

Biotechnology

BIOSCIENCES

Free Program Overview



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Biotechnology, Bioinformatics, Bioscience Business and Marketing

Are you interested in learning about the Bioinformatics, Biotechnology, and Bioscience Business and Marketing certificate programs, and about careers in these fields? Offered four times a year, these special free information sessions provide opportunities to meet instructors and other students, learn about program prerequisites, course content and program requirements, and see how these programs can help you advance your current career or break into a new field.

Course 16649
and 22402

Explore UCSC Extension's Other Bioscience Programs

Bioinformatics

Clinical Trials Design and Management

Medical Devices

Regulatory Affairs

Bioscience Business and Marketing

See ucsc-extension.edu/biosciences
for more information

Biotechnology: One of the Bay Area's Top Growth Industries

The Bay Area is at the forefront of the global biopharmaceutical industry. It is one of the fastest growing sectors of California's economy. Local companies and research institutions are setting the pace in the discovery and development of biopharmaceuticals to target major unmet medical conditions such as cardiovascular disease, cancer, AIDS and other degenerative diseases.

Build the Foundation You Need to Succeed with the Biotechnology Certificate

The Biotechnology Certificate equips professionals with a rich background in the principles, processes and cutting edge technologies central to biotechnology. The certificate program provides a solid understanding of the scientific disciplines that underlie the industry's activities, a foundation in the principles that guide drug discovery and development, an appreciation of cutting-edge bioscience research and technology, and a broader awareness of today's biopharmaceutical industry.

Who Will Benefit from This Program

This program benefits professionals from all disciplines who want to develop a solid scientific foundation in the principles and applications of biotechnology, in order to work more effectively in or transition into the biopharmaceutical sector.

Certificate Requirements

To satisfy the requirements for the Certificate in Biotechnology, you must complete the **four required courses** as indicated in both Core A and B, and **8 units of electives** from Track 1 and Track 2, for a **minimum total of 19 units**. For GPA requirements and program time limits, see ucsc-extension.edu.

Prerequisites

Familiarity with the principles of modern molecular biology is required. Completion of "Molecular Biology, Introduction" or an equivalent course in the last five years, or equivalent experience satisfies this requirement. Please direct questions about the suitability of a prerequisite to program@ucsc-extension.edu. For those new to the industry, we recommend taking "Biotechnology Basics for Non-Scientists" prior to starting certificate course work (see ucsc-extension.edu).

Recommended Course Sequence

We recommend that you begin with "Drug Discovery, Introduction" or "Drug Development Process." After that, you may take courses in any sequence, unless otherwise specified.

Program Contact

Applied and Natural Sciences Department
(408) 861-3860
program@ucsc-extension.edu



About UCSC Extension in Silicon Valley

The vital learning community at UCSC Extension in Silicon Valley is well known for its collegial atmosphere and rigorous preparation. Our faculty of expert practitioners teaches state-of-the-art solutions to the everyday problems confronting technology professionals working in Silicon Valley. The professional education programs we offer build expertise, open doors to new opportunity, and deliver tangible value. Our broad portfolio of open-enrollment courses and certificates, affordable pricing, experience-based instruction, and central location in Silicon Valley help turn jobs into careers.

BIOTECHNOLOGY CERTIFICATE

19-unit minimum

PREREQUISITE COURSE	Units	Course	F	W	Sp	Su
Molecular Biology, Introduction	3.0	4213	■	■	■	
REQUIRED COURSES A AND B (four)	Units	Course	F	W	Sp	Su
Core A—Both required						
Drug Development Process.....	2.0	6559	■	■	■	■
Drug Discovery, Introduction	3.0	4853	■		■	
Core B—Choose 2 of 3 (The remaining core B may be used as an elective.)						
Cellular Biology.....	3.0	3383	■		■	
Experimental Methods in Molecular Biology	3.0	1912		■		■
Immunology, Principles.....	3.0	2257		■		■
ELECTIVE COURSES	Units	Course	F	W	Sp	Su
(8 units required; a minimum of 1 of the 8 units must be from each track.)						
Track 1: Discovery						
Bioinformatics Tools, Databases and Methods	3.0	2447	■		■	
Biology of Cancer	2.0	6630			■	
DNA Microarrays—Principles, Applications and Data						
Analysis.....	3.0	2183			■	
Gene Expression and Pathways	2.0	6020		■		
Human Physiology in Health and Disease	3.0	6999		■		
Mass Spectrometry in Drug Discovery	2.0	4887			■	
Neurobiology, Introduction.....	3.5	20042				
Pharmacology, Principles	2.0	5596	■			
Stem Cell Biology	1.5	13567	■			
Structure Analysis of Biological Molecules	2.0	5925	■			
Toxicology Basics for Biotechnology	1.5	2310				■
Viruses, Vaccines and Gene Therapy	1.5	6974			■	
Track 2: Development						
Biopharmaceutical Fundamentals	2.0	6659				
Biopharmaceutical Project Management and Leadership	1.5	4490				■
Bioscience Business and Marketing Essentials	1.5	19000	■		■	
Bioscience Business Development: Building Value	1.5	19001	■			■
Bioscience Product Marketing	2.0	1654		■		■
Clinical Statistics for Non-Statisticians	2.0	2345		■		■
Drug Development: Formulation Design, Manufacture						
and Control.....	1.5	4452			■	
Good Manufacturing Practices	3.0	6328		■		■
Intellectual Property Essentials for the Life Science						
Industry.....	1.0	1942			■	
Medical Device Design and Development	2.0	19977	■		■	
Medical Devices: Regulatory Strategies and Marketing						
Pathways.....	1.5	5939		■		■
Molecular Diagnostics	1.5	21972	■		■	
Nanotechnology, Introduction	1.0	4820		■		
Regulation of Drugs and Biologics	3.0	19007	■		■	
Regulation of Medical Devices and Diagnostics.....	3.0	19071		■		■
Risk Management for Regulated Industries	3.0	22631		■		■

