RUTGERS
School of Environmental and Biological Sciences

COURSE SYLLABUS

COURSE NAME; NUMBER; SEMESTER; MEETING DAYS, TIMES, AND PLACE.
Molecular and Cellular Physiology (3 cr)
16:340:592 Spring 2020
T/Th5 (Tuesday & Thursday @ 3:55–5:15 PM) plus a 60-minute evening session (Tues 5:30–6:30 PM)
Foran Hall 138A

CONTACT INFORMATION:
Instructor(s): William J. Belden, Ph.D.
Office Location: Foran Hall 326
Phone: 848-932-5617 Email: beldenwj@sebs.rutgers.edu
Office Hours: Tuesday & Thursday @ 9:00–10:45 AM (or by appointment)

PREREQUISITES AND OTHER REGISTRATION RESTRICTIONS:
This course is designed for graduate students. Students should have 2 semesters of undergraduate Organic Chemistry. Special permission may be granted on a case-by-case basis.

COURSE WEBSITE, RESOURCES AND MATERIALS:
- Textbook: *Molecular Biology of the Cell* (6th edition) by Alberts et al. Garland Science.
- Selected primary research articles for student presentations

COURSE DESCRIPTION:
This course is designed to explore the molecular mechanisms of cell biology as it pertains to mammalian physiology. Specific emphasis is placed on gene expression and genome function including the role of chromatin and non-coding RNA, translation, cell cycle and division, protein trafficking, cellular metabolism and cell signaling. Other topics include the specific function of cellular organelles, DNA replication and repair, mRNA processing and translation, the nuclear pore complex and shuttling between the cytoplasm and nucleus, cytoskeleton, protein trafficking between organelles and through the secretory pathway, electron transport, cell homeostasis and apoptosis, extracellular matrix, stem cell development and hematopoiesis, and cellular clocks.

The weekly evening sessions will place special emphasis on critical assessment of primary literature and methods for bioinformatic data analysis. Graduate students are required to present a primary research article and lead a discussion among the students and participate in the review and discussion of other papers presented by their peers.

LEARNING GOALS:
To provide students a solid foundation in cell biology and prepare students for a career in biomedical and/or pharmaceutical research.

- **Objective 1:** Acquire a solid understanding of how cells function in the context of mammalian physiology at the molecular level.
  Assessment: Exams (with open-ended questions), homework assignments, and participation in a weekly journal club and presentation of a primary journal article using genomic approaches
- **Objective 2:** Develop communication skills (written and verbal) to prepare students for the rigors of an academic or industry research career.
  Assessment: Exams (with open-ended questions), homework assignments, and participation in a weekly journal club and presentation of a primary journal article using genomic approaches
- **Objective 3:** Develop an understanding of genomic approaches to molecular biology and critical analysis of primary literature.

Assessment: Participation in a weekly journal club and presentation of a primary journal article using genomic approaches

ASSIGNMENTS/RESPONSIBILITIES:
Students will be responsible for completing reading assignments and have a comprehensive understanding of cellular processes.

Grading:
2 exams (20% each, 40% total)
Comprehensive final (30%)
2 assignments (10%)
Presentation (10%)
Weekly participation in research discussion (10%)

The standard Rutgers University grading scale will be used (90+ A; 85+ B+; 80+ B; 75+ C+; 70+ C; 60+ D; below 60 F). Of special note, a C grade in graduate school is considered a failing grade for most graduate programs in the United States.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES
Please follow the procedures outlined at https://ods.rutgers.edu/students/registration-form. 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:

Tues/Fri **Reading assignments for Alberts et al., 6th Edition**

Note: Evening session readings can be chosen by the student presenter and approved by the Instructor (criteria for choosing an article and having it approved will be dependent on the article), or the instructor can assign an article to the student.

