Molecular and Cell Biology

The Department of Molecular and Cell Biology offers a program of graduate study leading to the PhD in molecular and cell biology. This program provides advanced training in the research methods and concepts of the study of the molecular structures and processes of cellular life. The training is intellectually focused, but at the same time offers unusually wide opportunities for varied disciplinary specialization.

Admission to the University

Uniform minimum requirements for admission

The following minimum requirements apply to all programs and will be verified by the Graduate Division:

1. A bachelor's degree or recognized equivalent from an accredited institution;
2. A minimum grade-point average of B or better (3.0);
3. If the applicant comes from a country or political entity (e.g. Quebec) where English is not the official language, adequate proficiency in English to do graduate work, as evidenced by a TOEFL score of at least 570 on the paper-and-pencil test, 230 on the computer-based test, 90 on the iBT test, or an IELTS Band score of at least 7 (note that individual programs may set higher levels for any of these); and
4. Enough undergraduate training to do graduate work in the given field.

Applicants who already hold a graduate degree

The Graduate Council views academic degrees as evidence of broad research training, not as vocational training certificates; therefore, applicants who already have academic graduate degrees should be able to take up new subject matter on a serious level without undertaking a graduate program, unless the fields are completely dissimilar.

Programs may consider students for an additional academic master's or professional master's degree if the additional degree is in a distinctly different field.

Applicants admitted to a doctoral program that requires a master's degree to be earned at Berkeley as a prerequisite (even though the applicant already has a master's degree from another institution in the same or a closely allied field of study) will be permitted to undertake the second master's degree, despite the overlap in field.

The Graduate Division will admit students for a second doctoral degree only if they meet the following guidelines:

1. Applicants with doctoral degrees may be admitted for an additional doctoral degree only if that degree program is in a general area of knowledge distinctly different from the field in which they earned their original degree. For example, a physics PhD could be admitted to a doctoral degree program in music or history; however, a student with a doctoral degree in mathematics would not be permitted to add a PhD in statistics.
2. Applicants who hold the PhD degree may be admitted to a professional doctorate or professional master's degree program if there is no duplication of training involved.

Applicants may only apply to one single degree program or one concurrent degree program per admission cycle.

Any applicant who was previously registered at Berkeley as a graduate student, no matter how briefly, must apply for readmission, not admission, even if the new application is to a different program.

Required documents for admissions applications

1. **Transcripts:** Upload unofficial transcripts with the application for the departmental initial review. Official transcripts of all college-level work will be required **if admitted**. Official transcripts must be in sealed envelopes as issued by the school(s) you have attended. Request a current transcript from every post-secondary school that you have attended, including community colleges, summer sessions, and extension programs.
   If you have attended Berkeley, upload unofficial transcript with the application for the departmental initial review. Official transcript with evidence of degree conferral ***will not*** be required if admitted.
2. **Letters of recommendation:** Applicants can request online letters of recommendation through the online application system. Hard copies of recommendation letters must be sent directly to the program, not the Graduate Division.
3. **Evidence of English language proficiency:** All applicants from countries in which the official language is not English are required to submit official evidence of English language proficiency. This requirement applies to applicants from Bangladesh, Burma, Nepal, India, Pakistan, Latin America, the Middle East, the People's Republic of China, Taiwan, Japan, Korea, Southeast Asia, and most European countries. However, applicants who, at the time of application, have already completed at least one year of full-time academic course work with grades of B or better at a U.S. university may submit an official transcript from the U.S. university to fulfill this requirement. The following courses will not fulfill this requirement: 1) courses in English as a Second Language, 2) courses conducted in a language other than English, 3) courses that will be completed after the application is submitted, and 4) courses of a non-academic nature. If applicants have previously been denied admission to Berkeley on the basis of their English language proficiency, they must submit new test scores that meet the current minimum from one of the standardized tests.

Normative Time Requirements

Normative Time to Advancement

Normative Time to Advancement is 2 years.

Normative Time in Candidacy

Normative Time in Candidacy is 3.5 years.

Total Normative Time

Total Normative Time is 5.5 years

Time to Advancement

Curriculum

MCELLBI 293A	Research Seminar	2
MCELLBI 293C	Responsible Conduct of Research	1
MCELLBI 380	Teaching of Molecular and Cell Biology (2 courses)	1-2
MCELLBI 200A	Fundamentals of Molecular and Cell Biology	3
MCELLBI 200B	Fundamentals of Molecular and Cell Biology	3
MCELLBI 291A	Introduction to Research	2-12
MCELLBI 291B	Introduction to Research	2-12
Two MCELLBI advanced topics electives		
MCELLBI 290	Graduate Seminar (3)	1
MCELLBI 292	Research	3-12

Molecular and Cell Biology

MCELLBI 200A Fundamentals of Molecular and Cell Biology 3 Units
The goal of this course is to provide graduate-level instruction on molecular and cellular biosciences from a highly-integrated systems perspective, rather than using a more classic, techniques-oriented format. A collection of approaches, and a focus on critical thinking and problem solving, will be used to show how fundamental, highly-significant biological problems are "cracked open." Reading will be assigned from a mix of classic and current peer-reviewed papers selected by the instructors.

Rules & Requirements

Prerequisites: 200A and 200B must be taken concurrently. Combined course required and restricted to all MCB first-year graduate students

Hours & Format

Fall and/or spring: 15 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Instructors: Marqusee, Rio, Drubin, Rine, Vance, Feller

MCELLBI 200B Fundamentals of Molecular and Cell Biology 3 Units
The goal of this course is to provide graduate-level instruction on molecular and cellular biosciences from a highly-integrated systems perspective, rather than using a more classic, techniques-oriented format. A collection of approaches, and a focus on critical thinking and problem solving, will be used to show how fundamental, highly-significant biological problems are "cracked open." Reading will be assigned from a mix of classic and current peer-reviewed papers selected by the instructors.

