

## MIMG Major Requirements

By default, all students enter Pre-MIMG under Path 1. Admission to Path 2 requires that the student conduct research in an MIMG, MCDB, or Biol Chem lab, have a GPA of at least 3.0, & submit an application. Students must apply for Path 2 no later than Winter quarter of third year, but exceptions may be made for transfers. See Bridget Wells for more information.

<b>Path 1</b>	<b>Path 2</b>
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Quarter	Foundation Courses	Units
All	CHEM 153A - Biochemistry	4
F, W	MIMG 101- Intro Microbiology	4
F, W	MIMG 185A - Immunology ( <i>take in final year</i> )	5

Path 1- choose <b>one</b> lab pair:	Units	Path 2- <b>take all four:</b>	Units		
F+S; S+F	MIMG 103AL + BL	5 + 4	Qtr varies	MIMG 196A- Path 2 Research	4
F+W; W+S	MIMG 109AL + BL	5 + 4	Qtr varies	MIMG 180A- Research Sem	2
F + W	MCDB C150 + 150AL	5 + 4	Qtr varies	MIMG 196B- Path 2 Research	4
			Qtr varies	MIMG 180B- Research Sem	2
<b>unit subtotal = 22</b>			<b>unit subtotal = 25</b>		

<b>Focus Electives</b>		
<b>Both paths choose 3 classes from:</b>		
Quarter		Units
All	CHEM 153L - Biochem Lab	4
F, W, Sp	MCDB 138- Developmental Bio	5
F, W, Sp	MCDB 165A- Biology of Cells	5
W	MIMG 102- Virology	4
F	MIMG 105- Biological Microscopy	4
Not in 15-16	MIMG 106- Bacterial Infect	4
Sp	MIMG 132- Cell Bio of Nucleus	4
W	MIMG CM156 - Hum Genetics	5
W	MIMG 158- Microbial Genomics	4
F	MIMG 168- Parasitology	4
<b>minimum unit subtotal = 12</b>		

<b>General Electives</b>		
<b>Path 1 needs 12 units.</b>	<b>Path 2 needs 8 units.</b>	
Choose from:		
<ol style="list-style-type: none"> <li>1. Any remaining Focus Electives</li> <li>2. These other MIMG classes:</li> </ol>		
<b>Quarter</b>	<b>Units</b>	
Sp	MIMG C122- Mouse Molec Gen	2
W	MIMG 191H- <i>Dept Honors Only</i>	2
F, W, Sp	MIMG 198 - Dept Honors Research*	4
All	MIMG 199- Research*	4
*Path 1 may use up to 2 qtrs (4+4 un) of 198/199 <span style="margin-left: 100px;">*Path 2 may use up to 1 qtr (4 un) of 198/199</span>		
<ol style="list-style-type: none"> <li>3. Approved classes from other departments</li> </ol>		
<b>See the list below.</b>		

<b>Path 1 unit total = at least 46 units</b>	<b>Path 2 unit total = at least 45 units</b>
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All courses must be taken for a letter grade and passed with at least a C-. No more than two repeats allowed in any of the upper division major classes. Students must maintain 2.0 major & overall GPA.  
 ~ Classes DO NOT have to be taken in the order in which they are listed on this page.  
 ~ Students are encouraged to begin the AL/BL pair in 3rd year to avoid scheduling conflicts in 4th year.  
 ~ Do not take an 'AL' in the same quarter as MIMG 185A due to each being a heavy class.

## Non-MIMG Courses that Satisfy General Elective Req for the MIMG Major

On the following list, the quarter(s) that the classes are offered is noted, but this is **subject to change** and you should always **consult the Schedule of Classes** for the most up-to-date information.

Dept	Course	Title	Units	Quarter(s) Offered
MCDB	100	<i>Introduction to Cell Biology</i>	5	Sum ONLY
	138	<i>Developmental Biology</i>	5	Fall, Winter, Spring
	M140	<i>Cancer Cell Biology</i>	5	Winter
	144*	<i>Molecular Bio of Cellular Processes &amp; Experimental Ap</i>	5	Fall, Winter, Spring
	C150	<i>Plant Chemical &amp; Molecular Communication</i>	4	Fall
	165A	<i>Biology of Cells</i>	5	Fall, Winter, Spring
	168*	<i>Stem Cell Biology</i>	5	Spring
	172	<i>Genomics and Bioinformatics</i>	5	Not in 15-16
	M175A	<i>Neuroscience: From Molecules to Mind</i>	5	Fall
	M175B	<i>Neuroscience: From Molecules to Mind</i>	5	Winter
	M175C	<i>Neuroscience: From Molecules to Mind</i>	5	Spring
	187AL	<i>Research Immersion Lab in Genomic Biology</i>	5	Winter

**\* Important restrictions to MCDB courses:**

MCDB 144 is not open for credit if you've already taken Chem 153B.

