

BIOTECHNOLOGY - B.S.

College of Arts and Sciences
 Department of Chemistry and Biochemistry
 Department of Biological Sciences
www.kent.edu/chemistry

About This Program

Our Biotechnology program offers a thorough education on the principles and techniques of biotechnology, equipping you with the necessary skills for a diverse array of careers in academia, government and industry. With access to cutting-edge research facilities, experienced faculty and real-world opportunities, you will gain the skills and knowledge needed to make an impact in this exciting field. Read more...

Contact Information

- Program Coordinator: **Min-Ho Kim** | mkim15@kent.edu | 330-672-1445
- Speak with an Advisor
- Chat with an Admissions Counselor

Program Delivery

- **Delivery:**
 - In person
- **Location:**
 - Kent Campus

Examples of Possible Careers and Salaries*

Secondary school teachers, except special and career/technical education

- 3.8% about as fast as the average
- 1,050,800 number of jobs
- \$62,870 potential earnings

Biological technicians

- 4.9% about as fast as the average
- 87,500 number of jobs
- \$46,340 potential earnings

Medical scientists, except epidemiologists

- 6.1% faster than the average
- 138,300 number of jobs
- \$91,510 potential earnings

Biological scientists, all other

- 2.2% slower than the average
- 44,700 number of jobs
- \$85,290 potential earnings

* Source of occupation titles and labor data comes from the U.S. Bureau of Labor Statistics' Occupational Outlook Handbook. Data comprises projected percent change in employment over the next 10 years; nation-wide employment numbers; and the yearly median wage at

which half of the workers in the occupation earned more than that amount and half earned less.

Admission Requirements

The university affirmatively strives to provide educational opportunities and access to students with varied backgrounds, those with special talents and adult students who graduated from high school three or more years ago.

First-Year Students on the Kent Campus: First-year admission policy on the Kent Campus is selective. Admission decisions are based upon cumulative grade point average, strength of high school college preparatory curriculum and grade trends. Students not admissible to the Kent Campus may be administratively referred to one of the seven regional campuses to begin their college coursework. For more information, visit the admissions website for first-year students.

First-Year Students on the Regional Campuses: First-year admission to Kent State's campuses at Ashtabula, East Liverpool, Geauga, Salem, Stark, Trumbull and Tuscarawas, as well as the Twinsburg Academic Center, is open to anyone with a high school diploma or its equivalent. For more information on admissions, contact the Regional Campuses admissions offices.

International Students: All international students must provide proof of English language proficiency (unless they meet specific exceptions) by earning a minimum 525 TOEFL score (71 on the Internet-based version), minimum 75 MELAB score, minimum 6.0 IELTS score or minimum 48 PTE Academic score, or by completing the ELS level 112 Intensive Program. For more information, visit the admissions website for international students.

Transfer Students: Students who have attended any other educational institution after graduating from high school must apply as undergraduate transfer students. For more information, visit the admissions website for transfer students.

Former Students: Former Kent State students or graduates who have not attended another college or university since Kent State may complete the reenrollment or reinstatement form on the University Registrar's website.

Admission policies for undergraduate students may be found in the University Catalog's Academic Policies.

Some programs may require that students meet certain requirements before progressing through the program. For programs with progression requirements, the information is shown on the program's Coursework tab.

Program Requirements

Major Requirements

| Code | Title | Credit Hours |
|--|---|--------------|
| Major Requirements (courses count in major GPA) | | |
| BSCI 10120 | BIOLOGICAL FOUNDATIONS (ELR) (KBS) (KLAB) | 4 |
| BSCI 30140 | CELL BIOLOGY | 4 |
| BSCI 30156 | ELEMENTS OF GENETICS | 3 |
| BSCI 30171 | GENERAL MICROBIOLOGY | 4 |
| BSCI 40158 | MOLECULAR BIOLOGY | 3 |
| BTEC 10210 | INTRODUCTION TO BIOTECHNOLOGY | 3 |
| BTEC 40191 | SEMINAR: RECENT DEVELOPMENTS IN BIOTECHNOLOGY | 1 |
| BTEC 40192 | INTERNSHIP IN BIOTECHNOLOGY (ELR) | 6-12 |