Rules & Requirements

Prerequisites: Must be taken concurrently. Combined course required for all MCB first-year graduate students

Hours & Format

Fall and/or spring: 15 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Instructors: Marqusee, Rio, Drubin, Rine, Vance, Feller

MCELLBI 206 Physical Biochemistry 3 Units
Application of modern physical concepts and experimental methods to the analysis of the structure, function, and interaction of large molecules of biological interest.

Rules & Requirements

Prerequisites: Year courses in organic chemistry and physical chemistry. 100 recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 210 Macromolecular Reactions and the Cell 4 Units
General course for first-year graduate students. Covers our current understanding of, methodological approaches for analyzing, and recent advances in the function of cellular macromolecules and macromolecular complexes in DNA replication, recombination, transposition and repair, gene expression and its regulation, mRNA splicing, genome organization, noncoding RNAs, signal transduction, protein synthesis, folding and degradation, growth control, and other life processes.
Rules & Requirements

Prerequisites: 110 or equivalent. Admission to the course requires formal consent of instructors, except for MCB graduate students and graduate students in the laboratories of MCB faculty

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Formerly known as: 200

MCELLBI C212A Chemical Biology I - Structure, Synthesis and Function of Biomolecules 1 Unit
This course will present the structure of proteins, nucleic acids, and oligosaccharides from the perspective of organic chemistry. Modern methods for the synthesis and purification of these molecules will also be presented.
Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: CHEM C271A

MCELLBI C212B Chemical Biology II - Enzyme Reaction Mechanisms 1 Unit
This course will focus on the principles of enzyme catalysis. The course will begin with an introduction of the general concepts of enzyme catalysis which will be followed by detailed examples that will examine the chemistry behind the reactions and the three-dimensional structures that carry out the transformations.
Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: CHEM C271B

MCELLBI C212C Chemical Biology III - Contemporary Topics in Chemical Biology 1 Unit
This course will build on the principles discussed in Chemical Biology I and II. The focus will consist of case studies where rigorous chemical approaches have been brought to bear on biological questions. Potential subject areas will include signal transduction, photosynthesis, immunology, virology, and cancer. For each topic, the appropriate bioanalytical techniques will be emphasized.
Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: CHEM C271C

MCELLBI C214 Protein Chemistry, Enzymology, and Bio-organic Chemistry 2 Units
The topics covered will be chosen from the following: protein structure; protein-protein interactions; enzyme kinetics and mechanism; enzyme design. Intended for graduate students in chemistry, biochemistry, and molecular and cell biology.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

Hours & Format

Fall and/or spring:
10 weeks - 3 hours of lecture per week
15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: CHEM C230

MCELLBI C216 Microbial Diversity Workshop 1 Unit
This workshop for graduate students will parallel C116, Microbial Diversity, which should be taken concurrently. Emphasis in the workshop will be on review of research literature and formulation of paper pertinent to research in microbial diversity.
Rules & Requirements

Prerequisites: Graduate standing; C112 or consent of instructor and organic chemistry (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of workshop and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Instructor: Coates

Also listed as: PLANTBI C216

MCELLBI 218C Research Review in Biochemistry and Molecular Biology: Synthetic Biology and Cellular Enzymology 2 Units
Synthetic biology, metabolic engineering, systems biology, enzyme mechanism, and gene discovery.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor or consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Chang

MCELLBI 218D Research Review in Biochemistry and Molecular Biology: Gene Regulation at the RNA Level 2 Units
RNA elements involved in alternative splicing and other co-transcriptional mechanisms of regulation. Specific areas of interest include riboswitches and other structured RNA elements involved in gene regulation.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor or consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Hammond

MCELLBI 218E Research Review in Biochemistry and Molecular Biology: Viruses as Models for Eukaryote Gene Expression and Replication 2 Units
Recent developments in eukaryote viral and cellular regulation. New concepts in transcription and RNA replication, with particular emphasis on virus-cell interactions.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor or consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Botchan

MCELLBI 218F Research Review in Biochemistry and Molecular Biology: Energy-dependent Proteases and Molecular Machines 2 Units
Our goals are to decipher the fundamental principles that govern substrate engagement, de-ubiquitylation, unfolding, and translocation by the proteasome.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor or consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Martin

MCELLBI 218G Research Review in Biochemistry and Molecular Biology: Myxobacterial Development 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Zusman

MCELLBI 218H Research Review in Biochemistry and Molecular Biology: Protein Synthesis in Bacteria and Mammals 2 Units
The mechanism of protein synthesis in bacteria and human cells. Specific areas of interest include the structure and function of the ribosome and the regulation of protein synthesis.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Cate

MCELLBI 218I Research Review in Biochemistry and Molecular Biology: Chemical Biology and Inorganic Chemistry 2 Units
Research and literature topics in chemical biology and inorganic chemistry relevant to human health and disease and energy science will be discussed.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Chris Chang

MCELLBI 218J Research Review in Biochemistry and Molecular Biology: Advanced 20th Century Perspectives on Cancer Cell Genetics 2 Units
Transduction of cellular sequences and genetic regulation of transformation by oncogenic retroviruses as models for natural carcinogenesis, including a critical review of the current research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Duesberg

MCELLBI 218O Research Review in Biochemistry and Molecular Biology: Chemical Biology and Enzymology 2 Units
Topics at the interface of chemistry and biology with a particular focus on mechanisms of enzyme catalysis.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Marletta

MCELLBI 218P Research Review in Biochemistry and Molecular Biology: Chemical Biology and Neuroscience 2 Units
Molecular approaches to designing and deploying tools for voltage imaging and brain mapping.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructors: Miller, Evan

