

Lakeland

COMMUNITY COLLEGE

PROGRAM GUIDE

Applied Studies Division

Biotechnology Science

- Associate of Applied Science Degree in Biotechnology Science
- Biotechnology Science Certificate
- Bioinformatics Concentration

 Opportunity
starts **HERE**
lakelandcc.edu

Biotechnology Science



Biotechnology science is the use of organisms, cells or their components to create products or solve problems. A degree in biotechnology science easily transfers to a bachelor's degree in a biotechnology-related field.

Biotechnology science has applications in the fields of medicine, environmental science, food science, agriculture, textiles and forensics. It is used to study causes and cures for diseases, produce vaccines and gene therapies, create disease resistant plants, strengthen crops, increase the food supply, develop cleaner industrial processes, improve energy efficiency, and protect the environment.

Career Opportunities

There is a high demand for trained employees in the field of biotechnology science. It is one of the top 10 fastest growing fields in the country. Northeast Ohio is home to numerous world-class research institutions and the region has seen an explosion in growth of biotech industries in recent years. Hot career trends include biomedical research, new gene discovery, gene therapy and environmental testing.

Employers aggressively recruit Lakeland graduates to fill the growing demand for qualified bioscience technicians. Many students turn their internships at local academic or industrial organizations into permanent jobs. Recent graduating classes have experienced a greater than 90 percent placement rate in employment, a bachelor's degree program, or both. Seamless articulation agreements and transfer modules with other colleges and universities make the study of biotechnology science at Lakeland an easy first step in a career pathway that can include advanced college degrees.

The Lakeland Advantage

- Easy transfer of biotechnology science credits to bachelor's degree programs.
- The program is partnered with world-class academic institutions including Case Western Reserve University and Cleveland Clinic, as well as private institutions such as STERIS, Athersys, Ricerca Biosciences, Amresco and many others.
- A 2 + 2 bachelor's degree pathway option with Ursuline College.
- Many employers offer tuition waivers and reimbursement programs to reduce, or eliminate, the cost of a bachelor's degree.
- Choose Ohio First Scholarships available to cover a significant portion of Lakeland's tuition.

Lakeland's Program

Lakeland's biotechnology science program offers a two-year course of study leading to an Associate of Applied Science degree in biotechnology science or a biotechnology science certificate for those who already have a bachelor's or associate degree.

A new bioinformatics concentration is a hybrid technical program that combines biotechnology science and information technology/computer science courses.

Students in Lakeland's program gain knowledge and training in a wide range of microbiology and molecular biology laboratory techniques as well as a strong foundation in communication skills.

Classroom and laboratory instruction, plus required internships at leading research or industrial facilities, provide students with the skills to operate the advanced equipment found in most high-tech biomedical, pharmaceutical, agricultural and environmental industries.

Choose  **Ohio** First

**Ten (10) full tuition
scholarships are
available each year.
Contact Dr. Joe Deak at
440.525.7466
for details.**

Biotechnology Science (9375)

Associate of Applied Science Degree

The Biotechnology Science program prepares students for entry-level laboratory technician positions in research and industrial laboratories engaged in biotechnology. Graduates may choose career paths in the medical, pharmaceutical, agricultural, environmental, or forensic science industries, as well as basic biological research. The program emphasizes hands-on training utilizing industry standard equipment to perform both routine and specialized experimental techniques. Students become adept in macromolecular separation and characterization, genetic manipulation, cell culture, and microbial growth control. Fundamental laboratory skills such as documentation, reagent preparation, safety, troubleshooting, good laboratory practice (GLP), and good manufacturing practice (GMP) are stressed.










A minimum GPA of 2.0 and a "C" grade or higher is required in all science and program-specific courses for graduation.



A certificate is also available.

Admission Procedures

Students must meet specific admission requirements for this program. Listed below are requirements for admission to the Biotechnology Science Program:


- Complete college application(s).
- Submit high school transcript as well as any college transcript(s).
- Meet with the biotechnology science program director to obtain a program application form.
- Meet with a counselor to review program prerequisites and requirements.
- Completion of high school chemistry with a grade of "C" or above or successful completion of CHEM 1100 Elementary Chemistry.
- Successful completion of MATH 0950 Intermediate Algebra or placement into MATH 1650 College Algebra.

Course	Title	Credit Hours
First Semester		
BIOS 1050	Introduction to Biotechnology Science 	3
BIOS 1200	Biotechnology Science Lab Skills 	5
BIOL 1510	Principles of Biology I	4
CHEM 1500	General Chemistry I	5
FYEX 1000	First Year Experience	1
	Credit Hours	18
Second Semester		
BIOS 1500	Introduction to Biochemistry 	4
BIOL 2700	Microbiology	4
CHEM 1600	General Chemistry II	5
ENGL 1110 or ENGL 1111	English Composition I (A) ¹ or English Composition I (B)	3
	Credit Hours	16
Summer		
BIOS 1600	Advanced Molecular Separations 	4
BIOS 2100	Applied Microbiology 	3
	Credit Hours	7
Third Semester		
BIOS 2500	Recombinant DNA Technology 	4
BIOS 2600	Bioscience Manufacturing Processes 	4
MATH 1550	Statistics	4
	Credit Hours	12
Fourth Semester		
BIOS 2550	Introduction to Bioinformatics 	1
BIOS 2800	Biotechnology Science Seminar 	1

