

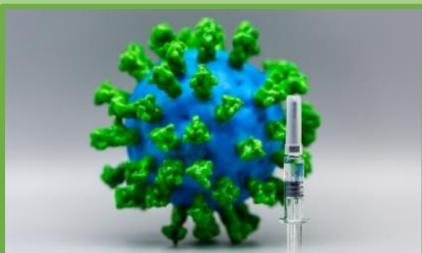
Do you want to prepare for a bioscience career in the agriculture, food, or manufacturing industries?

B.S. in Applied Biotechnology



Why Applied Biotechnology?

Gain the knowledge and tools you need to answer some of the world's most pressing questions in the areas of food production, health, and sustainability.



Applied Biotechnology subplan

Our most customizable subplan with applications of biotechnology in a range of industries, including medicine.



Food & Beverage Fermentation subplan

The science of fermentation as it applies to producing food and beverages.



Industrial Plant & Microbial Biotechnology subplan

Genetic engineering and growth of plants and microbes to make products.

For more information, contact the academic advisor:

Maya Azzi (she/her/hers)

mazzi@arizona.edu

(520) 621-5403

MAP YOUR FUTURE IN APPLIED BIOTECHNOLOGY

Focus on Food Production, Health & Sustainability

Do you want to find ways to use living cells or biological processes to develop products and technologies to feed and clothe a growing population and fight disease? The interdisciplinary Applied Biotechnology degree gives you the knowledge and tools you need to answer some of the world's most pressing questions in the areas of food production, health, and sustainability. You may pursue careers in industry related to developing vaccines, biofuels, fermented food and beverages, biologic pharmaceuticals, or insect-resistant crops, or in basic research or medicine.

The Applied Biotechnology program is right for you if:

- you want to understand, analyze, and implement innovations using biotechnology.
- you enjoy performing research to generate data-driven answers.
- you have a passion for working in collaborative teams within industries related to agriculture, food, and manufacturing.
- you're conscious of the growing human population and climate change and the need for practical solutions to ensure an abundant supply of sustainable food, renewable energy, medicines, and materials.
- you're committed to the ethical and responsible practice of science.
- you want to educate the next generation about biotechnology.
- you're considering pursuing a graduate degree in the biological sciences or a medical degree.

What kinds of jobs/career tracks could you be eligible for with a BS in Applied Biotechnology?

Research Assistant/Technician in biotechnology companies; food/beverage production companies; or academic, institutional, or government research laboratories. Perform research or other laboratory tasks under the supervision of a more senior scientist.

Process Development Associate in biotechnology or food production companies. Develop protocols for manufacturing and/or purifying products.

Quality Control Technician in biotechnology or food production companies. Test products for quality, consistency, purity, and safety.

Graduate or Professional school in a related field. This major includes rigorous preparation for many biological science fields.

MS degree: Research Associate, with more independence than a Research Assistant

PhD degree: Scientist or Research Professor. Design experiments and manage projects and people

Medical school or other health-related advanced degree

Career options by sub-plan

Applied Biotechnology

- Perform basic and applied research in academic, institutional, or government laboratories
- Develop products in the biotechnology industry, including vaccines, enzymes, biofuels, and biologics

Food and Beverage Fermentation

- Monitor product quality and safety in food production facilities
- Develop new (e.g., plant-based meat substitutes) or improved products in the food and beverage industry

Industrial Plant and Microbial Biotechnology

- Monitor product quality and safety in biotechnology manufacturing facilities
- Genetically engineer microorganisms and plants to synthesize products such as vaccines, enzymes, and biofuels
- Develop and monitor manufacturing processes for biotechnology products

