

IBMS 6315 Transmembrane Signaling and Gene Regulation Credit Hours: 3

Semester: Summer 9-week **Year:** 2026
Class Day/Time: Monday 9:00am-12:00pm **Class Location:** B12

Instructor of Record: Hua Tang
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Office Hours: TBD

Course Description: This course will cover the mechanism of transmembrane signaling of gene regulation and the role of various 2nd messengers in the regulation of various aspects of cell physiology.

Prerequisite: IBMS6401 and IBMS6402

Co-requisite: none

Goals of Course & Course Objectives: The goal of this course is for the students to obtain an understanding of transmembrane signaling mechanisms and gene regulation of higher eukaryotes.

Course Objectives:

1. To be able to communicate and discuss fundamental mechanisms of various transmembrane signaling pathways.
2. To be able to communicate and discuss structural and functional aspects of various signaling molecules and their cellular functions.
3. To be able to understand and discuss basic concepts of gene regulation.
4. To be able to create a hypothesis driven mini-research projects based on the knowledge of learned signaling mechanisms.

Student Learning Outcomes (SLO or “competencies”):

1. The student will have overview of various transmembrane signaling pathways in the cells and their role in the regulation of cell function through the control of gene and protein activities.
2. The student will understand the changes in various transmembrane signaling pathways in pathophysiological conditions.
3. The student will understand the mechanisms underlying the phenotypic changes of the cells and the development of various diseases.
4. The student will be able to describe the characteristics of various transmembrane signaling pathways in the regulation of cell function.
5. The student will be able to describe the mechanisms of various signaling pathways including G-protein signaling, Ca²⁺ signaling, Receptor Tyrosine kinase signaling, WNT signaling, Toll like receptor pathway, JAK/STAT pathway, NFκ-b signaling, and mTOR signaling.
6. The student will be able to design a hypothesis driven research strategy.

Course Assessment/Methods of Evaluation:

Student understanding will be evaluated with comprehensive examinations of a purely subjective nature covering each topic in detail, evaluations of quizzes, class participation, and creation of mini-research proposals. Students who successfully complete the course will demonstrate a thorough understanding of fundamental knowledge of transmembrane signaling mechanisms, gene regulation, and the role of various signaling molecules in cell physiology.

- **Quizzes:** There may be short in-class quizzes. The specific lecturers will determine the grade worth of these quizzes. These grades will be taken into consideration using pre-assigned weightage in determining the final grade.
- **Lecture and small group discussion:** Class is composed of formal lecture and small group discussion. Students need to critically read the assigned original research article that is given one week prior to the class. The articles are discussed in class, and the students are asked to be discussion leaders in class.
- **Proposal of mini-research project.** Students are expected to submit two written mini-research proposals that are presented in class using power point presentation. **(60%)** Submit two written mini projects by July 6, at 5:00pm. Each mini project should contain following: Title, Background/Significance (max one page); Hypothesis; Research strategy and proposed experiments (One Specific Aim that may contain multiple sub-aims; may include figures). Total 3 pages per each mini project (Single space, arial 11, AHA Margin), References (additional pages)

Presentation: A student performs PPT presentation of the proposed project (20 min presentation and 60 min discussion)

- **All documents must be typed, and handwritten documents are not acceptable.**
- **Class Participation and Attendance: Punctual attendance and participation in group discussion and presentation is critical. It is critical to sign (legibly) the sign-up sheet for each class to record your attendance. Students are expected to be in attendance for the majority of the class time. If not, students will not get full credit for attendance. Tardiness of more than 30 min may not get full credit. (Attendance and paper presentation/discussion are 20% of grade, respectively)**
- A grade of less than a B may result in loss of Graduate Assistantships.
- No grades will be withheld for completion of work except in extreme circumstances.

Work such as mini-project proposal and other assignments turned in late will lose 5% (1 day late), 10% (2-3 days late), 20% (4-7) and 30% (7-14) of the points possible. More than 14 days late will lose 100% of the points.

Linked Program Learning Outcomes:

The student learning outcomes listed above address the following Integrated Biomedical Sciences Program PLO domains:

- PLO1 - Core Knowledge domain
- PLO2 - Research Methods and Analysis domain
- PLO3 - Scholarly domain
- PLO4 - Professionalism domain

Textbook:

[Include text & ISBN, where it is available and whether or not alternative editions are acceptable, indicate material on reserve or in the library etc.]