MCELLBI 218Q Research Review in Biochemistry and Molecular Biology: Single Molecular Imaging of Macromolecular Enzymes 2 Units
Yildiz laboratory combines molecular biology and single molecule biophysical techniques to understand mechanisms that underlie cellular organization and motility. Specific focuses of the lab are to dissect 1) the mechanism of cytoplasmic dynein motility, 2) the regulation of intraflagellar transport, and 3) the protection and maintenance of mammalian telomeres.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Yildiz

MCELLBI 218R Research Review in Biochemistry and Molecular Biology: The Protein Folding Problem 2 Units
Protein structure, stability, design, and the pathway of protein folding.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Marqusee

MCELLBI 218S Research Review in Biochemistry and Molecular Biology: Cryo-Electron Microscopy of Macromolecules 2 Units
Structure-function studies of the cytoskeleton and large molecular machines by cryo-electron microscopy and image reconstruction.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Nogales

MCELLBI 218V Research Review in Biochemistry and Molecular Biology: Biophysics of Macromolecule Transport Across Membranes 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Krantz

MCELLBI 218W Research Review in Biochemistry and Molecular Biology: Enzyme Catalysis 2 Units
Fundamental aspects of enzyme catalysis, as probed by kinetic, spectroscopic, and molecular biological approaches.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Klinman

MCELLBI 218X Research Review in Biochemistry and Molecular Biology: Chemical Reactions of Metabolism 2 Units
Define how metabolic reactions function in the context of the cellular system in order to elucidate the so-called design principles of metabolic function.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Savage

MCELLBI 218Z Molecular and Cellular Mechanisms of Nutrient Sensing 2 Units
In our laboratory, we study the molecular mechanisms of nutrient sensing and growth control. Specific areas of interest include the mTOR pathway, energy sensing, lysosomal biology and translational control.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Zoncu

MCELLBI 219A Structural Membrane Biology 2 Units
The mechanisms by which protein complexes use their structures to bud, bend, and sever membranes will be covered in research reports and reviews of the current literature and in discussion of current experiments in the field.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Hurley

MCELLBI 219B Regulation of Translation 2 Units
Understanding the molecular basis and physiological role of translational regulation in gene expression with an emphasis on global profiling and functional genomics.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Ingolia

MCELLBI 219F Research Review in Biochemistry and Molecular Biology: Eukaryotic Gene Expression 2 Units
Protein-DNA interactions and the control of gene expression in eukaryotes.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Tjian

MCELLBI 219G Virus-Host Interactions 2 Units
Understanding the creative strategies viruses use to manipulate gene expression in host cells, with a focus on RNA-based regulation of gene expression.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Glaunsinger

MCELLBI 219H Research Review in Biochemistry and Molecular Biology: Molecular and Cell Biology of <Listeria monocytogenes> Pathogenesis 2 Units
Discussion of recent research on the genetics, cell biology, and immunology of the model facultative intracellular bacterical pathogen,
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Portnoy

MCELLBI 219J Research Review in Biochemistry and Molecular Biology: Structure and Function of RNA 2 Units
RNA structure, folding, and function. Specific topics include ribozyme mechanisms, RNA-mediated translation initiation, and protein targeting and secretion.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Doudna

MCELLBI 219Q Research Review in Biochemistry and Molecular Biology: Structural Biology of Molecular Machines 2 Units
Crystallographic and biochemical studies of protein machines, focused on protein-nucleic acid interactions; analysis of chemomechanical function within multiprotein complexes will be covered in research reports and reviews of the current literature and in discussion of current experiments in the field.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Berger

MCELLBI 219S Research Review in Biochemistry and Molecular Biology: Structural Biology of Signaling and Replication 2 Units
Mechanisms and structure in DNA replication and eukaryotic cell signaling.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Kuriyan

MCELLBI 219T Research Review in Biochemistry and Molecular Biology: Signal Transduction Mechanisms 2 Units
Discussion of recent research on various aspects of signal transduction mechanisms in eukaryotic cells, including G protein-coupled receptors, protein kinase cascades, synthesis and mobilization of lipid mediators, calcium sensing and response pathways, activation and inhibition of gene expression, and the biochemical basis of signal desensitization and physiological adaptation, with strong emphasis on genetic and molecular analysis of these systems, especially in the yeast
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Thorner

MCELLBI 219U Research Review in Biochemistry and Molecular Biology: Single Molecule Biophysics 2 Units
Methods of single molecule manipulation and visualization that are used to characterize the structure and mechanochemical properties of translocating DNA binding protein such as RNA polymerase and to investigate the mechanical denaturation of single protein molecules will be covered in research reports and reviews of the current literature and in discussion of current experiments in the field.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Bustamante

MCELLBI 219X Research Review in Biochemistry and Molecular Biology: Cell Surface Glycoconjugate Interactions 2 Units
Investigations of cell surface glycoproteins as mediators of cell-cell interactions. Development of new methods for engineering cell surface structures.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Bertozzi

MCELLBI 219Y Research Review in Biochemistry and Molecular Biology: Regulation of HIV Gene Expression 2 Units
Regulation of HIV gene expression by viral proteins and cellular cofactors will be covered in research reports and reviews of the current literature and in discussion of current experiments in the field.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Zhou

MCELLBI 219Z Research Review in Biochemistry and Molecular Biology: Telomere Synthesis and Dynamics 2 Units
Emphasizes a study of the replication of eukaryotic telomeric DNA. Special focus on techniques in protein biochemistry and molecular biology.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Collins

MCELLBI 230 Advanced Cell Biology 4 Units
Advanced treatment of topics in cell biology.
Rules & Requirements