Jan 21: Course Overview, Introduction to Cells, and Cell Specialization in Mammals
(Reading assignment: Chapter 1 and Chapter 9)

Evening: *Overview of reading list and expectations of graduate students*

Jan 23: Chemistry of Cellular Components and Organelles: Nucleic Acids, Amino Acids, Polypeptides, and Lipids
(Reading assignment: Chapter 2)

Jan 28: Proteins
(Reading assignment: Chapter 3)

Evening: *Lecture: High throughput sequencing technology and chemistry*

Jan 30: The Nucleus, Genome Structure and Chromatin
(Reading assignment: Chapter 4, pgs 175-194)

Feb 4: Chromatin Regulation
(Reading assignment: Chapter 4, pgs 194-234)

Evening: *Lecture: High throughput sequencing experiments and analysis.*

Feb 6: DNA Replication
(Reading assignment: Chapter 5, pgs 237-266)

Feb 11: DNA, Recombination and Repair
(Reading assignment: Chapter 5, pgs 266-295)

Evening: *Lecture: The ENCODE Project and The Cancer Genome Atlas*

Feb 13: Transcription and Splicing
(Reading assignment: Chapter 6, pgs 299-333)

Feb 18: Translation and the Ribosome
(Reading assignment: Chapter 6, pgs 333-362)

Evening: *Student-led discussion of primary research article (TBD)*

Feb 20: **Exam #1**

Feb 25: Control of Gene Expression
(Reading assignment: Chapter 7, pgs 369-413)

Evening: *Student-led discussion of primary research article (TBD)*

Feb 27: Post-Transcriptional Control (miRNA and RNAi)
(Reading assignment: Chapter 7, pgs 413-436)

Mar 3: Cell Signaling and Homeostasis
(Reading assignment: Chapter 15, pgs 813-876 & Chapter 17, pgs 1010-1018)

Evening: *Student-led discussion of primary research article (TBD)*

Mar 5: Actin and Tubulin Cytoskeleton
(Reading assignment: Chapter 16, pgs 889-914)

Mar 10: Motor Proteins
(Reading assignment: Chapter 16, pgs 915-960)

Evening: *Student-led discussion of primary research article (TBD)*

Mar 12: Cell Cycle, Cell Division, Mitosis and Meiosis
(Reading assignment: Chapter 17, 963-1010)

SPRING BREAK

Mar 24: Membrane Structure and the Secretory Apparatus
(Reading assignment: Chapter 10, pgs 565-576 & Chapter 12 pgs 641-649)

Evening: *Student-led discussion of primary research article (TBD)*

Mar 26: **Exam #2**

Mar 31: Membrane Proteins and Translocation into the ER and Nucleus
(Reading assignment: Chapter 10, pgs 576-611 & Chapter 12, 669-691)

Evening: *Student-led discussion of primary research article (TBD)*

Apr 2: Vesicle Transport
(Reading assignment: Chapter 13, pgs 695-721)

Apr 7: Endosomes, Lysosome and Phagocytosis
(Reading assignment: Chapter 13, pgs 722-750)

Evening: *Student-led discussion of primary research article (TBD)*

Apr 9: Ion Channels
(Reading Assignment: Chapter 11, pgs 611-638)

Apr 14: Extracellular Matrix
(Reading Assignment: Chapter 19, pgs 1035-1081)

Evening: *Student-led discussion of primary research article (TBD)*

Apr 16: Mitochondria Transport and Electron Transfer
(Reading Assignment: Chapter 12, pgs 658-666 & Chapter 14 753-782)

Apr 21: Cellular Stress, Apoptosis and Senescence
(Reading Assignment: Chapter 18, pgs 1115-1129 & Chapter 18, pgs 1021-1032)

Evening: *Student-led discussion of primary research article (TBD)*

Apr 23: The Cellular Clock
(No Reading)

Apr 28: Cellular Differentiation, Stem Cells and Hematopoiesis

Evening: *Student-led discussion of primary research article (TBD)*

Apr 30: Course overview session/Review for final exam

FINAL EXAM DATE AND TIME

Online Final exam Schedule: http://finalexams.rutgers.edu/
May 8, 2020 @ 12:00–3:00 PM

ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at http://academicintegrity.rutgers.edu/academic-integrity-policy. 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.

STUDENT WELLNESS SERVICES

Just In Case Web App http://codu.co/cee05e
Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

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 professional 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 / www.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 Accommodations. 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://ods.rutgers.edu/students/registration-form.

Scarlet Listeners
(732) 247-5555 / http://www.scarletlisteners.com/
Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.