

Course Name; Number; Semester; Meeting Days, Times, and Place

Molecular and Cellular Physiology
11:067:492 (3 credits) Spring 2026
Monday/Thursday 10:20-11:40 AM
Cook/Douglass Lecture Hall, rm 110

Contact Information

Instructor(s): Meli'sa S. Crawford, Ph.D.
Office Location: 304 Foran Hall
Phone: 848-932-6389 Email: mc3023@scarletmail.rutgers.edu
Office Hours: by appointment only

Course, Website Resources and Materials

- Textbook: *Karp's Cell and Molecular Biology*, 9th Edition (2019)

Course Description

This advanced course explores the molecular mechanisms underlying eukaryotic cell function in mammalian physiology. Students will examine gene expression and genome function, DNA replication and repair, transcription and translation, cell cycle regulation, cytoskeleton dynamics, cell signaling, protein trafficking, and cellular metabolism. Additional topics include immune response, cancer biology, cell-environment interactions, and modern techniques in cell and molecular biology. Through integrated learning, students develop critical reasoning skills and the ability to connect molecular mechanisms with physiological processes.

PREREQUISITES:

This course is designed for seniors and advanced juniors. Prerequisites include 2 semesters of General Biology and 2 semesters of Organic Chemistry. Special permission may be granted on a case-by-case basis.

Learning Goals

Students will:

1. Understand the molecular mechanisms underlying eukaryotic cell function in mammalian physiology, including gene expression and genome function, DNA replication and repair, transcription and translation, cell cycle regulation, and cellular metabolism.
2. Analyze specialized cellular processes including cytoskeleton dynamics, cell signaling pathways, protein trafficking, immune response, cancer biology, and cell-environment interactions.
3. Develop critical reasoning skills and the ability to integrate molecular and cellular mechanisms with physiological processes, including the application of modern techniques in cell and molecular biology.

Assignments/Responsibilities, Grading & Assessment

Students will be responsible for completing reading assignments to help them develop a comprehensive understanding of cellular processes. Assessments will come from **4 exams (20% each, 80% total)**, **2 assignments (10%)** and **4 quizzes (10%)**. Short answer questions on exams will be used to assess goal 2 and large comprehensive questions (1 or 2 per exam) will be used to assess Goal 3.

Accommodations for Students with disabilities

Please follow the procedures outlined at <https://ods.rutgers.edu/students/getting-registered>. Full policies and procedures are at <https://ods.rutgers.edu/>

Absence Policy

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

Course Schedule

- Jan 22: Introduction to the Study of Cell and Molecular Biology**
(Chapter 1, pgs. 1-38)
- Jan 26: The Chemical Origin of Life- Carbs, Lipids and Proteins**
(Chapter 2, pg. 39-98)
- Jan 29: The Structure and Function of the Plasma Membrane**
(Chapter 4; pgs. 137-202)
- Feb 2: Bioenergetics, Enzymes and Metabolism; Quiz #1**
(Chapter 3)
- Feb 5: Exam # 1**
- Feb 9: The Central Dogma: DNA to RNA to Protein**
(Chapter 11, pgs. 477-535)
- Feb 12: Control of Gene Expression in Bacteria**
(Chapter 12, Section 12.1, 12.3)
- Feb 16: Control of Gene Expression in Bacteria; Chromosomes/Chromatin**
(Chapter 12, 12.4, 12.5 pgs. 550-556)
- Feb 19: Control of Gene Expression; RNA Processing and Transcriptional Control Quiz #2**
(Chapter 12, 12.5 pgs. 567-591)
- Feb 26: Exam #2; Assignment #1 due on March 2nd**
- Mar 2: DNA Replication and Repair**
(Chapter 13, pgs. 606-634)
- Mar 5: DNA Recombination; Journal Club**
- Mar 9: Cell cycle, cell division, mitosis and meiosis**
(Chapter 14, pgs. 637-683)
- Mar 12: Overview of Cytoskeleton Function, Motor Proteins;**
(Chapter 9, Sections 9.1, 9.2, 9.4)
- Mar 14-22: SPRING BREAK**
- Mar 23: Actin and Myosin**
(Chapter 9, Section 9.8)
- Mar 26: Cell signaling and Signal Transduction: Communication between Cells; Quiz #3**
(Chapter 15, pgs. 685-692, 721-724)
- Mar 30: Exam #3**