Prerequisites: 130. Formal consent of instructors required, except for MCB graduate students and graduate students in the laboratories of MCB faculty

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 231 Advanced Developmental and Stem Cell Biology 4 Units
Principles of animal development will be set forth from the classical and recent experimental analysis of induction, localization, patterning mutants, axis formation, regional gene expression, and cell interactions. Early development of selected vertebrates and invertebrates will be examined, and emerging topics in microRNA and stem cell biology will be highlighted. A weekly discussion section with readings from the research literature is required.
Rules & Requirements

Prerequisites: Previous course in development (131 or equivalent) or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1-2 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 236 Advanced Mammalian Physiology 5 Units
Principles of mammalian (primarily human) physiology emphasizing physical, chemical, molecular, and cellular bases of functional biology. The following topics will be covered: cellular and membrane ion and nonelectrolyte transport; cell and endocrine regulation; autonomic nervous system regulation; skeletal, smooth, and cardiac muscle; cardiovascular physiology; respiration; renal physiology; gastrointestinal physiology. Discussion section will study advanced physiological topics, including: presentations by the faculty; problem sets; discussion of the primary literature and of reviews; two presentations by each student on topics in current physiological research.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI C237 Stem Cells and Directed Organogenesis 3 Units
This course will provide an overview of basic and applied embryonic stem cell (ESC) biology. Topics will include early embryonic development, ESC laboratory methods, biomaterials for directed differentiation and other stem cell manipulations, and clinical uses of stem cells.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Instructor: Conboy

Also listed as: BIO ENG C218

MCELLBI 239B Research Review in Cell and Developmental Biology: Regulation of the Cell Cycle 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Rape

MCELLBI 239BB Research Review in Cell and Developmental Biology: Mechanics and Dynamics of Cell Movements 2 Units
Research in our laboratory is focused on the mechanics and dynamics of cell movements on the purified protein, single cell, and tissue levels. For these studies, we are developing new instruments to quantify cell and molecular mechanics bases on optical microscopy, force microscopy, and microfabrication.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Fletcher

MCELLBI 239C The Regulation of Meiotic Gene Expression and Cellular Morphogenesis 2 Units
The mechanisms that link cellular differentiation programs and dynamic gene regulation in complex eukaryotic systems remain mysterious. Such programs drive diverse and central biological processes including organismal development, immune function, disease progression, and meiosis. This course is focused on the molecular basis for the cellular remodeling accompanying meiosis, the highly conserved process by which gametes are produced.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Brar

MCELLBI 239D Research Review in Cell and Developmental Biology: Epithelial Function, Structure, and Regulations 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Machen

MCELLBI 239EE Research Review in Cell and Developmental Biology: Cell Morphogenesis 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Heald

MCELLBI 239F Research Review in Cell and Developmental Biology: Nucleocytoplasmic Transport 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Weis

MCELLBI 239FF Research Review in Cell and Developmental Biology: Signal Transduction and Tumor Suppressor Genes 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Luo

MCELLBI 239H Research Review in Cell and Developmental Biology: Cell Division 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Cande

MCELLBI 239HH Research Review in Cell and Developmental Biology: Mechanisms of Control of Growth and Cell Proliferation 2 Units
Identifying pathways that restrict growth and cell proliferation in vivo.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Hariharan

MCELLBI 239I Research Review in Cell and Developmental Biology: Cytoskeleton and Cell Motility 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Welch

MCELLBI 239J Research Review in Cell and Developmental Biology: Steroid Hormone and Growth Factor Action 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Firestone

MCELLBI 239K Research Review in Cell and Developmental Biology: Secretion and Cell Membrane Assembly 2 Units
Cell surface growth with emphasis on the unicellular eukaryote S. cerevisiae.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Schekman

MCELLBI 239KK Research Review in Cell and Developmental Biology: Assembly and Subcellular Organization of Bacterial Organelles 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Komeili

MCELLBI 239M Research Review in Cell and Developmental Biology: MicroRNA Functions in Cancer Development, Mouse Tumor Models 2 Units
Malignant transformation represents the endpoint of successive genetic lesions that confer uncontrolled proliferation and survival, unlimited replicative potential, and invasive growth.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: He

MCELLBI 239N Research Review in Cell and Developmental Biology: Biophysics of Cell Motility and Morphogenesis 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Oster

MCELLBI 239O Research Review in Cell and Developmental Biology: Cancer Biology 2 Units
Inheritance, chromatin structure, gene expression, and the organization of chromosomes in the nucleus.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Karpen

MCELLBI 239Q Research Review in Cell and Developmental Biology: Regulation of Cell Polarity in Drosophila 2 Units
Mechanisms underlying the establishment and maintenance of cellular organization in epithelia and other cell types.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Bilder

MCELLBI 239R Research Review in Cell and Developmental Biology: Telomere Biology of Human Stem Cells 2 Units
The goal of our laboratory is to understand the key functions of telomeres and telomerase in tissue homeostasis, tumorigenesis, and aging. To this end, we generate genetically engineered human pluripotent and adult stem cell models to measure telomere and telomerase function during cellular differentiation and tumor formation.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Hockemeyer

MCELLBI 239T Research Review in Cell and Developmental Biology: The Cell Biology of Fertilization 2 Units
Research in our lab is focused on the cell biology of mammalian fertilization. Our lab uses biophysical, biochemical, and molecular genetics methods to study sperm ion channels and transporters that regulate sperm motility, chemotaxis, and the acrosome reaction. A better understanding of these processes will eventually lead to the development of effective tools to control and preserve male fertility, improve the reproductive health of human population worldwide, and advance family planning.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Lishko