■ held in classroom ○ offered online □ both classroom and online sessions are available

Visit ucsc-extension.edu for the most current program schedule.

Prerequisite Course

Molecular Biology, Introduction

This course provides a comprehensive introduction to molecular biology for nonbiologists and a review for those who want to refresh and update their knowledge of this subject. Topics include fundamental concepts of genes and proteins, central dogma and the genetic code; structure and function of genes; gene expression, transcription and translation; protein structure and function; introduction to genetics; Mendelian analysis; molecular and population genetics, genetic markers and maps; and the impact of modern molecular biology on science and medicine.

Course 4213

Required Courses

Drug Development Process

The development of new drugs is a complex, lengthy, and expensive process. In this course, we examine this process—from discovery to market and beyond—and see what makes the biopharmaceutical industry unique. Infused with real-world examples, lectures address drug discovery; preclinical characterization of new drug entities; the phases and purposes of both pharmacological and clinical development; regulatory filings, compliance and oversight; FDA jurisdiction; and strategic issues in drug development.

Course 6559

Drug Discovery, Introduction

This introductory course provides a framework for understanding the complex and evolving process of drug discovery, from target selection to drug optimization. The instructional team addressed fundamental principles and cutting-edge approaches to drug discovery, and provide strategies for implementing and integrating various scientific approaches. Topics include target selection; validation; lead discovery, including primary and secondary screening and selectivity assays; optimization of properties, including combinatorial and medicinal chemistry, molecular modeling and biological approaches; pharmacokinetics and ADME; and toxicology.

Course 4853

Course Descriptions

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Cellular Biology

Essential to any understanding of biology and its practical applications is an appreciation of the structures, functions and complex biological processes at work in the cell. This course covers the essential concepts of cellular biology, including the functions of cellular macro-molecules, subcellular organization, nuclear control of cellular activity, cytoskeleton, cell signaling, cancer and more. Also addressed are the experimental approaches used to explore cellular activities.

Course 3383

Experimental Methods in Molecular Biology

This lecture-based course provides a theoretical overview of the key molecular biology techniques used in basic life science research and by the biopharmaceutical industry for the discovery of novel therapeutics. Topics include gene cloning, manipulation and sequencing; PCR; RNA interference; gene expression analysis; protein expression, engineering, and structure determination; and the fundamentals of experimental design. Also addressed are high-throughput sequencing and microarray expression analysis and the types of data these techniques generate.

Course 1912

Immunology, Principles

Explore the fundamental principles of immunology along with recent developments in the field and their implications for drug discovery and development, as well as disease treatment. Topics include innate, humoral and cell-mediated immunity; the clonal selection of lymphocytes; antigens, antibodies and their interactions; antibody gene rearrangement; lymphocyte development; aspects of clinical immunology such as inflammation; the immune response to bacterial, viral, fungal and parasitic diseases; vaccines; AIDS and other immunodeficiencies; autoimmune diseases; allergies; transplantation immunology; and cancer. Throughout the course, immunological techniques important in research and clinical laboratories are highlighted.

Course 2257

Enrollment Information

Visit ucsc-extension.edu/biosciences, for the most up-to-date information about all our courses and programs, including instructor biographies, schedules and textbook requirements.

Enroll online at ucsc-extension.edu.