APPLIED BIOTECHNOLOGY MAJOR			
General Education Requirements	Course	Offered	27-35 Units
Foreign language (2nd semester proficiency)	Various	F/SP/SU	0-8
First Year Composition 1	ENGL 101	F/SP/SU	3
First Year Composition 2	ENGL 102	SP/SU	3
General Education, Tier 1	TRAD 1	F/SP/SU	3
General Education, Tier 1	TRAD 2	F/SP/SU	3
General Education, Tier 1	INDV 1	F/SP/SU	3
General Education, Tier 1	INDV 2	F/SP/SU	3
General Education, Tier 2	Humanities	F/SP/SU	3
General Education, Tier 2	Individuals & Societies	F/SP/SU	3
General Education, Tier 2	Arts	F/SP/SU	3
*Diversity Emphasis		F/SP/SU	
General Science Core	Course	Offered	38-41 Units
Calculus	MATH 113 or MATH 122A+122B or MATH 125	F/SP/SU	3-5
Introductory Physics I, lecture + lab	PHYS 102+181 (3+1)	F/SP/SU	4
Introductory Physics II, lecture + lab	PHYS 103+182 (3+1)	F/SP/SU	4
General Chemistry I Lecture and Laboratory	CHEM 141+143 (3+1) <i>or</i> CHEM 151 (4) <i>or</i> CHEM 161+163 (3+1)	F/SP <i>or</i> F/SP/SU <i>or</i> F	4
General Chemistry II Lecture and Laboratory	CHEM 142+144 (3+1) <i>or</i> CHEM 152 (4) <i>or</i> CHEM 162+164 (3+1)	F/SP <i>or</i> F/SP/SU <i>or</i> F	4
Organic Chemistry I Lecture and Laboratory	CHEM 241A+243A (3+1)	F/SP/SU	4
Organic Chemistry II Lecture and Laboratory	CHEM 241B+243B (3+1)	F/SP/SU	4
Introductory Biology I, Lecture and Laboratory	MCB 181R+L (3+1)	F/SP/SU	4
Introductory Biology II, Lecture and Laboratory	ECOL 182R+L (3+1)	F/SP/SU	3
Introduction to Statistics and Data Analysis	AREC 239	SP	4
Major Core	Course	Offered	19 Units
Principles of Microbiology, lecture + lab	MIC 285R+L (4+1)	SP	5
Introduction to Biotechnology	PLS 340	F	3
Foundations in Biochemistry <i>or</i> Metabolic Biochemistry	BIOC 384 <i>or</i> BIOC 385	F/W/SP/SU	3
Fermented Food and Beverages	NSC 3XXR	SP	3
Communicating Knowledge in Agriculture and the Life Sciences <i>or</i> Scientific Writing for Environmental, Agricultural, and Life Sciences	ALC 422 <i>or</i> ENVS 408	F/SU <i>or</i> F/SP	3
Senior Capstone	MIC/NSC/PLS 498A	SP	2
<i>Select a sub-plan - see additional tables</i>			23 Units

APPLIED BIOTECHNOLOGY SUB-PLAN			
Sub-plan core	Course	Offered	15-20 Units
Biotechnology Laboratory	PLS 340L	SP	2
<i>At least one additional laboratory course chosen from:</i>			
Plant and Animal Genetics	PLS 312	SP	4
Fermented Foods and Beverages Laboratory	NSC 3XXL	SP	1
Microbial Genetics Laboratory	PLP 428L	SP	2
Advanced Food Science & Microbiology Laboratory	MIC 430L	F	2
<i>At least one genetics course chosen from:</i>			
Plant and Animal Genetics	PLS 312	SP	4
Microbial Genetics	PLP 428R	SP	3
Plant Genetics and Genomics	PLS 449A	Contact Dept.	3
<i>At least two additional Biotechnology-related courses chosen from:</i>			
Plants, Genes, and Agriculture	PLS 245	SP	3
Plant Biotechnology	PLS 424R	SP	3
Food Microbiology and Biotechnology	MIC 430	SP	3
Industrial Biotechnology	PLS 434	F	3
Recombinant DNA Methods and Applications	MCB 473	SP	4
<i>At least one additional Microbiology-related course chosen from:</i>			
Microbial Physiology	MIC 328R	SP	3
Microbial Diversity	PLS 329A	F	3
Core Concepts in Molecular Microbiology	MIC 350	F	3
Microbiological Techniques	MIC 421B	F	5
Microbial Genetics	PLP 428R	SP	3
Food Microbiology and Biotechnology	MIC 430	SP	3
Sub-plan electives	Course	Offered	Bring to 23 units
Plants, Genes, and Agriculture	PLS 245	SP	3
Plant and Animal Genetics	PLS 312	SP	4
Fermented Foods and Beverages Laboratory	NSC 3XXL	SP	1
Genomics	ECOL 326	F/SU	3
Microbial Physiology Laboratory	MIC 328L	SP	1
Microbial Physiology	MIC 328R	SP	3
Microbial Diversity	PLS 329A	F	3
Core Concepts in Molecular Microbiology	MIC 350	F	3
Fundamentals of Food Science	NSC 351R	F/SU	3
Plant Molecular Biology	PLS 358	SP	3
Foundations in Biochemistry <i>or</i> Metabolic Biochemistry	BIOC 384 <i>or</i> BIOC 385	F/W/SP/SU	3
Bioethics	MCB 404	F/SP/SU	3
Plant Breeding and Genetics	PLS 415	SP	3
Bioinformatics and Genomic Analysis	MCB 416A	SP (even yrs.)	3
Microbiological Techniques	MIC 421B	F	5
Problem Solving with Genetic Tools	MCB 422	F/SP/SU	3
Plant Biotechnology	PLS 424R	SP	3
Microbial Genetics Laboratory	PLP 428L	SP	2
Microbial Genetics	PLP 428R	SP	3
Food Microbiology and Biotechnology	MIC 430	SP	3
Advanced Food Science & Microbiology Laboratory	MIC 430L	F	2
Industrial Biotechnology	PLS 434	F	3
Plant Biochemistry and Metabolic Engineering	PLS 448A	F	3
Plant Genetics and Genomics	PLS 449A	Contact Dept.	3
Recombinant DNA Methods and Applications	MCB 473	SP	4