MCELLBI 239U Research Review in Cell and Developmental Biology: The Cytoskeleton and Morphogenesis 2 Units
Review of current literature and discussion of current research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-0 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Drubin

MCELLBI 239V Research Review in Cell and Developmental Biology: Molecular Mechanisms of Transduction in Touch and Pain Receptors 2 Units
Review of current literature and discussion of current research.
Current research focuses on elucidating the molecular mechanisms of somatosensory mechanotransduction.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Bautista

MCELLBI 239W Research Review in Cell and Developmental Biology: Leech Embryology and Development 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Weisblat

MCELLBI 239X Malignant Transformation 2 Units
Malignant transformation by retroviruses and the role of protein phosphorylation in growth regulation.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Martin

MCELLBI 239Z Research Review in Cell and Developmental Biology: Chromosome Remodeling and Reorganization During Meiosis 2 Units
How chromosomes are reorganized during melosis to accomplish the pairing, recombinatin, and segregation leading up to successful gamete production.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Dernburg

MCELLBI 240 Advanced Genetic Analysis 4 Units
Principles and practice of classical and modern genetic analysis as applied to eukaryotic organisms, including yeast, nematodes, , mice and humans; isolation and analysis of mutations; gene mapping; suppressor analysis; chromosome structure; control of gene expression; and developmental genetics.
Rules & Requirements

Prerequisites: Graduate standing with 110 or 140 or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Instructors: Koshland, Meyer

MCELLBI C243 Seq: Methods and Applications 3 Units
A graduate seminar class in which a group of students will closely examine recent computational methods in high-throughput sequencing followed by directly examining interesting biological applications thereof.
Rules & Requirements

Prerequisites: Graduate standing in Math, MCB, and Computational Biology; or consent of the instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Instructor: Pachter

Also listed as: MATH C243

MCELLBI C244 Discrete Mathematics for the Life Sciences 4 Units
Introduction to algebraic statistics and probability, optimization, phylogenetic combinatorics, graphs and networks, polyhedral and metric geometry.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: MATH C239

MCELLBI 249A Research Review in Genetics and Development: Genetics of Regulatory Variation 2 Units
Work in my group will focus on transcriptional regulatory networks and their variation between members of a species.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Brem

MCELLBI 249BB Research Review in Genetics and Development: Aging and Protein Homeostasis 2 Units
Central to the aging process is the unfolding of the proteome. Specific areas under study include cellular responses to protein misfolding and coordination of these responses across an organism.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Dillin

MCELLBI 249C Research Review in Genetics and Development: Nucleic Acid-Protein Interactions and Control of Gene Expression 2 Units
Biochemical and molecular genetic aspects of eukaryotic messenger RNA splicing and transposition, with an emphasis on as an experimental system.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Rio

MCELLBI 249D Research Review in Genetics and Development: Mechanisms of Genetic Regulation in Yeast 2 Units
Genes, gene products and molecular mechanisms that control cell types in the unicellular eukaryote .
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Rine

MCELLBI 249E Research Review in Genetics and Development: Molecular Genetics of <Drosophila> 2 Units
Gene regulation and developmental neurobiology.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: G. Rubin

MCELLBI 249F Research Review in Genetics and Development: Neuronal Development 2 Units
Molecular and genetic approaches to the problem of how neurons develop, with emphasis on and .
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Garriga

MCELLBI 249G Research Review in Genetics and Development: Developmental and Evolutionary Genetics 2 Units
We study how genes control pattern formation during development and pattern modification during evolution.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Miller

MCELLBI 249H Investigating Cellular Aging and Chromosome Segregation during Gametogenesis 2 Units
This course focuses on understanding 1) how cellular aging is affected during gametogenesis, the developmental program that produces gametes for sexual reproduction and 2) how chromosome segregation is regulated during meiosis, the specialized cell division that generates gametes.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Unal

MCELLBI 249J Research Review in Genetics and Development: Developmental and Molecular Genetics of <C. elegans> 2 Units
Molecular and genetical analysis of sex determination and dosage compensation in the nematode .
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Meyer

MCELLBI 249K Research Review in Genetics and Development: Animal Origins 2 Units
Evaluation of current research on choanoflagellates, sponges, and animal origins. Intended to complement ongoing research for graduate students.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: King

MCELLBI 249L Imaging Single Molecules: Fashion or Game Changer? 2 Units
Research review in genetics, genomics and development. We will explore how the detection of single particles
(DNA, RNA, proteins) can help with understanding cellular organization and
enzymatic processes dynamics and kinetics. Most of the experiments described will be drawn from the gene expression and nuclear organization
literature.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Darzacq

MCELLBI 249M Research Review in Genetics and Development: Saccharomyces Cerevisiae Microtubule Cytoskeleton 2 Units
Review of current literature and discussion of current research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Barnes

MCELLBI 249MM Physical Biology of Living Organisms 2 Units
Research review in genetics, genomics and development. In development a single cell goes through a series of repeated divisions and these cells read the program encoded in their DNA in order to become
familiar cell types such as those found in muscle, liver, or our brains. The goal of our lab is to uncover the rules behind these decisions with the objective of predicting and manipulating developmental programs from just
looking at DNA sequence. In order to reach this predictive understanding we
combine physics, synthetic biology, and new technologies to query and control developmental decisions in real time at the single cell level in the fruit fly embryo.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Garcia

MCELLBI 249N Research Review in Genetics and Development: Gene Regulation 2 Units
Current literature and research in gene regulation will be covered in research reports and reviews of the current literature and in discussion of current experiments in the field.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Levine

MCELLBI 249O Research Review in Genetics and Development: Genome Sequences 2 Units
Biochemistry, cancer biology and virology, cell biology, computational biology, genetics, microbiology, molecular and cell physiology.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Eisen

