College | Life Sciences
Microbiology, Immunology & Molecular Genetics

Microbiology, Immunology, & Molecular Genetics (MIMG) Major Overview

Last updated July 2024. Course offerings and major information are subject to change.
This document was compiled by the MIMG Advising Team. For any questions, please contact the undergraduate advisors at undergrad@microbio.ucla.edu

MIMG Undergraduate Advising

MIMG Advisors: Dr. Jenesis Fonseca and Sierra Dwyer

Contact us via the MIMG Advising Email: undergrad@microbio.ucla.edu → Always include your University ID (UID). Your UID is a unique, nine-digit number, which can be located in several places including on your UCLA ID card (BruinCard).

MIMG Listserv

We share key information via our "Listserv" email list including: **Office Hours, Appointment Scheduling Page**, and **MIMG announcements** (reminders, events, and opportunities for students).

Please email us at undergrad@microbio.ucla.edu with your UID and preferred email to be added to the Listserv.

Office Hours and Individual Appointments
We offer office hours and individual appointment sessions to students in our major. Information about specific times is shared via the listserv on a weekly basis.

Advising Office Hour Policies

- **Office Hours are designed for drop-in, brief questions about the MIMG major.**
  - These sessions are *limited to 15 minutes or less,* and may depend on the number of students needing support.

- **Office Hours are held in-person or via Zoom**
  - Upon joining Zoom Office Hours, you'll be placed in a waiting room.
  - There might be a wait time of up to 15 minutes if we're with another student. We'll admit you into the meeting as soon as possible.

- **If you can't attend Office Hours:**
  - Most questions can be answered via email or by checking out MIMG's website.

- Please email us at undergrad@microbio.ucla.edu with your UID and specific questions, and we will get back to you as soon as possible. Make sure to include your UID in your message.

Individual Advising Appointment Policies

Individual advising appointments are reserved for MIMG students who cannot attend Office Hours or who may have more complex MIMG inquiries.

Current MIMG students can schedule 1-on-1 MIMG advising appointments for the following purposes *only:*

1. MIMG major and pre-major/LS core questions.
2. Short-term planning for MIMG major courses.
3. Enrollment questions/concerns about MIMG courses.
4. Questions about MIMG research opportunities.

If you want to meet to plan your MIMG courses, we will expect you to do the following ahead of time:

1. Review MIMG's Degree Requirements.

2. Bring a prepared draft of your MIMG Major Plan/Courses. (If helpful, please use our Editable MIMG Major/Course Plan).

Schedule Individual MIMG Advising Appointments here.*
**Incoming students can make appointments after your summer Orientation advising session.*

MIMG Career Pathways & Resources

Undergraduate students majoring in MIMG prepare for careers in biomedical research, medicine, dentistry, or other health professions, biotechnology and genetic engineering, industrial microbiology, agricultural or environmental sciences, public health, and law or bioethics, among others.

Some MIMG students are Pre-Health. Students should utilize UCLA Pre-Health Services and be aware of Pre-Health requirements at UCLA.

Students can utilize UCLA Career Advising for career advising and resources.

The MIMG Department does not have its own degree-granting MS or PhD program. Those who are interested in graduate studies in biological sciences should apply through UCLA's Graduate Programs in Bioscience (GPB), a consortium of 11 home areas and their affiliated PhD programs, organized to provide the best possible research training and professional development for graduate students pursuing PhDs in the life and biomedical sciences.

MIMG Major Preparation Courses:The Life Sciences (LS) Core

The LS Core is designed to prepare students for any discipline in the life sciences and includes all preparation courses for the MIMG major.

LS Core Grading Policy

- All MIMG major classes and major preparation classes (Life Science Core) must be taken for a letter grade and passed with a grade of C– or better and must be completed with an overall grade-point average of 2.0 or better.
- Students receiving a grade of D or F in two LS core courses, either in separate courses or repetitions of the same course, are subject to dismissal from the major and ineligible to continue in the MIMG program.