Course Content:

This course will discuss following intracellular signaling mechanisms:

G-protein signaling

Ca²⁺ signaling

Receptor Tyrosine kinase signaling

WNT signaling

TLR signaling

JAK-STAT signaling

TGF-beta signaling

mTOR signaling

Course Schedule:

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|-------------------|--------------------------------------|
| May 11 (Monday) | G protein Signaling (Wang) |
| May 22 (Friday) | Ca ²⁺ signaling (Wang) |
| May 25 (Monday) | No Class: Memorial Day |
| June 1 (Monday) | Receptor Tyr kinase signaling (Qian) |
| June 8 (Monday) | WNT signaling (Qian) |
| June 15 (Monday) | TLR Signaling (Tang) |
| June 22 (Monday) | JAK-STAT signaling (Tang) |
| June 29 (Monday) | TGF-beta signaling (Tang) |
| July 6 (Monday) | mTOR signaling (Gaddam) |
| July 13 (Monday) | mini-project 1 & 2 |
| July 20 (Monday) | mini-project 3 & 4 |
| July 27 (Monday) | mini-project 5 & 6 |
| August 3 (Monday) | mini-project 7 & 8 |

Other Class Policies**Attendance:**

Regular or punctual attendance is expected. If a student misses a class or lab, the student is responsible for obtaining any information distributed during those times. Make-ups are possible only under certain instances (labs cannot be made up). Arrangements for any make-ups and/or missed labs should be discussed directly with the instructor for that day's class.

Academic Honesty:

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

Cheating

Dishonesty of any kind involving examinations, assignments, alteration of records, wrongful possession of examinations, and unpermitted submission of duplicate papers for multiple classes or unauthorized use of keys to examinations is considered cheating. Cheating includes but is not limited to:

- Using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class.
- Falsifying or inventing any information, including citations, on an assigned exercise.
- Helping or attempting to help another in an act of cheating or plagiarism.

Plagiarism

Plagiarism is presenting the words or ideas of another person as if they were your own. Materials, even ideas, borrowed from others necessitate full and complete acknowledgment of the original authors. Offering the work of another as one's own is plagiarism and is unacceptable in the academic community. A lack of adequate recognition constitutes plagiarism, whether it utilizes a few sentences, whole paragraphs, articles, books, audio-visual materials, or even the writing of a fellow student. In addition, the presentation of material gathered, assembled or formatted by others as one's own is also plagiarism. Because the university takes such misconduct very seriously, the student is urged to carefully read university policies on Misconduct in Research and Other Scholarly Activity 05.00. Examples of plagiarism are:

- Submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another.
- Submitting a work that has been purchased or otherwise obtained from an Internet source or another source.
- Incorporating the words or ideas of an author into one's paper without giving the author due credit.

Use of Artificial Intelligence:

UT Tyler is committed to exploring and using artificial intelligence (AI) tools as appropriate for the discipline and task undertaken. We encourage discussing AI tools' ethical, societal, philosophical, and disciplinary implications. All uses of AI should be acknowledged as this aligns with our commitment to honor and integrity, as noted in UT Tyler's Honor Code. Faculty and students must not use protected information, data, or copyrighted materials when using any AI tool. Additionally, users should be aware that AI tools rely on predictive models to generate content that may appear correct but is sometimes shown to be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the quality and content of the information you submit. Misusing AI tools that violate the guidelines specified for this course (see below) is considered a breach of academic integrity. The student will be subject to disciplinary actions as outlined in UT Tyler's Academic Integrity Policy.

For this course, **AI is not permitted in this course at all.** To best support your learning, you must complete all graded assignments by yourself to assist in your learning. Doing your own work, without human or artificial intelligence assistance, is best for your efforts in mastering course learning objectives. This exclusion of other resources to help complete assignments includes artificial intelligence (AI). Refrain from using AI tools to generate any course context (e.g., text, video, audio, images, code, etc.) for any assignment or classroom assignment

Adding/Dropping:

The official deadline for adding and dropping courses is as published in the academic calendar ([Registrar Withdrawal webpage](#)). However, students are strongly encouraged to meet with their graduate advisor or the Program Coordinator prior to adding/dropping courses. Movement into and out of classes after the 4th class day requires approval of the Program Director. Each student is responsible for their own enrollment status with the university.

Disability Accommodations:

UT Tyler HSC abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, which mandate reasonable accommodations be provided for students with documented disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate provision of accommodation you may need. If you have not already done so, you will need to register with the Student Services Office (located on the main campus). You may call 903-566-7079 for more information.