COMM 1050	Fundamentals of Public Speaking ²	2
Select course(s) from the Social and Behavioral Science Electives list		3
1st 8 weeks		
BIOS 2400	Tissue Culture 	3
2nd 8 weeks		
BIOS 2700	Internship 	3
Credit Hours		13
Total Credit Hours		66

¹ English course selection is based on placement test results (ENGL 1111 English Composition I (B) is 4 credits, only 3 credits apply to the degree). Students who place into ENGL 1111 English Composition I (B) should consult with the program chair.

² Students may substitute COMM 1000 Effective Public Speaking. This 3 credit hour course may be required for students transferring to a four-year college.

 This course is designated as a technical course in the program. Students must earn a "C" grade or higher in the course to fulfill the college's graduation requirements policy.

Electives

Course	Title	Credit Hours
Social and Behavioral Sciences Electives		
ANTH 1160	Introduction to Cultural Anthropology	3
ECON 1150	Basic Economics	3
ECON 2500	Principles of Macroeconomics	3
ECON 2600	Principles of Microeconomics	3
GEOG 1500	Introduction to Geography	3
GEOG 1600	World Regional Geography	3
GEOG 2500	World Cultural Geography	3
HIST 1150	Western Civilization I: Antiquity Through the Reformation	3
HIST 1250	Western Civilization II: Age of Revolution Through the Present	3
HIST 2150	U.S. History: Colonization Through Reconstruction	3
HIST 2250	U.S. History: Reconstruction to the Present	3
POLS 1300	U.S. National Government	3
POLS 2500	Modern Political Ideologies	3
PSYC 1500	Introduction to Psychology	3
SOCY 1150	Principles of Sociology	3

Biotechnology Science Certificate (3751)

This certificate is designed primarily for students with a baccalaureate or associate degree, and a basic science background including one year of college chemistry, cell biology, and general microbiology.

Admission to the Biotechnology Science program is required.

NOTE: BIOS 1500 Introduction to Biochemistry has prerequisites that include BIOL 1510 Principles of Biology I or an equivalent cellular biology course, and CHEM 1500 General Chemistry I or an equivalent chemistry course. BIOS 2100 Applied Microbiology has prerequisites that include BIOL 2700 Microbiology or an equivalent general microbiology course. Students may need to take additional courses if they have not already taken the prerequisite courses or their equivalent.

Course	Title	Credit Hours
BIOS 1050	Introduction to Biotechnology Science	3
BIOS 1200	Biotechnology Science Lab Skills	5
BIOS 1500	Introduction to Biochemistry	4
BIOS 1600	Advanced Molecular Separations	4
BIOS 2100	Applied Microbiology	3
BIOS 2400	Tissue Culture	3
BIOS 2500	Recombinant DNA Technology	4
BIOS 2550	Introduction to Bioinformatics	1
BIOS 2600	Bioscience Manufacturing Processes	4
BIOS 2700	Internship	3
BIOS 2800	Biotechnology Science Seminar	1
Total Credit Hours		35

For more information about our graduation rates, the median debt of students who completed the program, and other important information, please view this program's Gainful Employment information (<https://lkn.lakelandcc.edu/go/ge/?g=3751>).

Bioinformatics Concentration (9376)

Associate of Applied Science Degree

Bioinformatics develops and uses computer software to analyze and manage biological data. Bioinformatics is fundamental to modern biological research and to the development of individualized medicine that will combine genome analysis, medical records, and results of clinical trials and research to tailor treatments and prevention regimen. Graduates of this program will fill the need for scientists with knowledge of biology, genetics, molecular biology, database management, and computer programming. This program is a hybrid technical program that contains approximately equal amounts of Lakeland's biotechnology science and information technology/computer science courses. Job opportunities include biology and biomedical research, healthcare, and biomedical informational services sectors.

A minimum GPA of 2.0 and a grade of "C" or above is required for all science, math and program specific courses.







ADMISSION PROCEDURES

Students must meet specific admission requirements for this program. The admission requirements for the Bioinformatics program are:





- Complete college application(s)
- Submit high school transcript as well as any college transcript(s)
- Meet with the Biotechnology Science program director to obtain a program application form
- Meet with a counselor to review program prerequisites and requirements
- Completion of high school chemistry with a grade of "C" or above or successful completion of CHEM 1100 Elementary Chemistry
- Successful completion of MATH 0950 Intermediate Algebra or placement into MATH 1650 College Algebra
- Successfully complete the CIS Tech Prep program OR have waived with equivalent high school or college coursework the following course:
 - ITIS 1005 Computer Essentials or ITIS 1007 Principles of Information Technology and Computer Science

OR





Complete ITIS 1005 Computer Essentials or ITIS 1007 Principles of Information Technology and Computer Science with a grade of "C" or better