LS Core Curriculum

Chemistry (General and Organic)

Chem 14 A, 14B, 14BL, 14C, 14CL*, 14D,
OR
Chem 20A, 20B, 20L, 30A, 30AL, 30B, 30BL*

**(Chem 14CL and Chem 30BL are not required of MIMG majors, but required to meet medical school eligibility requirements to apply.)*

Mathematics (Calculus and Statistics)

Math 3A, 3B, 3C and Stats 13**
OR
Math 31A, 31B, 32A and Stats 13**
OR
Life Sciences 30A, 30B, and Stats 13**

***Stats 10 is not an appropriate alternative to Stats 13 requirement. Exceptions are made for transfer students who have already completed Stats 10 before arriving at UCLA.*

Calculus-based Physics

Physics 5A, 5B, 5C
OR
Physics 1A, 1B, 1C, 4AL, 4BL

NOTE: Physics series is not a prerequisite for any MIMG major courses and can be completed as desired before graduation.

Life Sciences (Biology, Cell/Molecular Biology)

Life Sciences 7A, 7B, 7C, 7L*

**7L is an impacted course. For more about Impacted Courses review the Registrar's Office website.*
**7L was previously referred to as 23L before fall 2024.*

MIMG Foundation Course Prerequisites

MIMG Major Foundation Course:	**Prerequisite:**	**MIMG Major Course Typically Offered in the Following Qtr(s):** *Course offerings are subject to change.*
CHEM 153A (impacted)	CHEM 14D	All quarters
CHEM 153B (impacted) OR MIMG 132	CHEM 153A OR LIFESCI 107	All quarters or spring
LIFESCI 107	CHEM 14A, 14C, LIFESCI 7C, 7L	All quarters (uniquely for 2024-2025, offered Winter and Spring)
MIMG 101	LIFESCI 7A, 7B, 7C & 7L	Fall & Winter
MIMG 185A	LIFESCI 7A, 7B, 7C, 7L, CHEM 153A	Winter & Spring
MIMG 103AL/BL or 109AL/BL	LIFESCI 7A, 7B, 7L, MIMG 101	All quarters

MIMG Major Requirements (Path 1 or Path 2)

MIMG Department Academic Policies:

- Each major course must be taken for a letter grade of C− or better, and students must have a minimum overall grade-point average of 2.0 or better in the major. Students receiving a grade of D or below in two major courses, either in separate courses or repetitions of the same course, are subject to dismissal from the major.
- Any single course can be used in only ONE category of the major.
- Courses do not have to be taken in the order outlined on this page.

Path 1 vs. Path 2

- Path 1 & Path 2 represent the two concentrations in our major based on the lab course options.
- All students entering the MIMG major will be Path 1 automatically.
- To be admitted to Path 2, the student must be researching in a MIMG, MCDB, or other approved lab; have a GPA of at least 3.0; and submit an application for consideration.
- Students must apply for Path 2 no later than Winter quarter of third year, however exceptions may be made for transfer students to Fall quarter of their fourth year.

Course availability is subject to change. Some elective courses may have restrictions or pre-requisites. Always refer to the Schedule of Classes for the most up to date information.

PATH 1 **Research Immersion Lab**		
5 Foundation Courses		
Quarter	Course	Units
All	Chem 153A - Biochemistry	4
All/Sp	Chem 153B OR MIMG 132	4
All	Life Science 107	5
F, W	MIMG 101 - Intro Microbio	4
W, Sp	MIMG 185A - Immunology	5
Path 1 Lab Course *Virology **or** Microbiology: 1 quarter lab + 1 quarter analysis.*		
Quarter	Course	Units
F+W; W+Sp	MIMG 103AL Lab +103BL Analysis Virology	5+4

PATH 2 **Independent Research**		
5 Foundation Courses		
Quarter	Course	Units
All	Chem 153A - Biochemistry	4
All/Sp	Chem 153B OR MIMG 132	4
All	Life Science 107	5
F, W	MIMG 101 - Intro Microbio	4
W, Sp	MIMG 185A - Immunology	5
Path 2 Lab Contract Courses *2 quarters research + analysis course/seminar.*		
Quarter	Course	Units
W+Sp; Sp+F	MIMG 196A Research Apprenticeship I + MIMG 180A Analysis	4+2