Apr 2: Cells and Their Environments; Extracellular Interactions
(Chapter 7; Sections 7.1- 7.4)

Apr 6: Cells and Their Environments; Tight Junctions, Intracellular Communication
(Chapter 7; Sections 7.5-7.7)

Apr 9: The Immune Response
(Chapter 17; pgs. 775-779)

Apr 13: Cancer; Basic Properties of a Cancer Cell and Engineering
(Chapter 16, Section 16.1-16.3)

Apr 16: Techniques in Cell and Molecular Biology: Microscopy
(Chapter 18; Sections 18.1-18.3)

Apr 20: Techniques in Cell and Molecular Biology: Cell Culture
(Chapter 18; Sections 18.5-18.6)

Apr 23: Techniques in Cell and Molecular Biology: Protein Examination
(Chapter 18; Sections 18.7-18.9)

Apr 27: Techniques in Cell and Molecular Biology: Enzymatic Amplification of DNA
(Chapter 18; Sections 18.13-18.14)

Apr 30: Techniques in Cell and Molecular Biology: Use of Antibodies; Quiz #4
(Chapter 18; Section 18.18)

May 5: Review for Final; Assignment #2 due on May 7th

EXAM 4- During Final Exam Period (May 7-13)

Note: Supplemental review articles will be provided for specialized topics. Reading assignments may be adjusted based on class progress.

Final Exam/Paper Date and Time

Online Final exam Schedule: <http://finalexams.rutgers.edu/>
Comprehensive Final Exam according to final exam schedule

Academic Integrity

The university's policy on Academic Integrity is available at <https://academicintegrity.rutgers.edu/sites/default/files/pdfs/current.pdf>. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated, and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

SEBS DEI Statement

This course is designed to serve students from all backgrounds and foster an inclusive learning environment that respects and affirms the dignity, value, and uniqueness of every individual, community, and perspective. We recognize that diverse voices and life experiences strengthen our collective learning, and we encourage students to contribute their personal insights and perspectives.

Disrespectful language or behavior toward any individual or group will not be tolerated. If you experience or witness disrespect or unfair treatment from instructors, we encourage you to speak up. You may address concerns directly with the instructor in person or via email, report anonymously through the Office of Academic Programs, or file a bias report through the Rutgers Diversity and Inclusion initiative at: <http://inclusion.rutgers.edu/report-bias-incident/>.

Student Wellness Services

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / www.rhscaps.rutgers.edu/

CAPS is a university mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professionals within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / <https://vpva.rutgers.edu/>

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling, and advocacy for victims of sexual and relationship violence and stalking to students, staff, and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodation. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://webapps.rutgers.edu/student-ods/forms/registration>.

DoSomething button through Rutgers Dean of Students office:

<http://health.rutgers.edu/do-something-to-help/>

Wellness Coaching through Rutgers HOPE:

<https://health.rutgers.edu/health-education-and-promotion/health-promotion-peer-education/wellness-coaching>

Self-Help Apps found on the Rutgers Student Health website:

<https://health.rutgers.edu/health-education-and-promotion/self-help/self-help-apps>

NJ Hopeline - (1-855-654-6735) | **National Suicide Hotline** - (1-800-273-8255)

Basic Needs Resources: Any student who has difficulty affording groceries or accessing sufficient food, or who lacks a safe and stable place to live, is urged to contact the Rutgers Student Food Pantry and/or the Dean of Students (details below). Furthermore, please notify the professor if you are comfortable doing so, as they may be able to provide additional support.

Rutgers Student Food Pantry

848-932-5500 / College Ave Student Center, Room 115 (126 College Ave) / <http://ruoffcampus.rutgers.edu/food/>

Check their website for hours and additional locations. The Rutgers Student Food Pantry is dedicated to helping all Rutgers students in need of food, no questions asked. Students will be provided with groceries that typically last about one week.

Dean of Students Office

848-932-2300 / 88 College Avenue, New Brunswick, NJ 08901 / <https://deanofstudents.rutgers.edu/>

Mon-Fri, 8:30am-5:00pm

The Dean of Students Office at Rutgers University-New Brunswick provides solutions, services, and support to help students navigate Rutgers University. The Office serves as a student support network by providing advocacy, problem resolution, and critical incident intervention for those times when additional assistance is needed. Please call to schedule an appointment to meet with a representative from the Dean's office.