M252A-B & M262A-B
Molecular Mechanisms of Human Diseases
Course Organizers: Ren Sun & Yibin Wang
Course Coordinator: Lynn Talton

Instructors

Fall Quarter (M252)
Desmond Smith, Grace Xiao,
Tom Vondriska, Tim Lane, Lily Wu,
Chris Denny, Yousang Gwack, Yibin Wang
Ren Sun, Hong Zhou, Martha Lewis

Winter Quarter (M262)
Tom O'Dell, Ming Guo, Yi Sun,
Yibin Wang, Mansoureh Eghbali,
Reza Ardehali, Aleksey Matveyenko,
David Walker, Heather Christofk

Introduction
M252 and M262 is a 2-quarter introductory course for graduate students in bioscience-related disciplines. The course provides didactic lectures to cover the fundamental concepts and methodologies in modern biology, with a particular emphasis on implications and relevance to human diseases. The goal is to integrate fundamental biology with the mechanisms underlying disease development and applications in therapy.

Learning Objectives
The course emphasizes the integration of biology and medicine. The course is designed to stimulate students’ interest and develop their capacity to dissect complex problems, while at the same time increasing their appreciation and understanding of translational research. Each quarter is divided into three-week topic blocks with a team of three instructors. Six topic blocks will be presented across the two quarters, including: 1) Modern Biology Approaches, 2) Cancer Biology, 3) Infectious Diseases, 4) Neurological Diseases, 5) Cardiovascular Diseases, and 6) Metabolic Diseases.

Lectures and Discussions
Each week will include two didactic lectures (register as M252A or M262A) led by one of the block instructors and include two discussion sessions. One weekly discussion session (register as M252B or M262B) will consist of a literature discussion of a primary research article relevant to the week’s topic and led by one of the block instructors in small groups. The second weekly discussion session will be led by postdocs working in the field. Students will develop a 2-page research proposal over the block based on the block topic, each week students will prepare a new draft of their proposal and present it in the discussion for feedback. Students may register for the lecture component only, if allowed by their graduate program, but both co-requisites are recommended.

Course Registration
This class is posted as two co-requisite courses each quarter and co-listed in Molecular & Medical Pharmacology (MMP) and Molecular, Cellular & Integrative Physiology (MCIP). Students may register through either department. Undergraduates need instructor approval, Dr. Sun rsun@mednet.ucla.edu.

Fall Quarter: M252A (lecture component) and M252B (discussion component)
Winter Quarter: M262A (lecture component) and M262B (discussion component)
Course Website
The login for the course website is at: http://www.medsch.ucla.edu/Angel. Students will be provided login access to the course after the organizational meeting, Monday, Sept 30, 2-3pm, CHS 14-214U.

Each Block “Week” Consists of:

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
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<tbody>
<tr>
<td>Lecture 1</td>
<td>Initial lecture led by the week’s instructor.</td>
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<td>Meets 2:00-3:30pm, including a small break.</td>
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<tr>
<td>Lecture 2</td>
<td>Continuation of lecture led by the week’s instructor.</td>
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<td>Meets 2:00-3:30pm, including a small break.</td>
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<tr>
<td>Literature Discussion Group</td>
<td>Literature Discussion led by a topic instructor in a small group.</td>
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<td></td>
<td>Meets 2:00-4:00pm, according to group/room assignment.</td>
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<tr>
<td>Postdoc Discussion Activity</td>
<td>Discussion of short proposal-writing assignment (&lt;1 page) based on previous literature discussion. Meets 2:00-4:00pm, according to group/room assignment.</td>
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Grading Guidelines
The course grade for M252A and M262B will be based on an average of the three exam grades (delivered as a Letter, A-F). The course grade for M252B and M262B will come from participation in the M252B Discussions.

Exams
There will be 3 exams per quarter, each covering the topics of the preceding 3 week block. Exams will be administered online in the TLC Computer Lab in the Bio-Medical Library using the ANGEL system. Students will be asked to leave their belongings in an adjacent area and will only be allowed to bring in their textbook and class notes (paper). Once in the lab, the students will log in to their ANGEL account to access the exam, take and submit it from the lab. Exams will be open book (text and paper notes only), but no computers, calculators, or mobile devices will be allowed. Exam questions may include short essays and multiple-choice and will draw from lectures, assigned reading, and the textbook. Exam time is limited to 3 hours. Questions will come from both the didactic lecture and the assigned required reading components. Optional reading materials may help understanding, but will not be directly tested.