F+ W, W + Sp	***OR*** MIMG 109AL Lab +109BL Analysis Microbiology	

2 Focus Electives *Choose 2 courses.*		
Quarter	Course	Units
All	Chem 153B - Biochem: DNA,RNA	4
All	Chem 153L - Biochem Lab	4
All	MCDB 138 - Developmental Bio	5
All	MCDB 165A - Biology of Cells	5
W	MIMG 102 - Virology	4
F	MIMG 105 - Biol Microscopy	4
Sp	MIMG 132 - Cell Bio of Nucleus	4
W	MIMG CM156 - Human Genetics	4
W	MIMG 158 - Microbial Genomics	4
W	MIMG 168 - Parasitology	4

1-2 General Electives Complete 4 units		
Quarter	Course	Units
	Options: 1.Continue taking Focus Electives 2. MIMG Courses below:	
Sp	MIMG C122 and/or MIMG 185B	2
W	MIMG 191H - Honors Seminar	2
All	MIMG 198 - Dept Hon. Research	4
All	MIMG 199 - Research	4

W+Sp; Sp+F	MIMG 196B Research Apprenticeship II + MIMG 180B Analysis	4+2

2 Focus Electives *Choose 2 courses.*		
Quarter	Course	Units
All	Chem 153B - Biochem: DNA,RNA	4
All	Chem 153L - Biochem Lab	4
All	MCDB 138 - Developmental Bio	5
All	MCDB 165A - Biology of Cells	5
W	MIMG 102 - Virology	4
F	MIMG 105 - Biol Microscopy	4
Sp	MIMG 132 - Cell Bio of Nucleus	4
W	MIMG CM156 - Human Genetics	4
W	MIMG 158 - Microbial Genomics	4
F	MIMG 168 - Parasitology	4

General Electives Complete 4 units		
Quarter	Course	Units
	Options: 1.Continue taking Focus Electives 2. MIMG Courses below:	
Sp	MIMG C122 and/or MIMG 185B	2
W	MIMG 191H - Honors Seminar	2
All	MIMG 198 - Dept Hon. Research	4
All	MIMG 199 - Research	4

3. See other Dpt. Approved Courses	3. See other Dpt. Approved Courses

Approved MIMG General Elective Courses

Department	Course		Units
Bioengineering	100	Bioengineering Fundamentals	4
	CM145	Molecular Biotechnology for Engineers	4
	CM178	Intro to Biomaterials	4
Biostatistics	100A	Intro to Biostatistics	4
Chem & Biochem	103	Environmental Chemistry	4
	110A	Physical Chemistry: Chemical Thermodynamics	4
	M117	Structure, Patterns & Polyhedra	5
	136	Organic Structural Methods	5
	C140	Bionanotechology	4
	153B	Biochem: DNA, RNA, and Protein Synthesis	4
	153C	Biochem: Biosynthetic & Energy Metabolism & Its Regulation	4
	153L	Biochemical Methods I	4
	154	Biochemical Methods II	5
	156	Physical Biochemistry	4
	CM160A	Bioinformatics and Genomics	4
	171	Intermediate Inorganic Chemistry	4
	172	Advanced Inorganic Chemistry	4
	C179	Biological Inorganic Chemistry	4
	C181	Polymer Chemistry	4
Computer Science	CM121	Introduction to Bioinformatics	4
	CM122	Algorithms in Bioinformatics and Systems Biology	4
	CM124	Computational Genetics	4
EE Biol	121	Molecular Evolution	4
	C135	Population Genetics	4
	137	Chemical Communication	4
	162	Plant Physiology	4
Epidemiology	100	Intro to Epidemiology	4

Human Genetics	C144	Genomic Technology	4

MCDB	100	Introduction to Cell Biology (no credit if 165A completed)	5	All
	104AL	Research Immersion Laboratory in Developmental Biology	5	
	138	Developmental Biology	5	
	M140	Cancer Cell Biology	5	
	C141	Molecular Basis of Plant Differentiation and Dev.	5	
	143	Dev. Biology: Genetic control of organogenesis	5	
	144	Molecular Bio of Cellular Processes (no credit if Chem 153B completed)	5	
	C150	Plant Chemical & Molecular Communication	4	
	165A	Biology of the Cell	5	
	168	Stem Cell Biology	5	
	172	Genomics and Bioinformatics	5	
	M175A	Neuroscience: From Molecules To Mind	5	
	M175B	Neuroscience: From Molecules To Mind	5	
	M175C	Neuroscience: From Molecules To Mind	5	
	187AL	Research Immersion Lab in Genomic Biology	5	

