanth Daniel's WebEx Meeting Room](https://purdue.webex.com/join/daniel58)  
<https://purdue.webex.com/join/daniel58>

## Course Logistics

**Classroom Policies:** Lecture recordings will be posted on Brightspace by the end of day after each lecture. You will need to check the course web page in Brightspace on each lecture day and utilize the notifications setting in Brightspace to stay up to date.

**Emails:** I encourage the use of email to contact me but please consider email etiquette. Use my email address at the top of this syllabus. Please write course name in email subject line. I will usually reply within 24 hours.

### **Assessments:**

- ❖ **Exams:** The exams will be online on Brightspace and will be administered under proctoring. There will be multiple-choice, short answer questions and an essay question requiring a more detailed answer, all of which will cover the material from lecture and the assigned reading material used in the Study Guides. Any material from lecture and assigned scientific literature could appear on the exams, even if it is not included in your pre-printed notes- what this

means is that the exam material is not restricted to the written lecture notes but will also encompass the verbal lecture that accompanies each set of notes.

❖ **Assignment: Topics, detailed instructions and sign-up sheet will be given in class after Exam-2.**

- A research paper will be selected by the student with the instructor's guidance which will be the basis for critical analysis in the presentation and the term paper. The assignment will involve a formal slide presentation (15 min) by you of a recent research paper that *analyzes your assigned topic*. You will select a research paper published in one of the journals listed under "Assignments". You will need to get the instructor's approval of your selected paper in advance of your presentation. You will also need to submit a 4-6 page written Term Paper using appropriate citations of scientific references on the day of your presentation (Detailed instructions will be provided after Exam-2).
- ❖ **Homework:** There will be four homework tasks- one for each exam module. This will involve students turning in handwritten responses to Study Guide questions in short-answer format using the reading material and lecture slides on the day of exam for each module. **Use figures/ diagrams along with your handwritten responses**, when appropriate/ possible. **DO NOT SUBMIT ELECTRONICALLY WORD-PROCESSED RESPONSES. Submit scanned hard copy: Scan your handwritten homework assignment** (use any free phone app for scanning), proof-read and ensure that your scanned document is properly aligned and formatted for readability on screen **and submit as one PDF document on Brightspace.**
- ❖ **DUE DATE – on the day of each exam.**

**GRADING:**

- Exams (4 exams, 50 points each) : 200 points  
(5 EXTRA-CREDIT POINTS PER EXAM: Adds up to 5% of overall final grade)
  - Assignments  
Oral presentation on assigned topic : 50 points  
Term paper on assigned topic : 50 points
  - Homework (4 Tasks; 25 points each) : 100 points
- Total = 400 points**

**Grading Scale**

**A:** 90-100 %; **B+:** 85-89 %; **B :** 80-84 %; **C+:** 75-79 %; **C :** 70-74 %; **D+:** 65-69 %; **D :** 60-64 %  
**F :** 0-59 %

- **Make-Up Exams:** Exams will not be given before the scheduled exam date. You must make every effort to be in attendance for all exams. Make-up exams may be given at the discretion of the instructor for extreme circumstances and students must notify the instructor prior to the exam via email. **There will be no make-up exam for the final exam. Make-ups must be scheduled within 1 week of the original exam and students must be on time for the scheduled make-up exam, otherwise no credit will be given.** If the university cancels class on the day of an exam the exam will take place on the next regularly scheduled class period.

## Course Evaluation

During the last two weeks of the course, you will be provided with an opportunity to evaluate this course and your instructor. You will receive an invitation to complete an anonymous evaluation from the Department of Biology, Purdue University Fort Wayne. Your participation is an integral part of this course, and your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

## How to Succeed in this Course

### Tools for Success

- Review the lecture recordings posted in the Content section of the course in Brightspace.
- After each lecture, complete the relevant part of the Study Guide *by hand*, reviewing your previous lecture notes and textbook chapter being taught.
- Come to each lecture with your questions from previous lecture/ your reading/ study guide.
- Keep up with lectures by going over each lecture at home and making your own notes.
- Studying only on the night before the exam is unlikely to help you achieve a good grade.

## Course Schedule

### **Tentative Lecture Schedule- Subject to change**

Lecture recordings will be made available on Brightspace at the end of day for each lecture.

#### **MODULE 1**

Protein Structure

Protein Domains

Oligomers

Protein Case Study – I

Protein Case Study – II

REVISION MODULE-1 (Discussion of Practice Quiz & Study Guide)

**EXAM - 1; HOMEWORK-1 DUE Thu, Sep 15**

#### **MODULE 2**

Protein interactions *in vivo*

How enzymes work

Protein flexibility and dynamics

Protein Case Study – III

Protein Case Study – IV

REVISION MODULE-2 (Discussion of Practice Quiz & Study Guide)

**EXAM - 2; HOMEWORK-2 DUE Thu, Oct 13**

#### **MODULE 3**

How proteins make things move

How proteins transmit signals

Protein complexes: Molecular machines

Protein Case Study – V

Protein Case Study – VI

REVISION MODULE-3 (Discussion of Practice Quiz & Study Guide)

**EXAM - 3; HOMEWORK-3 DUE Thu, Nov 3**

#### **MODULE 4**

Multienzyme complexes

Techniques for studying proteins

Protein Case Study – VII

Protein Case Study – VIII

REVISION MODULE-4 (Discussion of Practice Quiz & Study Guide)

**EXAM - 4; HOMEWORK-4 DUE Thu, Dec 1**

#### **ASSIGNMENTS DUE**

**STUDENT PAPER PRESENTATIONS: Thu, Dec 8 & FINALS WEEK**