Bachelor of Science in Biotechnology

Biotechnology is the modern face of the biological sciences. It applies technological advances, particularly those involving the sciences of molecular genetics, recombinant DNA techniques, and molecular diagnostics to solve biological problems through the production of materials, processes, and services to benefit our environment.

In medicine, Biotechnology aids in the manufacture of therapeutics, enzymes, antibiotics, vitamins, and vaccines. In agriculture, Biotechnology helps improve food quality, quantity, and processing. Additionally, Biotechnology has applications in green manufacturing technologies. It minimizes contamination and pollution and locates alternative energy sources. In the past decade, industry has increasingly turned to biotechnology to improve product quality and to make the production process easier, cleaner, and more cost-effective.

Biotechnology graduates work in fields such as molecular biology, genetics, forensics, plant and animal sciences, food production, therapeutics, agriculture, and environmental sciences.

The Bachelor of Science in Biotechnology is overseen by the School of Arts and Sciences and is designed to satisfy QF Emirates Level 7 requirements.

Program Mission

The Bachelor of Science in Biotechnology Program, with separate concentrations in Cell and Molecular Biotechnology, Medical Biotechnology, and Forensic Biology, aims to produce skilled and knowledgeable biotechnologists who are capable of applying their acquired knowledge to scientific research and development in medicine, science, agriculture, forensics and the environment for the benefit of their societies, while maintaining the highest standards of professional ethics in their careers.

Program Educational Objectives

The goals of the Biotechnology Program are to:

1. Supply society with biologically literate citizens who are capable of advising and making decisions;
2. Produce ambitious, creative graduates who are interested in continuing their education in the biosciences;
3. Practice scientific inquiry and appreciate its role in the development of research, science, technology, and society;
4. Produce responsible biotechnology professionals to fulfill the employment and research needs in the biotechnology industry in the UAE and the region;
5. Contribute to the advancement of agriculture, medicine, and environmental sciences through the application of biotechnology theory and recombinant DNA technology; and
6. Enhance the students' ability to integrate their acquired math, computer, and bioscience knowledge and skills to investigate and solve biological problems.

Program Learning Outcomes

On completion of the program graduates will be able to:

1. **PLO1**: Identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.
2. **PLO2**: Formulate or design a system, process, procedure or program to meet desired needs.

3. **PLO3**: Develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
4. **PLO4**: Communicate effectively with a range of audiences.
5. **PLO5**: Discuss ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.
6. **PLO6**: Function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

Program Concentration Learning Outcomes – Cell and Molecular Biotechnology

7. **PLO7**: Lead and implement appropriate research strategies to produce verifiable data in Cell and Molecular Biotechnology.
8. **PLO8**: Evaluate and manage complex and unpredictable work procedures to be able to function successfully within the Cell and Molecular Biotechnology graduate programs and employment sectors.

Program Concentration Learning Outcomes – Medical Biotechnology

7. **PLO7**: Lead and implement appropriate research strategies to produce verifiable data in Medical Biotechnology.
8. **PLO8**: Evaluate and manage complex and unpredictable work procedures to be able to function successfully within the Medical Biotechnology graduate programs and employment sectors.

Program Concentration Learning Outcomes – Forensic Biology

7. **PLO7**: Lead and implement appropriate research strategies to produce verifiable data in Forensic Biology.
8. **PLO8**: Evaluate and manage complex and unpredictable work procedures to be able to function successfully within the Forensic Biology graduate programs and employment sectors.

Degree Requirements

The Bachelor of Science in Biotechnology degree is a four-year degree program with concentration in Cell and Molecular Biotechnology, Medical Biotechnology, and Forensic Biology. For the first three years of the Bachelor of Science in Biotechnology program, students follow a common sequence of courses, with courses specific to the respective concentration taken in the fourth year of the program. To earn a bachelor's degree, students must satisfactorily complete at least 128 approved credits, fulfill all the requirements for the Bachelor of Science in Biotechnology degree, and achieve a GPA of 2.00 or higher. Students must apply for at least forty-eight credits of upper-level courses (designated 300- level or higher) toward graduation requirements. Thirty-one to Thirty-four credit hours from approved courses are required to fulfill the General Education Program requirements. The degree is designed to be completed in four years, assuming students do not interrupt their study. Students who withdraw or take a leave of absence from the program must meet requirements for returning that are outlined in AURAK catalog. Students are required to meet specific standards to progress, as well as the maximum time allowed to complete the program, which are also detailed in the catalog. If a degree is not completed within a period of six years, all coursework in the major will be re-evaluated for its current relevance.

