

# Biological Sciences, M.S.

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The School of Biological Sciences offers both the Master of Science and Doctor of Philosophy, although emphasis at the graduate level is placed on the Ph.D. programs. Most training takes place within one of the departments, although full facilities and curricular offerings are available to all graduate students in all departments of the Biological Sciences. Interdisciplinary study and research are encouraged.

Students are expected to maintain a B average at all times. The normative time to degree is two years for the master's degree and five years for the doctoral degree. A master's degree is not a prerequisite for the Ph.D.

Students plan their academic program in consultation with the graduate advisor or a faculty committee. Faculty advisors may be changed to meet the needs and interests of the student. In addition, it is possible for students to transfer to another program in the School, subject to the approval of the dean of Graduate Studies, and acceptance into that program. Students are encouraged to consult with faculty members with regard to their research and academic interests.

During their graduate training, all doctoral students are required to serve at least two quarters as a 50-percent teaching assistant under the direction of laboratory coordinators or faculty. Advanced graduate students may work closely with faculty in the planning and execution of the teaching program. The amount and nature of the teaching experience varies with the department.

The Master of Science may be completed by submission of a research thesis (plan I) or by course work and a comprehensive examination (plan II).

## Plan I: Thesis Plan

The student is required to complete at least four didactic graduate courses (16 units) offered by the department, and elective course work with an additional eight units of graduate or upper-division undergraduate course work. In addition, the student will typically take additional seminar courses during the graduate study. Students in the M.S. program may be employed as teaching assistants, but units earned through enrollment in University Teaching (399) may not be counted toward degree completion. The student engages in thesis research with a faculty thesis advisor, and will prepare and submit a thesis to the thesis committee. The final examination is an oral presentation of the thesis to the committee. The normative time to degree is two years for the thesis M.S.

## Plan II: Comprehensive Examination Plan

The plan II M.S. is awarded based on completion of at least 36 units of course work and satisfactory completion of a comprehensive examination. The student is required to complete at least 16 units (four courses) of didactic graduate course work offered by the department. In addition, the student will take up to 12 units of research. An additional eight units or more of elective course work will be completed from other graduate courses offered by the department. A maximum of four units of upper-division undergraduate courses may be included in the program with the approval of the associate dean for Graduate Studies. Students in the M.S. program may be employed as teaching assistants, but units earned through enrollment in University Teaching (399) may not be counted toward degree completion. The comprehensive exam will be administered by a committee of at least three departmental faculty, and may include written and oral sections. The comprehensive examination format will include presentation of research or a capstone project and may include additional sections such as a research proposal, presentation of a project, critical analysis, or other components. The normative time to degree is two years for the M.S. by comprehensive examination.

## Master of Science with a Concentration in Biotechnology

Department of Molecular Biology and Biochemistry

### Craig M. Walsh, Director

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The field of biotechnology has developed explosively since the discovery of gene cloning and sequencing methods in the mid-1970s. The field is now represented by many active and successful companies who share an intense demand for well-trained people with up-to-date research skills in the manipulation of nucleic acids, proteins, immunological reagents, and pathogenic organisms. The program in Biotechnology is research-based, and leads to an M.S. in Biological Sciences. Students have the option to specialize in a specific area, including immunology/microbiology, cancer biology, genetics/genomics, stem cell biology, structural biology/biophysics, systems biology/bioinformatics, or pharmaceutical sciences. Specialization is made by selection of a research lab and electives relevant to the focus area.

The curriculum incorporates extensive training from both teaching laboratories and actual research settings (individual faculty laboratories). Focus is placed on techniques relevant to industry and seminar exposure to the nature of industry. It is designed to train students to enter the field of biotechnology as skilled laboratory practitioners.

Emphasis is placed on learning state-of-the-art technology in genomics, protein isolation and characterization, animal and microbial cell culture, and immunology. Students are trained in experimental rationales for solving actual research problems and are encouraged to take summer internships in industry between the first and second year of their studies.

**Admissions**

The Department of Molecular Biology and Biochemistry evaluates applicants to the program on the basis of grades, letters of recommendation, essays, interviews, and other relevant qualifications. Applicants should have a bachelor's degree from an accredited institution with a good background in biology, physics, and chemistry. The ideal preparation includes introductory as well as some advanced courses in biology (cell biology, developmental biology, genetics, and molecular biology), biochemistry, organic chemistry, calculus, statistics, and physics. Advanced laboratory and/or research experience is preferred.

**Requirements**

The program emphasizes training in laboratory and research environments. First-year students are required to enroll in a series of laboratory courses:

MOL BIO 250L	Biotechnology Laboratory - Nucleic Acids
MOL BIO 251L	Biotechnology Laboratory - Protein Purification and Characterization
MOL BIO 221L	Advanced Immunology Laboratory

These courses are designed to teach techniques in recombinant DNA methodology, protein isolation and characterization, proteomics, animal and microbial cell culture, immunology, and virology. In addition, students are trained rigorously in data recording and presentation as the laboratory notebooks are reviewed and graded by laboratory course instructors. Students are taught formal coursework in nucleic acids, proteins, genetic engineering, and molecular/cellular biology. Emphasis during the second year is devoted exclusively to research projects in faculty laboratories, with the exception of one elective course each quarter from an approved list or by consent of the Director. The program concludes with a formal written and oral presentation of the student's research at the end of the second year.

While the Biotechnology program is designed to produce skilled laboratory practitioners for industrial positions, some students may wish to continue in a Ph.D. program. The Department of Molecular Biology and Biochemistry is a member of the interdisciplinary graduate program in Cellular and Molecular Biosciences, a program which offers the Ph.D. in Biological Sciences. Biotechnology program students who wish to enter the interdisciplinary graduate program upon completion of the M.S. should apply for admission during their second year.

**Program in Law and Graduate Studies (J.D./Ph.D.; J.D./M.S.)**

Highly-qualified students interested in combining the study of law with graduate qualifications in Biotechnology are invited to undertake concurrent degree study under the auspices of UC Irvine's Program in Law and Graduate Studies (PLGS). Students in this program pursue a coordinated curriculum leading to a J.D. from the School of Law in conjunction with a Master's degree in Biological Sciences, Concentration in Biotechnology. Additional information is available from the PLGS Program Director's Office at 949-824-4158. A full description of the program, with links to all relevant application information, can be found here (<https://www.law.uci.edu/academics/interdisciplinary-studies/concurrent-degrees.html>).