Reading Prerequisite
Before the course starts, students are expected to have a strong working understanding of cellular and molecular biology at the level of the following text book, Molecular Cell Biology, Sixth Edition (2008, Lodish et al). You should develop a solid understanding of the contents of this book and refer back to relevant sections throughout the course.

Available to purchase at: UCLA Health Sciences Store, Online retailers (B&N, Amazon, etc.), as an e-book: http://ebooks.bfwpub.com/lodish6e, online resources for this book are available at: http://bcs.whfreeman.com/lodish6e/.

Reading Assignments
1-2 primary research articles will be assigned as required reading to accompany each lecture. These articles may be referenced in exams. A single or pair of primary research articles will also be assigned reading for discussion in the literature discussion small groups each week.
BLOCK 1 - Modern Biology Approaches

- **Functional Genomics - Desmond Smith**
  - Transcript Profiling & Application to Disease
  - High-throughput Biological Screens, siRNA pharmacogenomics & Functional Screens
  - Synthetic Biology & Biosystems
- **Bioinformatics - Grace Xiao**
  - TBD
- **Proteomics & Systems Biology - Tom Vondriska**
  - Systems Biology vs. Classical Physiology
  - Role of Proteomics
  - Concepts, Tools, & Challenges of Proteomics

BLOCK 2 - Cancer Biology

- **Cell Cycle Control - Tim Lane**
  - Regulation of Eukaryotic Cell Cycle, Cyclin, Cdk
  - Molecular mechanisms of mitotic events
  - Cell Cycle in Stem Cells
- **Signal Transduction - Chris Denny**
  - Short Circuiting Signal Transduction
  - Perturbing Transcriptional Balance
  - Supressing Programmed Cell Death
- **Tumor Micro-Environments - Lily Wu**
  - Tumors: Model Systems, Angiogenesis, Lymphangiogenesis
  - Immune System & Cancer
  - Co-targeting TIMs in Cancer Therapy

BLOCK 3 - Infectious Diseases

- **Viral & Immune Pathogenesis, Translational Medicine - Martha Lewis**
  - Pathogenesis & Viral Disease Progress
  - Therapy for Viral Diseases
  - Host Immune Response & Viral Evasion
- **Cell Biology of Viral Pathogenesis - Yousang Gwack**
  - Innate and Adaptive Immunity
  - Signalling Pathways in the Immune System
  - Immunity and Human Diseases
- **Viral Biochemistry & Molecular Biology - Hong Zhou**
  - Structures of Virus, Viral Proteins and Viral Infection
  - Genome Structure, Replication, Transcription & Packaging
**BLOCK 4 - Neural Diseases & Systems**

- **Neural System Physiology & Function** - Tom O'Dell
  - Neurophysiology & Excitatory Synaptic Transmission
  - Synaptic Plasticity
- **Molecular Genetics of Neural Diseases** - Ming Guo
  - Neurodegenerative Diseases: Clinical Features, Challenges, & Principles
  - Mitochondrial Dynamics & Autophagy
- **Epigenetic Mechanisms** - Yi Sun
  - Epigenetics, Epigenetic Diseases, Modeling Diseases Using Stem Cells
  - Epigenetic Regulation of Stem/Progenitor Cell Differentiation

**BLOCK 5 - Cardiovascular Diseases**

- **Cardiac Physiology from Cell to System** - M. Eghbali
  - Basic Concepts in Cell Membrane Biology
  - Cardiac Ion Channels in Health & Disease
  - Cardiovascular Physiology & Pathophysiology of Cardiovascular System
- **Regulatory Mechanisms** - Yibin Wang
  - Adrenergic Signaling in Cardiovascular Regulation
  - Mechanisms of Gene Regulation: miRNA & Non-coding RNAs
- **TBA** - Reza Ardehali

**BLOCK 6 - Metabolic Diseases**

- **Mechanisms of Diabetes** - Aleksey Matveyenko
  - Regulation of Insulin Secretion & Insulin Action
  - Prevention and Treatment of Type 2 Diabetes
- **Metabolism and Animal Aging** - David Walker
  - Biological Mechanisms of Aging
  - Nutritional Modulation of Aging
- **Fundamentals of Metabolism** - Heather Christofk
  - Cancer Metabolism
  - Lipid Metabolism, Nucleotide Metabolism, & Disease