MCDB 168 has two other MCDB courses (138 & 165A) as prerequisites.

BIOENGR	100	<i>Bioengineering Fundamentals</i>	4	Winter
	CM145	<i>Molecular Biotechnology for Engineers</i>	4	Fall
	CM178	<i>Intro to Biomaterials</i>	4	Fall

Note - you may need instructor consent to enroll in Bioengineering classes

PHYSICI	CM103	<i>Basic Human Bio for Bioengineers</i>	4	Winter
	124	<i>Molecular Biology of Aging</i> (dept consent needed)	4	Spring
	125	<i>Molecular Systems Biology</i> (dept consent needed)	4	Winter

CHEM & BIOCHEM	C100	<i>Genomics and Computational Biology</i>	5	Spring
	103	<i>Environmental Chemistry</i>	4	Spring
	110A	<i>Physical Chem: Chemical Thermodynamics</i>	4	Fall, Winter, Spring
	M117	<i>Structure, Patterns &amp; Polyhedra</i>	5	Not in 2015-2016
	136	<i>Organic Structural Methods</i>	5	Spring
	C140	<i>Bionanotechnology</i>	4	Spring
	153B	<i>Biochem: DNA, RNA, &amp; Protein Synthesis</i>	4	Fall, Winter, Spring
	153C	<i>Biochem: Biosynthetic &amp; Energy Metabolism &amp; Regulation</i>	4	Fall, Winter, Spring
	153L	<i>Biochemical Methods I</i>	4	Fall, Winter, Spring
	156	<i>Physical Biochemistry</i>	4	Fall, Winter, Spring
	CM160A	<i>Intro to Bioinformatics and Genomics</i>	4	Fall
	C161A	<i>Plant Biochemistry</i>	4	Not in 2015-2016
	171	<i>Intermediate Inorganic Chemistry</i>	4	Fall, Winter
	C172	<i>Advanced Inorganic Chemistry</i>	4	Spring
	C179	<i>Biological Inorganic Chemistry</i>	4	Fall
	C181	<i>Polymer Chemistry</i>	4	Not in 2015-2016

BIOSTAT	100A	<i>Introduction to Biostatistics</i>	4	Spring, Summer ONLY
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**Non-Public Health majors/minors are NOT permitted in enroll in Biostat 100A during Fall or Winter.**

	110A	<i>Basic Biostatistics (dept consent needed)</i>	4	Fall
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## Non-MIMG Courses that Satisfy General Elective Requirement (continued)

EE BIOL	121	<i>Molecular Evolution</i>	4	Fall
	135	<i>Population Genetics</i>	4	Spring
	162	<i>Plant Physiology</i>	4	Spring, Summer

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C&EE	M166	<i>Environmental Microbiology</i>	4	Winter
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Note- you must contact the professor for a PTE number to enroll.

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EPIDEM	100	<i>Intro to Epidemiology</i>	4	Summer ONLY
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**Non-Public Health majors/minors are NOT permitted to enroll in EPIDEM 100A during the academic year.**

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HUM GEN C144	<i>Genomic Technology</i>	4	Not in 2015-2016
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Not all electives are offered every year. Consult the Schedule of Classes or the appropriate department.  
Some electives are restricted to certain majors on the first pass.

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### About the College's Upper Division Unit Requirement:

As a UCLA student you must fulfill requirements for the College of Letters and Science (e.g., General Education courses, Writing II, Foreign Language) as well as requirements for the MIMG major (e.g., those stated above). One of the College of L&S requirements is the **60 unit Upper Division Unit requirement**. This states that a student must complete 60 units of upper division coursework which can be satisfied by taking those courses numbered 100 and above. As an MIMG major, you are required to take (at least) 46 units of upper division credit for Path 1 or (at least) 45 units for Path 2. This leaves a balance of 14-15 upper division units that you must fulfill in order to satisfy the College requirement. These 14-15 units can be fulfilled by ANY upper division courses. Feel free to go outside of the sciences. An upper division Film or Music History class can add a nice balance to the heavier upper division major classes that you will have in your third and fourth years.

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### Join the MIMG Mailing list – don't be left out!

The fastest way for you to receive announcements about the MIMG department and its courses, also information about internships, job opportunities, research positions, workshops, etc. is to be on the mailing list.