Department	**Course**		**Units**
Neuroscience	M101A	Cellular and Systems Neuroscience	5
	M101B	Molecular and Developmental Neuroscience	5
	M101C	Behavioral and Cognitive Neuroscience	5

Physci	CM103	Basic Human Bio for Biomed Engineers	4
	121	Disease Mechanisms and Therapies	4
	124	Molecular Biology of Aging	4
	125	Molecular Systems Biology	4
	128	Me, Myself and Microbes: The Microbiome in Health and Disease	5

Statistics	100A	Introduction to Probability	4
	100B	Introduction to Mathematical Statistics	4

MIMG Laboratory Requirements Overview

The Competency-based Research Laboratory Curriculum (CRLC) is designed to provide in-depth research opportunities for all students in the major. Laboratory requirements may be completed as follows:

Path 1:
Students may choose one of two laboratory courses referred to as *Research Immersion Labs* (Path 1 AL courses). The process of discovery is demonstrated through a guided, inquiry-based experience organized around team research project objectives. Activities span two consecutive quarters with each *Research Immersion Lab* followed by an *Advanced Research Analysis* course (Path 1 BL courses). The first course offers hands-on experience collecting data, analyzing preliminary results, and reading the scientific literature, and the second course emphasizes rigorous quantitative and computational analysis of data, oral presentation and discussion of research ideas, and formal written documentation of research accomplishments. All Path 1 students share their research achievements with peers and faculty by presenting a poster at a symposium.

Path 2:
Students interested in pursuing an independent research experience in a faculty mentor's laboratory may fulfill departmental major requirements by completing at least two consecutive quarters of letter-graded laboratory research (Path 2 course 196A/B) coupled to participation in concurrent research seminars (180A and 180B). Those who complete all course requirements for Path 2 are exempt from participating in Path 1.
This Path is suited for third-year students who maintain a 3.0 grade-point average in their major and who develop an interest in research while participating in a *Research Apprenticeship* experience in an MIMG, MCDB or other approved faculty mentor's laboratory. Path 2 students should acquire in-depth and broad knowledge about their research project by evaluating relevant scientific literature, orally presenting and formally writing about their research progress.
Eligible students must apply and be approved for enrollment in Path 2 by departmental curriculum committees.
All Path 2 students share their research achievements with peers and faculty by presenting a poster at a symposium at the end of 180B.

MIMG Departmental Honors Program

What is Departmental Honors?

To achieve departmental honors in MIMG, the student must:

- Be an MIMG student.
- Complete three consecutive quarters of MIMG 198A-B-C (individual honors research) preferably in the lab of an MIMG faculty member. Exceptions involving research in a non-MIMG lab will be considered on a case-by-case basis.
- Preferably, begin the honors research during the spring quarter of the year *before* the final year. Then, the student can use part of the spring quarter of the final year to write the thesis. In this case the thesis should be completed by May 15th (see the Honors Thesis

Guidelines below). Alternatively, the student can begin in the fall quarter of their final year, in which case their thesis is due by the end of Week 10 of the final year.
- Complete MIMG 191H in the winter quarter of their last year (a two-unit seminar class).
- Have a GPA of at least 3.5 in the upper-division major courses at the time of graduation.
- Write a comprehensive thesis, to be approved by the Faculty Honors Advisor (see below).

How do I qualify for Departmental Honors?

Before beginning the first quarter of MIMG 198, the student must:

- Have experience in the lab they are proposing to do their honors thesis in.
- Experience consists of SRP (MIMG 99), MIMG 196 or 199, or from volunteer work.
- Have a GPA of at least a 3.2 in the life science core curriculum courses and at least 3.5 in the major courses.
- Connect with the Faculty Honors Advisor

Faculty Honors Advisor:

Dr. Jeffrey H. Miller, 437 Boyer Hall; (310) 825 8460; jhmiller@mbi.ucla.edu

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Before pursuing Honors to enroll in MIMG 198A, the student must ask the mentor to email Dr. Miller to say that the mentor consents to the student doing honors research in their lab. Once the mentor's email has been sent, the student should contact Dr. Miller via email to discuss the proposed project. Because the student has already been working in the lab, they should have a basic idea of what they will be researching. Dr. Miller will review the student's project.