Elective Courses

Bioinformatics Tools, Databases and Methods

This course provides a practical introduction to the main public domain tools, databases and methods used in bioinformatics, including DNA and protein databases such as Genbank and PDB, software tools such as BLAST, and methods including those for aligning sequences. It emphasizes the needs of the user of bioinformatics tools and databases, rather than complex algorithm development and advanced computational methods. Computer lab exercises and online demonstrations of the various databases and tools on the Internet are included.

Course 2447

Biology of Cancer

Understanding the molecular and cellular basis of cancer is essential for the development of new therapeutic strategies and diagnostic tools. This course explores the basic biology of cancer, including the key cellular processes and players, whose alteration leads to uncontrolled cell proliferation. Topics include the pathology and genetic basis of cancer, the immune system, and the role of infectious agents and environmental carcinogens in the disease process.

Course 6630

Biopharmaceutical Fundamentals

Biopharmaceutical products based on recombinant proteins differ from small molecule drugs and other biologics in fundamental ways. This comprehensive course explores the scientific, clinical, manufacturing, regulatory, business and legal issues central to the discovery, development, and commercialization of recombinant protein-based biopharmaceuticals. An array of product classes, including growth and coagulation factors, interferons, hormones, therapeutic enzymes, antibodies, and structural proteins are discussed in terms of their biochemical characteristics, pharmacological properties, the technologies that underlie their production, and their commercialization.

Course 6659

Biopharmaceutical Project Management and Leadership

The drug development process and current industry practices are used as a framework to explore models and approaches for successful project management in the content of the unique biopharmaceutical industry. The instructor begins with a detailed look at factors that impact the project team structure and corresponding roles and responsibilities. Students then explore the critical management-by-influence skills needed to guide the direction of discussion and decision-making and to build and maintain project team commitment and performance at all levels in complex projects.

Course 4490

Bioscience Business and Marketing Essentials

This course will help you understand the dynamic bioscience industry landscape; appreciate important business drivers and challenges in the industry; gain insight into the critical roles that business and marketing disciplines play at all stages of a bioscience company's development; and learn the skills needed to develop key documents to inform important business decisions.

Course 19000

Bioscience Business Development: Building Value

Business development and licensing are critical to the commercialization of a new product and the development of a successful bioscience company. The expert instructional team emphasizes the importance of well-executed opportunity assessments, the hallmarks of viable business models and strategies, and the key financial vehicles for funding and maintaining companies. They discuss how to select and target potential partners; assess risks and current trends; determine value and when to deal; and maintain patent integrity worldwide.

Course 19001

Bioscience Product Marketing

This product marketing and selling-focused course gives participants an in-depth look at product planning and research, marketing planning, and promotional execution practices in the bioscience industry. Topics include market research methodologies, information sources and applications relevant to product planning; the development of marketing strategy, product positioning and differentiated claims; and the creation of tactical marketing programs and activities to maximize revenue potential.

Course 1654

DNA Microarrays—Principles, Applications and Data Analysis

DNA microarrays have revolutionized molecular biology and are changing the face of discovery research and medicine. This course addresses the underlying principles and applications of the latest DNA microarray technologies, as well as the analysis of microarray data. It is intended for biopharmaceutical professionals, computer scientists and others who are interested in understanding this important technology.

Course 2183

Drug Development: Formulation Design, Manufacture and Control

The identification of a promising lead compound is only the beginning. This course describes the principles and processes by which a new chemical or molecular entity is converted into a form that can be commercialized. The instructor explores the features and uses of different dosage forms; basic physicochemical, biopharmaceutical and pharmacokinetic considerations that form the basis of formulation design; an overview of manufacturing equipment, processes and analytical controls used to produce safe and effective drug products; and new types of drug delivery systems.

Course 4452

Gene Expression and Pathways

This course provides a solid foundation in the molecular concepts and cutting-edge technologies that are central to the understanding of gene expression pathways in simple cells and complex multicellular organisms. Topics include gene structure; regulatory proteins and transcriptional control; inheritance of states of gene expression; and posttranscriptional control of gene activity. Abnormalities in gene expression are discussed in relation to human disease states as well as drug discovery and diagnostic medicine.

Course 6020

Good Manufacturing Practices

Familiarity with the Good Manufacturing Practices (GMP) regulations is a necessity for employees engaged in the manufacture, regulation and quality assurance, and control of drugs and biologics. Through lectures, discussions and case studies, participants gain an understanding of the FDA GMP and Good Laboratory Practice (GLP) regulations. Emphasis is on drugs and biologics, with additional coverage of the regulations that apply to cell and gene therapies, including stem cells.