MCELLBI 249P Research Review in Genetics and Development: Mesodermal Patterning and Segmentation 2 Units
Genetic, molecular, and embryological aspects of mesodermal patterning and segmentation, with emphasis on the vertebrate, zebrafish.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Amacher

MCELLBI 249Q Research Review in Genetics and Development: Computational Genomics 2 Units
Recent developments in computational methods for genomics and their application for understanding the structure and function of genes encoded in completely sequenced genomes.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Brenner

MCELLBI 249S Research Review in Genetics and Development: Evolution of Development Mechanisms 2 Units
Evolution of development mechanisms with a focus on the genes that regulate segmentation and regionalization of the body plan.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Patel

MCELLBI 249T Research Review in Genetics, Genomics and Development: Evolution of Genomes 2 Units
Comparative analysis of eukaryotic genomes to inform the origins and diversification of animals and plants.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Rokhsar

MCELLBI 249U Research Review in Genetics and Development: Assembly of Eukaryotic Chromosomes 2 Units
Biochemical and genetic characterization of proteins that assemble histones onto DNA. Analysis of the relationship of chromatin assembly to DNA replication and gene expression.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Kaufman

Formerly known as: 219A

MCELLBI 249V Research Review in Genetics and Development: Induction in Vertebrate Development and ES Cell Differentiation 2 Units
The Roelink laboratory is interested in the mechanisms of embryonic induction, the phenomenon in which a group of cells changes the developmental fate of neighboring cells via the release of inducers.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Roelink

MCELLBI 249X Research Review in Genetics and Development: Comparative Genomics and Computational Biology 2 Units
The fundamental problem of comparative genomics: the determination of the origins and evolutionary history of the nucleotides in all extant genomes. My work incorporates various aspects of genomics, including the reconstruction of ancestral genomes (paleogenomics), the modeling of genome dynamics (phylogenomics and systems biology), and the assignment of function of genome elements (functional genomics and epigenomics).
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Pachter

MCELLBI 249Y Research Review in Genetics and Development: Mechanisms of Gene Control in Vertebrate Animals 2 Units
This course will focus on mechanisms of gene control in vertebrate animals, particularly in the area of vertebrate development. Amphibian egg formation, mesoderm induction, neural induction, and patterning of the nervous system at the molecular level. Control of transcription, post-transcriptional control of gene expression (including control of RNA turnover and RNA localization).
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Harland

Formerly known as: 218Y

MCELLBI 249Z Research Review in Genetics and Development: Chromosome Structure and Integrity, Genome Evolution 2 Units
Use of genetic, cell biological, and biochemical approaches in budding yeast to understand genome integrity, genome evolution, and most recently desiccation tolerance.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Koshland

MCELLBI 250 Advanced Immunology 4 Units
Molecular and cellular analysis of the immune response emphasizing concepts and methodology. Innate immunity, pathogen sensors, antibodies and T cell receptors, lymphocyte activation, tolerance and selection. Antigen processing, T cell subtypes, and T regulatory cells. NK cells, tumor surveillance, and AIDS.
Rules & Requirements

Prerequisites: 100, 110, 140, 150 or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 251 The Regulation of Immune System Development and Function 1 Unit
This is an advanced seminar course which will consider current research questions and experimental approaches in molecular and cellular immunology. Each registrant will present a 30-minute research talk describing the problems they are studying, the approach they are taking, their preliminary data, and technical problems. Other course participants (including basic immunology faculty) will provide criticism and suggestions.
Rules & Requirements

Prerequisites: 250 or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Winoto

MCELLBI 259B Research Review in Immunology and Pathogenesis: Specificity of T Lymphocytes 2 Units
Mechanisms of immune surveillance by T lymphocytes.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Shastri

MCELLBI 259C Research Review in Immunology and Pathogenesis: Nuclear Receptor-Mediated Regulation of Neuroinflammation 2 Units
In this course we will discuss our research as well as recent literatures focusing on understanding of 1) How is homeostasis in the CNS regulated by innate immune functions of microglia? 2) How can we intervene in dysfunction of microglia-mediated immune functions using NRs signaling and transcription?
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Saijo

MCELLBI 259D Research Review in Immunology and Pathogenesis: Mycobacterial Biology and Host-Pathogen Interactions 2 Units
We will discuss macrophage biology and innate immunity in the context of infection with *Mycobacterium tuberculosis* through
discussion of current research from the Stanley Lab and both cutting edge and classic literature in relevant fields.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Stanley

MCELLBI 259E Research Review in Immunology and Pathogenesis: Regulation of T Cell Receptor Genes Expression 2 Units
Molecular biology of T cell receptor genes and their transcription controlling proteins/genes. Programmed cell death during thymocyte differentiation.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Winoto

MCELLBI 259F Research Review in Immunology and Pathogenesis: Natural Killer (NK) Cell and T Cell Receptors 2 Units
Molecular and biological basis for recognition by natural killer cells and T cells.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Raulet

MCELLBI 259G Research Review in Immunology and Pathogenesis: T Cell Development 2 Units
Molecular and cellular aspects of thymocyte differentiation.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Robey

MCELLBI 259H Research Review in Immunology and Pathogenesis: B Cell Differentiation 2 Units
Molecular basis of terminal B cell differentiation. Role of transcription factors in B cell activation.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Sha

MCELLBI 259J Research Review in Immunology and Pathogenesis: Immune Evasion by Viruses 2 Units
The mechanisms used by viruses to counteract the pressure of the immune system.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Coscoy

MCELLBI 259M Research Review in Immunology and Pathogenesis: Innate Immunity and Innate Control of Adaptive Immunity 2 Units
Innate immunity and innate control of adaptive immunity.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Barton