If Dr. Miller approves the proposed project, he will notify both the student and Dr. Fonseca via email. The student must then sign the Departmental Honors Application, create a 198A contract, and submit both documents to Dr. Fonseca, MIMG's Student Services Advisor, by contacting undergrad@microbio.ucla.edu. Once these conditions are fulfilled, Dr. Fonseca can enroll the student in MIMG 198A.

MIMG 199s:

- MIMG 199s are research opportunities for undergraduate students to earn academic credit (4 units) for research work in a contract course.
- 199s require in-depth, independent research projects, 12-16 hours per week in a lab, a report every quarter, and letter grading. Students must complete EH&S Laboratory Safety Fundamentals Concepts course.
- Learn more about finding a faculty sponsor on our website or check out MIMG Research Resources & Tips for Undergraduate Students

Please Note: UCLA Upper Division Requirement- Students must receive credit for 180 quarter units minimum to graduate from UCLA

- Of those units, **60 units must come from upper division coursework** (courses numbered 100-199)
- As an MIMG major, you are required to take (at least) 43 units of upper division credit for Path 1 or 46 units for Path 2.

- This leaves a balance of 14-17 upper division units that you must take in order to satisfy the College requirement for upper division units.
    - These 14-17 units can come from **ANY** upper division courses that you wish to take. Please feel free to go outside of the sciences to make up those 14-17 units and to balance the heavy science course load in your 3rd and 4th years.

Students Who Wish to Switch Into the MIMG Major

- An established UCLA GPA of at least 2.0
- Significant progress in the Life Science Core preparation classes
- Assurance that you can finish by your current Degree Expected Term if you switch into our major

Note: Transfer students are not able to change from a non-life science major into a life science major after admission to UCLA. Biochemistry is not considered a life science major at UCLA.

Upper Division MIMG Course Descriptions

101 Introductory Microbiology (4)
Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3 and 4, or 7A, 7B, and 7L. Historical foundations of microbiology; introduction to bacterial structure, physiology, biochemistry, genetics, and ecology. Letter grading.

102 Introductory Virology (4)
Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3, or 7A, 7B, and 7L with grades of C- or better. Biological properties of bacterial and animal viruses, replication, methods of detection, interactions with host cells and multicellular hosts. Letter grading.

103AL Research Immersion Laboratory in Virology (5)
Lecture, two and one half hours; laboratory, eight hours. Requisites: MIMG 101, Life Sciences 3, 4, and 7L, or 7A, 7B, and 7L. MIMG 103AL is requisite to MIMG 103BL. Limited to Microbiology, Immunology, and Molecular Genetics majors. Research-oriented laboratory experience designed to promote discovery of novel bacterial viruses (phages). Working in teams, students conduct research projects that incorporate techniques in microbiology, virology, and molecular biology and involve use of bioinformatics tools and computational analysis software. Emphasis on reading and understanding scientific literature as well as improving critical thinking skills such as ability to evaluate hypotheses or experimentally address scientific questions. Critical aspects of research process, including record keeping, ethics, laboratory safety and citizenry, mechanics of scientific writing, and project responsibilities and ownership. Letter grading.

103BL Advanced Research Analysis in Virology (4)
Laboratory, six hours. Requisites: course 103AL, and Life Sciences 40 or Statistics 13. Limited to Microbiology, Immunology, and Molecular Genetics majors. Designed to provide students authentic, discovery-based research experience in life sciences. Investigation to be primarily computational in nature whereby students use bioinformatics or mathematical modeling software to interpret, expand, or refine datasets. Use of graphics software to prepare figures and illustrations for presentations, posters, reports, and websites (database entries). Research accomplishments

discussed in weekly seminar-style meetings in which student groups create PowerPoint slides and formally present results to class. Production of team poster and final report describing the entire research project required. Letter grading.