Course 6328

Human Physiology in Health and Disease

This course introduces the fundamental principles of human physiology in health and disease, and provides insights into the cutting-edge and established therapies being developed and used to treat a range of disease processes. Designed for individuals who have no formal medical training, the course begins with an overview of the hierarchical organization of the body, from cells to coordinated organ systems, and continues with a discussion of the key integrative/homeostatic control mechanisms. With these topics as a foundation, the instructor progresses through the functions of major systems of the body.

Course 6999

Intellectual Property Essentials for the Life Science Industry

This course demystifies key intellectual property principles and applications, emphasizing topics of particular relevance to the biotechnology, pharmaceutical and medical device sectors. The instructor explains the basic principles of patents, and explores their strategic implications in a variety of contexts, such as securing funding, establishing barriers to competitor entry, achieving freedom to operate, technology transfer, and strategic alliances.

Course 1942

Mass Spectrometry in Drug Discovery

Mass spectrometry (MS) has experienced revolutionary advances in recent years and has become the analytical tool of choice for a variety of research areas in drug discovery and development, ranging from proteomics to drug metabolism. This course covers the principles and applications of mass spectrometry and LC/MS (liquid chromatography mass spectrometry) as they are applied in biotechnology.

Course 4887

Molecular Diagnostics

This survey course provides a foundation in the basic science and technologies that underlie the emerging field of molecular diagnostics, and highlights the potential impact on the health care landscape. The instructor examines the role of pharmacogenomics in the development of new therapeutics and treatment options. He uses case studies to present the applications of molecular diagnostic tools in infectious disease identification and early detection and diagnosis of cancer. Also addressed are the regulatory challenges that face the new wave of diagnostic tests, and the global molecular diagnostics marketplace.

Course 21972

Pharmacology, Principles

The effects of pharmaceutical compounds are a result of complex interactions between the drug and the organism. This course examines the important concepts and principles underlying drug-receptor interaction as well as the methods and interpretation of pharmacological analysis. Topics include classes of drugs, their mechanisms of action and current therapeutic uses; factors that determine dosage, duration of action, side effects and changes in response over time; and individual differences in drug responsiveness.

Course 5596

Regulation of Drugs and Biologics

This course helps participants understand the regulatory requirements, both U.S. and international, for patented and generic pharmaceuticals, over-the-counter drugs, and biological products. Students gain knowledge and insight into the regulatory agencies and their roles and responsibilities; regulatory applications and pathways; postmarketing requirements; the impact of regulatory differences between the U.S. and other countries; and how regulatory approval processes affect corporate strategy.

Course 19007

Stem Cell Biology

California is at the forefront of stem cell research and the industry continues to offer exciting opportunities in the Bay Area. This course introduces the basic biology and clinical applications of embryonic and adult stem cell therapies, provides a market overview of stem cell startup companies, and touches on the FDA regulation of biologic products.

Course 13567

Structure Analysis of Biological Molecules

This course addresses the experimental and computational methods for determining three-dimensional molecular structure, with a primary focus on proteins. Students explore the concepts that underlie protein-based drug design, protein structure databases, protein structure classification methods, and physicochemical techniques for structural analysis of biological macromolecules. Theoretical and computational tools available for protein structure analysis, structure alignment, and protein structure prediction are also covered. One session is devoted to nucleic acid structure determination.

Course 5925

Toxicology Basics for Biotechnology

Biopharmaceutical companies expend vast resources to identify new chemical and biological agents that have the potential for clinical benefit. However, before these can be tested and used widely in patients, safety and acceptable toxicity to critical organs must be demonstrated. This course surveys the adverse effects resulting from the interaction of chemical agents with living systems.

Course 2310

Viruses, Vaccines and Gene Therapy

Interactive case studies and Web-supplemented lessons drive our exploration of the interplay of viruses with their cellular hosts. Building on these foundations, we examine salient topics in vaccines, gene therapy and therapeutic viruses. Pertinent and real issues relevant to the biopharmaceutical industry are also discussed. Course topics include virus evolution; emerging viruses—when worlds collide; the risk/benefits of vaccines; the polio eradication campaign; epidemiology of influenza; HIV-1 vaccines; and the trials and tribulations of gene therapy.

Course 6974

Other Applicable Electives

- Clinical Statistics for Non-Statisticians (Course 2345)
- Medical Device Design and Development (Course 19977)
- Medical Devices: Regulatory Strategies and Marketing Pathways (Course 5939)
- Nanotechnology (Course 4820)
- Regulation of Medical Devices and Diagnostics (Course 19071)
- Risk Management for Regulated Industries (Course 22631)

Visit ucsc-extension.edu/biosciences for course descriptions.