MCELLBI 259N Research Review in Immunology and Pathogenesis: Immunology, Microbiology, and Genetics of Bacterial Pathogenesis 2 Units
Role of innate host responses in defense against intracellular bacterial pathogens.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Vance

MCELLBI C260 Introduction to Neurobiology 4 Units
An introductory course designed to provide a general understanding of the nervous system including how it functions, how it develops, and how it changes with learning and memory. Analysis from the level of molecules to cells to simple circuits to complex networks to higher brain functions.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: NEUROSC C260

MCELLBI C261 Advanced Cellular Neurobiology 3 Units
Physical-chemical basis of membrane potentials, electrotonus, action potential generation and propagation, synaptic transmission, sensory receptor function, and volume conductor potentials.
Rules & Requirements

Prerequisites: Molecular and Cell Biology 160

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: NEUROSC C261

MCELLBI C262 Advanced Topics in Systems Neuroscience 3 Units
Advanced coverage of current research problems in systems-level neuroscience, and experimental and computational techniques used for these studies.
Rules & Requirements

Prerequisites: 160 or equivalent

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Formerly known as: IDS 200B

Also listed as: NEUROSC C262

MCELLBI C263 Advanced Developmental Neurobiology 3 Units
Advanced level coverage of current research problems in the embryonic and post-embryonic development of invertebrate and vertebrate nervous systems.
Rules & Requirements

Prerequisites: 162 or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

Also listed as: NEUROSC C263

MCELLBI 269A Research Review in Neurobiology: Special Topics in Neuroplasticity 2 Units
Molecular and cellular studies of nerve growth, axon guidance, synaptic formation, and synaptic plasticity using electrophysiological and optical imaging techniques.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Poo

MCELLBI 269B Research Review in Neurobiology: Synaptic Transmission and Neuromodulation 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Zucker

MCELLBI 269C Research Review in Neurobiology: Molecular Mechanisms of Neuronal Plasticity 2 Units
Research in our laboratory focuses on understanding how neurons use biochemical pathways to integrate diverse types of information in order to adjust synaptic strength and modulate neuronal excitability, and how these interactions go awry in disease. To investigate this we are taking a multi-disciplinary approach incorporating molecular, biochemical, imaging, and electrophysiological analyses in mouse and human cells.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Bateup

MCELLBI 269D Research Review in Neurobiology: Signaling Within and Between Neurons 2 Units
Review of recent research in molecular mechanisms involved in intracellular and extracellular signaling in the nervous system.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Kramer

MCELLBI 269F Optogenetic Dissection of Neural Circuits 2 Units
Research review in neurobiology. Review of recent optogenetic strategies for dissecting neural connectivity, function, and dysfunction in the rodent and primate brain.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Lammel

MCELLBI 269H Research Review in Neurobiology: Recent Advances in Retinal Neurobiology 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Werblin

MCELLBI 269I Research Review in Neurobiology: Stem Cells and Gene Therapy in the Nervous System 2 Units
The basic investigation of neural differentiation of stem cells, as well as the
use of stem cells and gene delivery for neuroregeneration.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Schaffer

MCELLBI 269J Research Review in Neurobiology: Taste Recognition in Drosophila 2 Units
The molecular and cellular basis of taste perception in the model organism .
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Scott

MCELLBI 269M Research Review in Neurobiology: Insect Neurophysiology 2 Units
Drosophila mutants that have behavioral abnormalities to unravel new and basic features of nervous system structure and function.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Tanouye

MCELLBI 269O Research Review in Neurobiology: Neural Circuits for Sensory Processing and Behavior 2 Units
Microcircuitry of the cerebral cortex that underlies sensory processing and adaptive behavior.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Adesnik

MCELLBI 269Q Research Review in Neurobiology: Sensory Processing and Plasticity in Cerebral Cortex 2 Units
How the cerebral cortex processes sensory input and stores information about the sensory world. We focus on the rat's primary somatosensory (S1) cortex.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Feldman

MCELLBI 269R Research Review in Neurobiology: Potassium Channels and Synaptic Plasticity 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Isacoff

MCELLBI 269S Research Review in Neurobiology: Molecular Mechanisms of Olfaction 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Ngai

MCELLBI 269T Research Review in Neurobiology: Processing of Visual Information in the Mammalian Brain 2 Units
Review of current literature and discussion of original research.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Dan

MCELLBI 269U Research Review in Neurobiology: Diseases/Retina 2 Units
Evaluation of current research in molecular mechanisms underlying diseases of the retina.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Flannery

MCELLBI 269W Research Review in Neurobiology: Neural Activity Affecting the Assembly of Neural Circuits 2 Units
How neural activity affects the assembly of neural circuits.
Rules & Requirements

Prerequisites: Enrollment is restricted to students conducting research in the laboratory of the instructor, or requires consent of instructor

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Feller

MCELLBI 280A Selected Topics in Molecular and Cell Biology 1 Unit
The course will focus on fundamental principles, essential concepts, and recent advances in select topics in molecular and cell biology. Topics include genomics and computational biology, molecular evolution, neurons and synapses, microbi ology and immunology, macromolecular structure and function, and scientific writing. Courses are taught in tandem and maybe taken individually.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 280B Selected Topics in Molecular and Cell Biology 1 Unit
The course will focus on fundamental principles, essential concepts, and recent advances in select topics in molecular and cell biology. Topics include genomics and computational biology, molecular evolution, neurons and synapses, microbi ology and immunology, macromolecular structure and function, and scientific writing. Courses are taught in tandem and maybe taken individually.
Rules & Requirements