105 Biological Microscopy (4)
Lecture, four hours; laboratory, three hours (five weeks only). Requisite or corequisite: Physics 1C or 5B or 6C. Introduction to modern microscopy technologies used in biochemistry, medicine, microbiology, and nano research. Basic image formation principles of microscopy, methods for sample preparation, imaging, data acquisitions, and three-dimensional reconstruction and visualization. Fluoresce, confocal, and super-resolution light microscopy; transmission electron microscopy, electron tomography, and three-dimensional cryo-electron microscopy; and atomic force and other scanning probe microscopy modalities. Practical experience in research provided through five carefully designed electron microscopy laboratory modules. P/NP or letter grading.

106 Molecular and Genetic Basis of Bacterial Infections (4)
Lecture, three hours; discussion, one hour. Requisite: MIMG 101. Biochemical and genetic properties of bacteria that afford potential for pathogenicity. Epidemiology and transmission of disease; chemotherapy and drug resistance. Regulation of virulence factors. Letter grading.

107 Viral Pathogenesis (4)
Lecture, three hours; discussion, one hour. Requisites: course 185A, Chemistry 153A. Viral pathogens that infect mammals. Viral entry into and replication in host cells. Host response and host/viral interaction. Pathogenic manifestations exhibited during viral infections. Letter grading.

109AL Research Immersion Laboratory in Microbiology (5)
Lecture, three hours; laboratory, eight hours. Requisites: MIMG 101, Life Sciences 3, 4, and 7L, or 7A, 7B, and 7L. Course 109AL is enforced requisite to 109BL. Limited to Microbiology, Immunology, and Molecular Genetics majors. Research-oriented laboratory experience designed to promote discovery of novel microorganisms. Working in teams, students conduct research projects that incorporate techniques in microbiology and molecular biology and involve use of bioinformatics tools and phylogenetics software for data analysis. Emphasis on reading and understanding scientific literature as well as improving critical thinking skills such as ability to create and evaluate hypotheses or experimentally address scientific questions. Critical aspects of the research process, including record keeping, ethics, laboratory safety and citizenry, mechanics of scientific writing, and project responsibilities and ownership. Letter grading.

109BL Advanced Research Analysis in Microbiology (4)
Laboratory, six hours. Requisites: MIMG 109AL; Life Sciences 40 or Statistics 13. Limited to Microbiology, Immunology, and Molecular Genetics majors. Designed to provide students authentic, discovery-based research experience in life sciences. Investigation to be primarily computational in nature whereby students use bioinformatics or mathematical modeling software to interpret, expand, or refine datasets. Use of graphics software to prepare figures and illustrations for presentations, posters, reports, and websites (database entries). Research accomplishments discussed in weekly seminar-style meetings in which student groups create PowerPoint slides and formally present results to class. Production of team poster and final report describing the entire research project required. Letter grading.

C122 Mouse Molecular Genetics (2)
Seminar, two hours. Requisite: Life Sciences 4, or 7A, 7B, and 7C. Designed for students doing research with mice. During past 25 years, molecular revolution has greatly increased power and scope of mouse genetics, and today mouse is primary experimental model in virtually all fields of biology and biomedicine. Seminar forum for in-depth discussion of tools and technologies of mouse genetics and their application to functional genomics, complex traits, stem cell biology, developmental biology, epigenetics, and genetic dissection of diseases. Concurrently scheduled with course C222. P/NP or letter grading.

MIMG 123 (4) Advanced Annotation and Comparative Genomics
Lecture, two and one half hours; computer laboratory, six hours. Requisite: course 103AL or Molecular, Cell, and Developmental Biology 187AL with grade of B- or better. Participation in discovery-based research experience, working as research team to analyze microbial genomes using bioinformatics techniques involving variety of online databases. Investigation of cellular pathways and structures as means to discover novel genes and unusual variations in classical systems. Results of high-quality annotation efforts may lead to publication in peer-reviewed science journal. Part of DOE Joint Genome Institute Undergraduate Research in Microbial Genome Annotation education program. Offered in summer only. Letter grading.

132 Cell Biology of Nucleus (4)
Lecture, three hours; discussion, one hour. Requisite: Life Sciences 4 or 107. Cell biology of eukaryotic nucleus, including principles of chromosome structure, transcription, RNA processing, nuclear-cytoplasmic transport, and cell cycle control. Letter grading.