Course	Title	Credit Hours
First Semester		
BIOL 1510	Principles of Biology I	4
CHEM 1500	General Chemistry I	5
ENGL 1110 or ENGL 1111	English Composition I (A) ¹ or English Composition I (B)	3
FYEX 1000	First Year Experience	1
Select course(s) from the Arts and Humanities Electives list		3
	Credit Hours	16
Second Semester		
BIOS 1500	Introduction to Biochemistry 	4
ITCS 1010	Programming Logic 	3
ITIS 1008	Ethics in Information Technology	1
ITON 1070	Operating Systems: Skills and Techniques 	1
ITON 1205	Network+ and Networking Essentials 	2
Select course(s) from the Related Electives list		4
	Credit Hours	15
Summer		
ITDB 1400	Introduction to SQL 	2
ITIS 1520	Microsoft Office Excel: Skills and Techniques 	3
	Credit Hours	5


Third Semester

BIOS 2500	Recombinant DNA Technology 	4
ITCS 1870	Python Programming I 	3
ITDB 1405	Oracle PL/SQL Programming 	2
ITON 1748	Linux Administration I 	3
MATH 1550	Statistics	4
Credit Hours		16

Fourth Semester

BIOS 2400	Tissue Culture 	3
BIOS 2550	Introduction to Bioinformatics 	1
BIOS 2700	Internship 	3
BIOS 2800	Biotechnology Science Seminar 	1
COMM 1000	Effective Public Speaking	3
Select course(s) from the Social and Behavioral Science Electives list		3
Credit Hours		14
Total Credit Hours		66

¹ English course selection is based on placement test results (ENGL 1111 English Composition I (B) is 4 credits, only 3 credits apply to the degree).

 This course is designated as a technical course in the program. Students must earn a "C" grade or higher in the course to fulfill the college's graduation requirements policy.

ELECTIVES

Course	Title	Credit Hours
Related Electives		
BIOL 1520	Principles of Biology II	4
BIOL 2700	Microbiology	4
MATH 1650	College Algebra	4
Arts and Humanities Electives		
ARTS 1120	Art Appreciation	3
ARTS 2220	Survey of Art I	3
ARTS 2230	Survey of Art II	3
ENGL 2250	Survey of American Literature I	3
ENGL 2260	Survey of American Literature II	3
ENGL 2280	Survey of British Literature I	3
ENGL 2290	Survey of British Literature II	3
HUMX 1100	Introduction to Humanities	3
HUMX 1200	The American Experience in the Arts	3
MUSC 1200	Music Appreciation	3
MUSC 1215	World Music	3
MUSC 1800	Popular Music: Rock, Jazz, Country, and Hip-Hop	3
MUSC 2200	Music History and Literature I	3
MUSC 2250	Music History and Literature II	3
PHIL 1500	Introduction to Philosophy	3
PHIL 2000	Comparative Religion	3
PHOT 1000	History of Photography	3
Social and Behavioral Sciences Electives		
ANTH 1160	Introduction to Cultural Anthropology	3
ECON 1150	Basic Economics	3
ECON 2500	Principles of Macroeconomics	3
ECON 2600	Principles of Microeconomics	3
GEOG 1500	Introduction to Geography	3

GEOG 1600	World Regional Geography	3
GEOG 2500	World Cultural Geography	3
HIST 1150	Western Civilization I: Antiquity Through the Reformation	3
HIST 1250	Western Civilization II: Age of Revolution Through the Present	3
HIST 2150	U.S. History: Colonization Through Reconstruction	3
HIST 2250	U.S. History: Reconstruction to the Present	3
POLS 1300	U.S. National Government	3
POLS 2500	Modern Political Ideologies	3
PSYC 1500	Introduction to Psychology	3
SOCY 1150	Principles of Sociology	3



Quality Education

Professors at Lakeland are experts in their fields with real-world experience. Lakeland prepares you for a high-demand career or for transfer to a four-year college or university. Access to bachelor's and graduate degrees is available on campus from partner institutions through Lakeland's Holden University Center (lakelandcc.edu/uc).



Affordable Tuition

Lakeland's tuition is about one-third the cost of most four-year schools. More than 50 percent of Lakeland students receive some form of financial assistance (lakelandcc.edu/tuition).



Convenience

Lakeland offers convenient day, evening, weekend and online courses (lakelandcc.edu/schedule).



Focus on Students

Lakeland offers a variety of student services to help you succeed, such as counseling, tutoring, computer labs, career services, free parking and affordable child care.



Opportunity starts **HERE**

Visit us on campus or online. Call 440.525.7900, email recruitmentcenter@lakelandcc.edu or visit lakelandcc.edu/visit for a campus tour.

Apply online: lakelandcc.edu/apply

Accreditation

Lakeland Community College is accredited through the Higher Learning Commission (HLC) and participates in the Academic Quality Improvement Program (AQIP). The Higher Learning Commission, 230 South LaSalle Street, Suite 7-500, Chicago, IL 60604-1413, phone: 800.621.7440, hlcommission.org.

Lakeland
COMMUNITY COLLEGE