Go to <http://lists.ucla.edu/cgi-bin/mailman/listinfo/mimg> & fill out the info. You will be sent a confirmation email which may end up in your Spam folder. Check there if you don't see the confirmation email right away.

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### MIMG STUDENT AFFAIRS OFFICER

Bridget Wells     [bridgetw@microbio.ucla.edu](mailto:bridgetw@microbio.ucla.edu)     (310) 825 8482     1602B Molecular Sciences Bldg.

Hours of availability are *typically* Monday through Friday from 9:00 - 12:00 and 1:00 - 5:00.

**Appointments are preferred - call or email to request one.**

**Students without appointments may be asked to come back later.**

## MIMG Laboratory Requirements Overview

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

**Path 1:** Students may choose one of three 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 at the end of BL.

Path 1 students may use up to two quarters (4 units + 4 units) of MIMG 198 or 199 towards the General Elective requirement.

**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). 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 Acquaintance* experience in an MIMG, MCDB or Biological Chemistry 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. Those who complete all course requirements for Path 2 are exempt from participating in Path 1. All Path 2 students share their research achievements with peers and faculty by presenting a poster at a symposium at the end of 180B.

Path 2 students may use up to one quarter (4 units) of MIMG 198 or 199 towards the General Elective requirement.

**Honors:** Path 2 students may substitute course 198A/B/C for 196A/B.

**Biomedical Research Minor:** Path 2 students may apply two of four independent research courses required for Minor to major requirements.

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## SAMPLE SCHEDULE, PATH 1

Please note that your schedule doesn't have to completely match this one. . . this is **only** a suggestion.

Path 1 – Students are highly encouraged to take an 'AL' course in Winter or Spring of their 3<sup>rd</sup> year.

	Fall Quarter	Winter Quarter	Spring Quarter
<b>1st year</b>	Chem 14A (4) Math (4) _____	Chem 14B (4) Chem 14BL (3) Math (4)	Chem 14C (4) Math/Stats (4) LS 1 (5)
<b>2nd year</b>	Chem 14CL* (4) Physics 6A (5) LS 2 (4) _____	Chem 14D (4) Physics 6B (5) LS 3 (4) _____	Physics 6C (5) LS 4 (5) LS 23L (2) _____
<b>3rd year</b>	Chem 153A (4) _____ _____ _____	MIMG AL (5) MIMG 101 (4) _____ _____	MIMG BL (4) MIMG Requirement _____ _____
<b>4th year</b>	MIMG 185A (5) MIMG Requirement _____ _____	MIMG Requirement MIMG Requirement _____ _____	MIMG Requirement MIMG Requirement _____ _____

## SAMPLE SCHEDULE, PATH 2

Please note that your schedule doesn't have to completely match this one. . . this is **only** a suggestion.

Path 2 – Students must apply no later than their 3<sup>rd</sup> year. Exceptions may be made for transfer students.

	Fall Quarter	Winter Quarter	Spring Quarter
<b>1st year</b>	Chem 14A (4) Math (4) _____	Chem 14B (4) Chem 14BL (3) Math (4)	Chem 14C (4) Math/Stats (4) LS 1 (5)
<b>2nd year</b>	Chem 14CL* (4) Physics 6A (5) LS 2 (4) _____	Chem 14D (4) Physics 6B (5) LS 3 (4) _____	Physics 6C (5) LS 4 (5) LS 23L (2) Lab experience (99 / 199)
<b>3rd year</b>	CHEM 153A (4) Lab experience (99 / 199) _____ _____	MIMG 196A (4) MIMG 180A (2) MIMG 101 (4) _____ _____	MIMG 196B (4) MIMG 180B (2) MIMG Requirement _____ _____
<b>4th year</b>	MIMG 185A (5) MIMG Requirement _____ _____	MIMG Requirement MIMG Requirement _____ _____	MIMG Requirement _____ _____

*\*Effective Fall 2014, Chem 14CL is optional for MIMG majors, but recommended for pre-health students.*

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# Upper Division MIMG Course Descriptions

## **101 Introductory Microbiology (4 units)**

Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3, 4. Historical foundations of microbiology; introduction to bacterial structure, physiology, biochemistry, genetics, and ecology.

## **102 Introductory Virology (4)**

Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3. Biological properties of bacterial and animal viruses, replication, methods of detection, interactions with host cells and multicellular hosts.

## **103AL Research Immersion Laboratory in Virology (5)**

(Formerly numbered 103L.) Lecture, two and one half hours; laboratory, eight hours. Requisites: Life Sciences 3, 4. Recommended requisite or corequisite: course 101. Limited to Microbiology, Immunology, and Molecular Genetics premajors and 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. Enforced requisite: course 103AL. 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 entire research project required. Letter grading.