CM156 Human Genetics (5)
(Same as Molecular, Cell, and Developmental Biology CM156.) Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3, 4, and 7L, or 7A, 7B, and 7C. Application of genetic principles in human populations, with emphasis on genomics, family studies, positional cloning, Mendelian and common diseases, cancer genetics, animal models, cytogenetics, pharmacogenetics, population genetics, and genetic counseling. Lectures and readings in literature, with focus on current questions in fields of medical and human genetics and methodologies appropriate to answer such questions. Concurrently scheduled with course CM256. Letter grading.

158 Microbial Genomics (4)
Lecture, three hours; discussion, one hour. Requisites: MIMG 101, Chemistry 153A. Evolution, biodiversity, and sequencing of genomes; bacterial and viral genomes; bioenergetics; gene knockouts; genomics of antibiotic resistance; proteomics. Guest lecturers from department and related departments who discuss key papers with focus on their areas of expertise. Letter grading.

168 Molecular Parasitology (4)
Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3 and 4, or 7A, 7B, and 7L. Survey of parasitic protozoa not only as parasites that interact with host, but also as model systems for analysis of basic biological phenomena such as gene regulation, molecular development, cell-cell interactions, molecular evolution, and novel biochemical pathways. Letter grading.

170 Cell and Gene Therapy (4)
Lecture, three and one half hours; discussion, one hour. Requisites: Chemistry 153A, Life Sciences 107. State-of-art study of stem cells and gene therapy, and approaches to treat congenital/genetic defects, diseases, or injuries in humans. Review of current knowledge of human stem cells and viral and non-viral gene delivery strategies, and how they can be safely evaluated in animal models of disease. Introduction to ethical and legal issues related to cell and gene therapy as well as how to translate therapies into practice including aspects of cell and gene therapy intellectual property, regulatory, and Food and Drug Administration considerations. Includes innovative mock company team pitches to venture capitalists to learn how to raise capital for their new inventions based on what they have learned. Letter grading.

174 Advanced Topics in Molecular Parasitology (2)
Lecture, two hours. Requisites: course 168, Life Sciences 3 and 4, or 7A, 7B, and 7L. Examination of recent advances in molecular biology of parasites and host/parasite relationship. Specific topics include parasite development, antigenic variation in trypanosomes, RNA editing, prospects for parasitic vaccines. Letter grading.

M178 Quantitative Regulatory Biology and Signal Transduction (4)
(Same as Computational and Systems Biology M178 and Physiological Science M178.) Lecture, three hours; laboratory, one hour. Requisites: Life Sciences 7A, 7B, 7C, 30A, 30B. Introduction to key biological regulatory circuit motifs and systems biology concepts that are critical to understanding how cellular responses are controlled. Letter grading.

180A Scientific Analysis and Communication I (2)
Seminar, two hours. Enforced corequisite: course 196A or 198A. Students read and discuss scientific articles and give presentations, introducing research topics using relevant primary literature. Critical aspects of research process, including record keeping, ethics, laboratory safety and citizenry, mechanics of scientific writing, diverse approaches to research, and project responsibilities and ownership. Acquisition of in-depth and broad knowledge about student research projects, improvement of oral and written communication skills, and full appreciation of process of doing good science and becoming skilled researchers. Letter grading.

180B Scientific Analysis and Communication II (2)
Seminar, two hours. Enforced requisites: course 180A, and Life Sciences 40 or Statistics 13. Enforced corequisite: course 196B or 198B. Students give presentations similar to laboratory meeting or research symposium talk in which speakers discuss project goals, methodological approaches, results, and conclusions. How to write research papers as well as prepare and present scientific posters. Production of deliverables that demonstrate research achievements and creation of sense of pride for work accomplished as skilled researchers. Letter grading.

185A Immunology (5)
(Formerly numbered 185A.) Lecture, three hours; discussion, 90 minutes. Requisites: Chemistry 153A, Life Sciences 3, 4, and 7L, or 7A, 7B, 7C, and 7L. Not open for credit to students with credit for course 261. Comprehensive study of experimental immunobiology and immunochemistry; cellular and molecular aspects of humoral and cellular immune reactions. Letter grading.