The Bachelor of Science in Biotechnology degree necessitates the completion of the following requirements:

Requirements	Credits
University General Education Requirements	31
Biotechnology Program Core Courses	63
Biotechnology Program Elective courses	7
Concentration (Cell and Molecular Biotechnology, Medical Biotechnology, or Forensic Biology) Course Requirements	21
Free Electives	6
TOTAL	**128**

University General Education Requirements — 31 Credit Hours

The program requires completion of the General Education Component. For information relating directly to the General Education requirements, please review the catalog section entitled, "General Education Component." You must speak with your advisor to ensure that the General Education Component requirements are satisfied**. The 5th writing intensive course for the BS in Biotechnology is BIOL 450 Bioethics.**

Course Code	Title	Credits
ENGL 101	Composition **(Writing Intensive)**	3
UNIV 100	University First-Year Transition	1
ITEC 103	Fundamentals of Information Technology	3
ARAB 101 or ARAB 110	Arabic Language and Culture for Non-Native Learners I OR Arabic Language and Culture for Native Arabic Speakers I	3
UNIV 200	Innovation, Entrepreneurship, and Sustainability **(Writing Intensive)**	3
MEST 100	Introduction to Islam in World Culture **(Writing Intensive)**	3
PHIL 100 or ENGL 200	Critical Thinking and Reasoning **(Writing Intensive)** OR Advanced Composition **(Writing Intensive)**	3
UAES 200	Survey of United Arab Emirates Studies	3
MATH 111	Calculus for Life Sciences	3
Gen Ed	General Education Social Sciences Course	3
BIOL 100	Humankind in a Biological World	3

Biotechnology Program Core Courses — 63 Credit Hours

Course Code	Title	No. of Credits
BIOL 112	University Biology I	3
BIOL 113	University Biology I Lab	1
BIOL 114	University Biology II	3
BIOL 115	University Biology II Lab	1
BIOL 230	General Microbiology	3
BIOL 231	General Microbiology Lab	1

BIOL 270	General Genetics	3
BIOL 271	General Genetics Lab	1
BIOL 330	Applied and Industrial Microbiology	3
BIOL 331	Techniques in Applied and Industrial Microbiology	1
BIOL 250	Biochemistry I	3
BIOL 251	Biochemistry I Lab	1
BIOL 350	Biochemistry II	3
BIOL 356	Virology	3
BIOL 380	Biotechnology and Genetic Engineering	3
BIOL 381	Biotechnology Lab Methods and Techniques	1
BIOL 450	Bioethics (***Writing Intensive***)	3
BIOL 491	Senior Seminar	2
BIOL 490	Research Methods in Biology	3
CHEM 111	Principles of General Chemistry	3
CHEM 112	Principles of General Chemistry Lab	1
CHEM 120	Analytical Chemistry	3
CHEM 121	Analytical Chemistry Laboratory	1
CHEM 215	Organic Chemistry I	3
CHEM 216	General Organic Chemistry Lab I	1
ENVS 102	Sustainability and Human-Environment Relations	3
STAT 100	Introductory Probability and Statistics	3
BIOL 390	Internship	3

Biotechnology Program Elective Courses **7 Credit Hours**

Course Code	Title	No. of Credits
BIOL 322	Microbial Genetics	3
BIOL 357	Artificial Intelligence in Biotechnology	3
BIOL 480	Food Biotechnology	3
BIOL 481	Bioprocessing Technology in the Pharmaceutical Industry	3
	Students may choose one course and its corresponding lab from the other concentration as an elective.	4

Concentration Course Requirements **21 Credit Hours**

Concentration in Cell and Molecular Biotechnology **21 Credit Hours**

Course Code	Course Title	No. of Credits
BIOL 420	Molecular Biology	3
BIOL 421	Molecular Biology and Recombinant DNA Lab	1
BIOL 425	Advanced Genetics	3
BIOL 430	Cell Culture Theory and Technology	3
BIOL 431	Cell Culture Techniques Lab	1
BIOL 434	Cell Communication and Signal Transduction	3
BIOL 473	Bioinformatics and Computational Biology	3
BIOL 494	Senior Project in Cell and Molecular Biotechnology	4

Concentration in Medical Biotechnology **21 Credit Hours**

Course Code	Course Title	No. of Credits
BIOL 411	Drug Discovery, Design and Development	3
BIOL 435	Stem Cell Biology and Regenerative Medicine	3
BIOL 436	Immunology	3
BIOL 440	Medical Microbiology	3
BIOL 441	Medical Microbiology Lab	1
BIOL 442	Molecular Diagnostics	3
BIOL 443	Molecular Diagnostics Lab	1
BIOL 495	Senior Project in Medical Biotechnology	4

Concentration in Forensic Biology **21 Credit Hours**

Course Code	Course Title	No. of Credits
CHEM 420	Forensic Chemistry	3
CHEM 421	Forensic Chemistry Lab	1
BIOL 423	Advanced Molecular Biology and Forensic Sciences	3
BIOL 424	DNA Fingerprinting and Serology Lab	1
BIOL 462	Crime Scene Investigation	3
BIOL 464	Criminal Justice	3
BIOL 473	Bioinformatics and Computational Biology	3
BIOL 496	Senior Project in Forensic Biology	4

Program Free Electives **6 Credits Hours**

Course Code	Course Title	No. of Credits
	Free Electives	6