| | | |
|---|---|------------|
| or BTEC 40196 | INDIVIDUAL INVESTIGATION IN BIOTECHNOLOGY (ELR) | |
| BTEC 40210 | CASE STUDIES IN BIOTECHNOLOGY (WIC) ¹ | 3 |
| BTEC 40220 | BIOINFORMATICS | 3 |
| BUS 10123 | EXPLORING BUSINESS | 3 |
| CHEM 10060 | GENERAL CHEMISTRY I (KBS) | 4 |
| CHEM 10061 | GENERAL CHEMISTRY II (KBS) | 4 |
| CHEM 10062 | GENERAL CHEMISTRY I LABORATORY (KBS) (KLAB) | 1 |
| CHEM 10063 | GENERAL CHEMISTRY II LABORATORY (KBS) (KLAB) | 1 |
| CHEM 20481 | BASIC ORGANIC CHEMISTRY I | 4 |
| CHEM 30284 | INTRODUCTORY BIOLOGICAL CHEMISTRY | 4 |
| CHEM 40251 | ADVANCED BIOLOGICAL CHEMISTRY LABORATORY (WIC) (min grade C) ¹ | 2 |
| CHEM 40262 | BIOCHEMISTRY: METABOLISM AND GENE EXPRESSION | 3 |
| MATH 12002 | ANALYTIC GEOMETRY AND CALCULUS I (KMCR) | 5 |
| MATH 30011 | BASIC PROBABILITY AND STATISTICS | 3 |
| PHIL 30015 | MEDICINE AND MORALITY | 3 |
| PHY 13001 | GENERAL COLLEGE PHYSICS I (KBS) | 4 |
| PHY 13021 | GENERAL COLLEGE PHYSICS LABORATORY I (KBS) (KLAB) | 1 |
| Major Electives, choose from the following: | | 9 |
| BSCI 30518 | VERTEBRATE ANATOMY | |
| BSCI 40143 | EUKARYOTIC CELL BIOLOGY | |
| BSCI 40159 | MOLECULAR BIOLOGY LABORATORY (ELR) (WIC) ¹ | |
| BSCI 40174 | IMMUNOLOGY | |
| BSCI 40463 | MEDICAL BIOTECHNOLOGY | |
| CHEM 30105 | ANALYTICAL CHEMISTRY I | |
| CHEM 30107 | ANALYTICAL CHEMISTRY LABORATORY I (WIC) ¹ | |
| CHEM 30301 | INORGANIC CHEMISTRY I | |
| CHEM 30475 | ORGANIC CHEMISTRY LABORATORY I (ELR) | |
| CHEM 40109 | BIOANALYTICAL CHEMISTRY | |
| CHEM 40365 | BIOLOGICAL INORGANIC CHEMISTRY | |
| CHEM 40567 | PHYSICAL CHEMISTRY FOR LIFE SCIENCES | |
| PSYC 41363 | BIOPSYCHOLOGY | |
| Any Upper-Division course (30000 or 40000 level) approved by program director | | |
| Additional Requirements (courses do not count in major GPA) | | |
| CS 10051 | COMPUTER SCIENCE PRINCIPLES (KMCR) | 4 |
| PHIL 21001 | INTRODUCTION TO ETHICS (DIVG) (KHUM) | 3 |
| UC 10001 | FLASHES 101 | 1 |
| Foreign Language (see Foreign Language College Requirement below) | | 8 |
| Kent Core Composition | | 6 |
| Kent Core Humanities and Fine Arts (minimum one course from each) | | 6 |
| Kent Core Social Sciences (must be from two disciplines) | | 6 |
| General Elective (total credit hours depends on earning 120 credit hours, including 39 upper-division credit hours) | | 1 |
| Minimum Total Credit Hours: | | 120 |

¹ A minimum C grade must be earned to fulfill the writing-intensive requirement.

Graduation Requirements

| Minimum Major GPA | Minimum Overall GPA |
|-------------------|---------------------|
| 2.000 | 2.000 |

Foreign Language College Requirement, B.S.

- Students pursuing the Bachelor of Science degree in the College of Arts and Sciences must complete 8 credit hours of foreign language.¹
- The following programs are exempt from this requirement: The Bachelor of Science in Cybercriminology and the Bachelor of Science in Medical Laboratory Science.²
- Minimum Elementary I and II of the same language

¹ All students with prior foreign language experience should take the foreign language placement test to determine the appropriate level at which to start. Some students may start beyond the Elementary I level and will complete the requirement with fewer credit hours and courses. This may be accomplished by (1) passing a course beyond Elementary I through Intermediate II level; (2) receiving credit through one of the alternative credit programs offered by Kent State University; or (3) demonstrating language proficiency comparable to Elementary II of a foreign language. When students complete the requirement with fewer than 8 credit hours and two courses, they will complete remaining credit hours with general electives.

