

Course Syllabus

Institution Name: University of Wisconsin-Madison

Course Number: AN SCI 875 (Section 004, Class Number 37945)

Course Title: Concepts in Endocrinology and Reproductive Physiology

Section Title: Biochemical Concepts in Endocrinology

Credits: 3 credits

Designations and Attributes: Graduate attribute

Section Description: Develop a fundamental understanding of the biochemical concepts that allow hormones to produce their effects in cells, tissues and organs. Provides knowledge of the basic building blocks of biomolecules, understanding of hormone-mediated cell signaling pathways, gene expression, protein transcription and translation, cellular metabolism, receptor-ligand interactions, and molecular basis for positive and negative feedback loops. Molecular biology approaches commonly used to investigate endocrine processes will also be discussed.

Requisites: Graduate/professional standing

Meeting Time: MWF 2:00-2:50pm

Location: HSLC Room 3260 (exception: meets in HSLC Room 3330 Monday, September 23rd, 2024 only)

Instructional Modality: In-person

Instructor Contact Info: Dr. Manish Patankar, Professor, email: patankar@wisc.edu; office hours TBD

Teaching Assistant Contact Info (if applicable): TBD

Course Learning Outcomes:

1. Identify and describe key theories, concepts, or methods in endocrinology and/or reproductive physiology.
2. Apply, analyze, or evaluate key theories, concepts, or methods in endocrinology and/or reproductive physiology.

Section Learning Outcomes:

1. Define the building blocks and structures of biological macromolecules.
2. Identify major signaling pathways engaged by endocrine hormones to gene expression, cell proliferation, metabolism and other biological processes.
3. Identify the molecular basis of positive and negative feedback mechanisms.

4. Develop skillsets for critical appraisal of the literature through participation in class discussions and presentations of peer-reviewed research articles.

Credit Hours: This class meets for three, 50-minute class periods each week over the fall semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc.) for about 2 hours out of the classroom for every class period. The syllabus includes additional information about meeting times and expectations for student work.

Course Overview: This course is designed to provide molecular understanding of hormone signaling and the processes that such signaling control. The course will start with examination of the basic building blocks of biomolecules, their chemical properties that define their functions and ability to form macromolecules. This will be followed by discussion of the structure of the macromolecules (proteins, DNA, lipids and glycans). The structure activity relationships will be a major focus and we will use these concepts to discuss the interactions between hormones and their receptors. Specific examples of hormones (steroid hormones, insulin, epinephrine, etc.) will be used to discuss in detail the biochemical pathways and their biological consequences. Post translational modifications (phosphorylation, glycosylation, etc.) will be discussed for their abilities to control hormone signaling. The positive and negative feedback loop, regulation of gene expression, cell proliferation and other biological processes will also be discussed. Finally, we will consider various tools and technologies (omics, CRISPR, etc.) available to researchers to study hormone signaling.

Course Website: TBD

Discussion and Laboratory Sessions: Not applicable as this will be a lecture class.

Required Textbook: Lehninger Principles of Biochemistry (7th edition or more recent) will be a primary reference textbook (please confirm with instructor before purchasing the textbook).

Reading Materials: Reading assignments from the textbook will be provided throughout the semester. There are no graded homework assignments.

Exams: There will be four exams. Final exam will not be cumulative. All exams will be take-home open book assignments. See schedule for exam due dates. Lowest score of the four exams will be dropped to calculate final grade for the course.

Course schedule:

Lecture #	Lecture Date for Fall 2024	Topic
Module 1: Basic biochemical concepts		
1	Sept 4, 2024	Basic building blocks-1
2	Sept 6, 2024	Basic building blocks-2
3	Sept 9, 2024	Basic building blocks-3
4	Sept 11, 2024	Basic building blocks-4
5	Sept 13, 2024	Macromolecules-1
6	Sept 16, 2024	Macromolecules-2
7	Sept 18, 2024	Macromolecules-3

8	Sept 20, 2024	Macromolecules-4
9	Sept 23, 2024	Structure-Activity relationships
10	Sept 25, 2024	Exam # 1 (<i>Exams are due 11:59 pm Oct 2, 2024</i>)
Module 2: Hormone-receptor interactions		
11	Sept 27, 2024	Ligand-receptor interactions
12	Sept 30, 2024	Nuclear receptors-1
13	Oct 2, 2024	Nuclear receptors-2
14	Oct 4, 2024	Cell surface receptors (GPCRs)-1
15	Oct 7, 2024	Cell surface receptors (GPCRs)-2
16	Oct 9, 2024	Cell surface receptors (Tyrosine Kinase)-3
17	Oct 11, 2024	Cell surface receptors (Tyrosine Kinase)-4
18	Oct 14, 2024	Ion channels
19	Oct 16, 2024	Non classical hormone receptors
20	Oct 18, 2024	Exam #2 (<i>Exams are due 11:59 pm Oct 25, 2024</i>)
Module 3: Cell signaling and biological processes controlled by hormone-receptor interactions		
21	Oct 21, 2024	Cell Metabolism-1
22	Oct 23, 2024	Cell Metabolism-2
23	Oct 25, 2024	Gene expression-1
24	Oct 28, 2024	Gene expression-2
25	Oct 30, 2024	Feed back loops-1
26	Nov 1, 2024	Feed back loops- 2
27	Nov 4, 2024	Feedback loops-3
28	Nov 6, 2024	Control via posttranslational modifications-1
29	Nov 8, 2024	Control via posttranslational modifications-2
30	Nov 11, 2024	Exam #3 (<i>Exams are due 11:59 pm Nov 18, 2024</i>)
Module 4: Biochemical and molecular biological tools used in endocrinology research		
31	Nov 13, 2024	Manipulating gene expression-1
32	Nov 15, 2024	Manipulating gene expression-1
33	Nov 18, 2024	Manipulating gene expression-1
34	Nov 20, 2024	Assessing protein modifications
35	Nov 22, 2024	Receptor-ligand kinetics
36	Nov 25, 2024	Assessing metabolic changes
37	Dec 2, 2024	Developing animal models for endocrine studies
38	Dec 4, 2024	Organ-on-a-chip models-1
39	Dec 6, 2024	Organ-on-a-chip models-2
40	Dec 9, 2024	Wrap-up lecture
41	Dec 11, 2024	Exam #4 (<i>Exams are due 11:59 pm Dec 18, 2024</i>)

Grading:

Final grade is comprised of the average of 3 highest exam scores; specifically 33.3% from each of 3 exams after dropping the lowest of the 4.

Grading scale will be as follows:

- A: 90%-100%
- A/B: 85%-89%
- B: 75%-84%

B/C: 70-74%
C: 65%-69%
D: 50%-64%
F: 0%-49%

Academic Policies:

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

DIVERSITY AND INCLUSION

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.