## **105 Biological Microscopy (4)**

Lecture, four hours; laboratory, three hours (five weeks only). Requisite: Physics 1B or 6B. Introduction to modern microscopy technologies in biological, medical, and nano applications. Focus on transmission electron microscopy and cryo-electron microscopy and their applications in modern biology. Practical experience provided through five carefully designed electron microscopy laboratory modules. Basic principles of microscopy and image formation, methods for sample preparation, imaging, data acquisition procedures, and three-dimensional visualization. Topics include light microscopy, electron microscopy, scanning electron microscopy, atomic force microscopy, and other emerging modalities of microscopy in biological research. P/NP or letter grading.

## **106 Molecular and Genetic Basis of Bacterial Infections (4)**

Lecture, three hours; discussion, one hour. Requisites: course 101, Life Sciences 4. Biochemical and genetic properties of bacteria which afford potential for pathogenicity. Epidemiology and transmission of disease; chemotherapy and drug resistance. Regulation of virulence factors.

## **109AL Research Immersion Laboratory in Microbiology (5)**

Lecture, three hours; laboratory, eight hours. Requisites: Life Sciences 3, 4. Recommended requisite or corequisite: course 101. Limited to Microbiology, Immunology, and Molecular Genetics premajors and 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 research process, including record keeping, ethics, laboratory safety and citizenry, mechanics of scientific writing, and project responsibilities and ownership. Letter grading.

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## Upper Division MIMG Course Descriptions (continued)

### **109BL Advanced Research Analysis in Microbiology (4)**

Laboratory, six hours. Enforced prerequisite: course 109AL. 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 entire research project required. Letter grading.

### **C122 Mouse Molecular Genetics (2)**

Lecture, two hours. Requisites: Life Sciences 3, 4. Emphasis on use of mouse genetic approach to studying fundamental biological questions. Topics include mouse genome and functional genomics, mutagenesis screening and cloning of disease genes, transgenesis and its application in developmental biology, stem cell biology, neurobiology, and modeling human genetic disorders. Reading materials include original papers and reviews. Concurrently scheduled with course CM222.

### **132 Cell Biology of Nucleus (4)**

Lecture, three hours; discussion, one hour. Requisite: Life Sciences 4. Cell biology of eukaryotic nucleus, including principles of chromosome structure, transcription, RNA processing, nuclear-cytoplasmic transport, and cell cycle control.

### **CM156 Human Genetics (5)**

(Same as Human Genetics CM156 and Molecular, Cell, and Developmental Biology CM156.) Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3, 4. Strongly recommended: Molecular, Cell, and Developmental Biology 100 or C139 or M140. Application of genetic principles in human populations, with emphasis on cytogenetics, biochemical genetics, population genetics, and family studies. Lectures and readings in the literature, with focus on current questions in the fields of medical and human genetics and methodologies appropriate to answer such questions.

### **158 Microbial Genomics (4)**

Lecture, three hours; discussion, one hour. Requisites: course 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.

### **168 Molecular Parasitology (4)**

Lecture, three hours; discussion, one hour. Requisites: Life Sciences 3, 4. Survey of parasitic protozoa not only as parasites which interact with a 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.

### **185A Immunology (5)**

Lecture, three hours; discussion, 90 minutes. Requisites: Life Sciences 3, 4, 23L. Recommended prerequisite or corequisite: Chemistry 153A. Not open for credit to students with credit for course 261. Introduction to experimental immunobiology and immunochemistry; cellular and molecular aspects of humoral and cellular immune reactions.

### **MCDB C150 Plant Communication (4)**

Lecture, three hours; discussion, one hour. Enforced requisites: Life Sciences 3, 4. Plants change atmosphere, enrich soil, and communicate with insects, bacteria, and each other -- Earth's ultimate symbiote. Introductory course in chemical ecology and how natural compounds affect gene expression. Emphasis on role of natural compounds in plant/microbe, plant/plant, and plant/herbivore interactions; synopsis of principles of plant defense mechanisms and responses to microbial infections.

### **MCDB 150AL Research Immersion Lab in Plant-Microbe Ecology (5)**

Laboratory, four hours. Enforced prerequisite: course C150. Course 150AL is enforced requisite to 150BL. Limited to Molecular, Cell, and Developmental Biology and Microbiology, Immunology, and Molecular Genetics majors. Introductory plant biology laboratory to give students hands-on experience doing experiments and making their own observations about plant biology.