Prerequisites: Graduate standing and consent of instructor

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 280C Selected Topics in Molecular and Cell Biology 1 Unit
The course will focus on fundamental principles, essential concepts, and recent advances in select topics in molecular and cell biology. Topics include genomics and computational biology, molecular evolution, neurons and synapses, microbi ology and immunology, macromolecular structure and function, and scientific writing. Courses are taught in tandem and maybe taken individually.
Rules & Requirements

Prerequisites: Graduate standing and consent of instructor

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 280D Selected Topics in Molecular and Cell Biology 1 Unit
The course will focus on fundamental principles, essential concepts, and recent advances in select topics in molecular and cell biology. Topics include genomics and computational biology, molecular evolution, neurons and synapses, microbi ology and immunology, macromolecular structure and function, and scientific writing. Courses are taught in tandem and maybe taken individually.
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 280E Selected Topics in Molecular and Cell Biology 1 Unit
The course will focus on fundamental principles, essential concepts, and recent advances in select topics in molecular and cell biology. Topics include genomics and computational biology, molecular evolution, neurons and synapses, microbi ology and immunology, macromolecular structure and function, and scientific writing. Courses are taught in tandem and maybe taken individually.
Rules & Requirements

Prerequisites: Graduate standing and consent of instructor

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 280F Selected Topics in Molecular and Cell Biology 1 Unit
The course will focus on fundamental principles, essential concepts, and recent advances in select topics in molecular and cell biology. Topics include genomics and computational biology, molecular evolution, neurons and synapses, microbi ology and immunology, macromolecular structure and function, and scientific writing. Courses are taught in tandem and maybe taken individually.
Rules & Requirements

Prerequisites: Graduate standing and consent of instructor

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 5 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 290 Graduate Seminar 1 Unit
Graduate student presentations on selected research topics in molecular and cell biology. Several sections covering different topics offered each semester. Concurrent enrollment in more than one section is permitted. List of topics to be announced before each semester.
Rules & Requirements

Prerequisites: Graduate standing in the department or consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 291A Introduction to Research 2 - 12 Units
Closely supervised experimental work under the direction of an individual faculty member; an introduction to experimental methods and research approaches in particular areas of molecular and cell biology.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 2-12 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade. This is part one of a year long series course. A provisional grade of IP (in progress) will be applied and later replaced with the final grade after completing part two of the series.

MCELLBI 291B Introduction to Research 2 - 12 Units
Closely supervised experimental work under the direction of an individual faculty member; an introduction to experimental methods and research approaches in particular areas of molecular and cell biology.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 2-12 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade. This is part two of a year long series course. Upon completion, the final grade will be applied to both parts of the series.

MCELLBI 292 Research 3 - 12 Units
Individual research under the supervision of a faculty member.
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI N292 Research 3 - 6 Units
Individual research under the supervision of a staff member.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Summer: 8 weeks - 3-6 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Letter grade.

MCELLBI 293A Research Seminar 2 Units
Seminar on presentation and evaluation of results in area of student's individual research interests.
Rules & Requirements

Prerequisites: Concurrent enrollment in 291A or 292

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

MCELLBI 293C Responsible Conduct of Research 1 Unit
This course will cover topics in responsible conduct in research drawing from case studies of the Association of American Medical Colleges and the NIH. Students will review case studies in preparation for class discussion. Required of all MCB graduate and post doctoral students funded on NIH training grants. One session will probably feature a guest lecturer on a topic relevant to the course.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1.5-1.5 hours of discussion and 1.5-1.5 hours of lecture per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

MCELLBI 295 Careers for Life Sciences Ph.D's 1 Unit
This course is designed to assist graduate students in the biological sciences with planning their postgraduate careers. Weekly guest speakers will present their experiences on a variety of topics. Postdoctoral students are invited. Topics may include academia; job searches; setting up a laboratory; patent law/technology transfer; public policy/regulatory affairs; bioinformatics; science writing/technical support; forensic science; postdoctoral positions in industry; teaching, and other topics of interest.
Rules & Requirements

Prerequisites: Open to graduate and postdoctoral students

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

MCELLBI 380 Teaching of Molecular and Cell Biology 1 - 2 Units
Teaching laboratories and/or discussions for Molecular and Cell Biology courses: analysis of specific format and problems. Two units of credit for those with 50% teaching appointment; one unit of credit for those with 25% teaching appointment.
Rules & Requirements

Prerequisites: Appointment as graduate student instructor or consent of instructor

Repeat rules: Course may be repeated for a maximum of 4 units.Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of seminar per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

MCELLBI 481B Instrumentation in Molecular and Cell Biology: Transmission Electron Microscopy 1 - 4 Units
Individualized laboratory instruction.
Rules & Requirements

Prerequisites: Graduate standing; consent of instructor and sponsorship of a faculty member

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Other professional

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Cande

MCELLBI 481C Instrumentation in Molecular and Cell Biology: Scanning Electron Microscopy 1 - 4 Units
Individualized laboratory instruction.
Rules & Requirements

Prerequisites: Graduate standing; consent of instructor and sponsorship of a faculty member

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Other professional

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Cande

MCELLBI 601 Individual Study for Master's Students 1 - 8 Units
Individual study for the comprehensive or language examinations in consultation with the field adviser.
Rules & Requirements

Credit Restrictions: Course does not satisfy unit or residence requirements for master's degree.

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-8 hours of independent study per week

Summer: 8 weeks - 1.5-15 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

MCELLBI 602 Individual Study for Doctoral Students 1 - 8 Units
Individual study in consultation with the major field adviser. Intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D.
Rules & Requirements

Prerequisites: Restricted to Ph.D. candidates

Credit Restrictions: Course does not satisfy unit or residence requirements for doctoral degree.

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-8 hours of independent study per week
8 weeks - 1-8 hours of independent study per week

Additional Details

Subject/Course Level: Molecular and Cell Biology/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.