FOOD AND BEVERAGE FERMENTATION SUB-PLAN			
Sub-plan core	Course	Offered	15 Units
Microbial Genetics	PLP 428R	SP	3
Fundamentals of Food Science	NSC 351R	F/SU	3
Fermented Foods and Beverages Laboratory	NSC 3XXL	SP	1
Food Microbiology and Biotechnology	MIC 430	SP	3
Advanced Food Science & Microbiology Laboratory	MIC 430L	F	2
Industrial Biotechnology	PLS 434	F	3
Sub-plan electives	Course	Offered	8 Units
Evolution of Food Plants	PLS 307	SP (even yrs.)	3
Nutrition and Metabolism <i>or</i> Nutrition and Disease	NSC 308 <i>or</i> NSC 310	F/SP/SU <i>or</i> F/SU	3
Plant and Animal Genetics	PLS 312	SP	4
Principles of Dairy Animal Milk Products and Processing	ACBS 320	SP	3
Genomics	ECOL 326	F/SU	3
Microbial Physiology	MIC 328R	SP	3
Fundamentals of Food Science Lab	NSC 351L	F/SP	1
Food Processing and Safety Preventive Controls	ACBS 355	F	3
Plant Molecular Biology	PLS 358	SP	3
Food Toxicology	ACBS 377	F	3
Food Safety & Microbiology	ACBS 380R	F	3
Foundations in Biochemistry <i>or</i> Metabolic Biochemistry	BIOC 384 <i>or</i> BIOC 385	F/W/SP/SU	3
Bioethics	MCB 404	F/SP/SU	3
Bioinformatics and Genomic Analysis	MCB 416A	SP (even yrs.)	3
Meat Animal Composition	ACBS 420	SP	3
Food Safety Law	ACBS 437	F	3

INDUSTRIAL PLANT AND MICROBIAL BIOTECHNOLOGY SUB-PLAN			
Sub-plan core	Course	Offered	20 Units
Plants, Genes, and Agriculture	PLS 245	SP	3
Biotechnology Laboratory <i>or</i> Microbial Genetics Laboratory	PLS 340L <i>or</i> PLP 428L	SP	2
Core Concepts in Molecular Microbiology	MIC 350	F	3
Plant Biotechnology	PLS 424R	SP	3
Microbial Genetics	PLP 428R	SP	3
Industrial Biotechnology	PLS 434	F	3
Plant Biochemistry and Metabolic Engineering	PLS 448A	F	3
Sub-plan electives	Course	Offered	3 Units
Evolution of Food Plants	PLS 307	SP (even yrs.)	3
Plant and Animal Genetics	PLS 312	SP	4
Genomics	ECOL 326	F/SU	3
Microbial Physiology Laboratory	MIC 328L	SP	1
Microbial Physiology	MIC 328R	SP	3
Microbial Diversity	PLS 329A	F	3
Biotechnology Laboratory	PLS 340L	SP	2
Fundamentals of Food Science	NSC 351R	F/SU	3
Plant Molecular Biology	PLS 358	SP	3
Foundations in Biochemistry <i>or</i> Metabolic Biochemistry	BIOC 384 <i>or</i> BIOC 385	F/W/SP/SU	3
Fermented Foods and Beverages Laboratory	NSC 3XXL	SP	1
Bioethics	MCB 404	F/SP/SU	3
Plant Breeding and Genetics	PLS 415	SP	3
Bioinformatics and Genomic Analysis	MCB 416A	SP (even yrs.)	3
Microbiological Techniques	MIC 421B	F	5
Problem Solving with Genetic Tools	MCB 422	F/SP/SU	3
Microbial Genetics Laboratory	PLP 428L	SP	2
Food Microbiology and Biotechnology	MIC 430	SP	3
Advanced Food Science & Microbiology Laboratory	MIC 430L	F	2
Plant Genetics and Genomics	PLS 449A	Contact Dept.	3
Antibiotics - A Biological Perspective	MIC 452	F	3
Recombinant DNA Methods and Applications	MCB 473	SP	4
Metagenomics: From Genes to Ecosystems	BE 487	F	3