² The Bachelor of Science in Medical Laboratory Science exemption exists under another college policy (Three-Plus-One Programs). The Bachelor of Science in Cybercriminology exemption is due to its extensive collaboration with and contribution from the Information Technology program in the College of Applied and Technical Studies, which does not have a foreign language requirement.

Roadmap

This roadmap is a recommended semester-by-semester plan of study for this major. However, courses designated as critical (!) must be completed in the semester listed to ensure a timely graduation.

| Semester One | | | Credits |
|---------------------|-----------------------|--|-----------|
| ! | BSCI 10120 | BIOLOGICAL FOUNDATIONS (ELR) (KBS) (KLAB) | 4 |
| ! | CHEM 10060 | GENERAL CHEMISTRY I (KBS) | 4 |
| ! | CHEM 10062 | GENERAL CHEMISTRY I LABORATORY (KBS) (KLAB) | 1 |
| | MATH 12002 | ANALYTIC GEOMETRY AND CALCULUS I (KMCR) | 5 |
| | UC 10001 | FLASHES 101 | 1 |
| Credit Hours | | | 15 |
| Semester Two | | | |
| | BSCI 30140 | CELL BIOLOGY | 4 |
| | BTEC 10210 | INTRODUCTION TO BIOTECHNOLOGY | 3 |
| | CHEM 10061 | GENERAL CHEMISTRY II (KBS) | 4 |
| | CHEM 10063 | GENERAL CHEMISTRY II LABORATORY (KBS) (KLAB) | 1 |
| | Kent Core Requirement | | 3 |
| Credit Hours | | | 15 |
| Semester Three | | | |
| | BSCI 30171 | GENERAL MICROBIOLOGY | 4 |
| | CHEM 20481 | BASIC ORGANIC CHEMISTRY I | 4 |
| | PHIL 21001 | INTRODUCTION TO ETHICS (DIVG) (KHUM) | 3 |

| | | |
|------------------------------------|---|------------|
| Foreign Language | | 4 |
| Credit Hours | | 15 |
| Semester Four | | |
| BSCI 30156 | ELEMENTS OF GENETICS | 3 |
| CS 10051 | COMPUTER SCIENCE PRINCIPLES (KMCR) | 4 |
| PHY 13001 | GENERAL COLLEGE PHYSICS I (KBS) | 4 |
| PHY 13021 | GENERAL COLLEGE PHYSICS LABORATORY I (KBS) (KLAB) | 1 |
| Foreign Language | | 4 |
| Credit Hours | | 16 |
| Semester Five | | |
| BUS 10123 | EXPLORING BUSINESS | 3 |
| MATH 30011 | BASIC PROBABILITY AND STATISTICS | 3 |
| PHIL 30015 | MEDICINE AND MORALITY | 3 |
| Kent Core Requirement | | 3 |
| Kent Core Requirement | | 3 |
| General Elective | | 1 |
| Credit Hours | | 16 |
| Semester Six | | |
| BSCI 40158 | MOLECULAR BIOLOGY | 3 |
| CHEM 30284 | INTRODUCTORY BIOLOGICAL CHEMISTRY | 4 |
| Major Elective | | 3 |
| Kent Core Requirement | | 3 |
| Kent Core Requirement | | 3 |
| Credit Hours | | 16 |
| Third Summer Term | | |
| BTEC 40192 | INTERNSHIP IN BIOTECHNOLOGY (ELR) | 2-6 |
| or | or INDIVIDUAL INVESTIGATION IN | |
| BTEC 40196 | BIOTECHNOLOGY (ELR) | |
| Credit Hours | | 2 |
| Semester Seven | | |
| BTEC 40191 | SEMINAR: RECENT DEVELOPMENTS IN BIOTECHNOLOGY | 1 |
| BTEC 40210 | CASE STUDIES IN BIOTECHNOLOGY (WIC) | 3 |
| BTEC 40220 | BIOINFORMATICS | 3 |
| Major Elective | | 3 |
| Kent Core Requirement | | 3 |
| Credit Hours | | 13 |
| Semester Eight | | |
| BTEC 40192 | INTERNSHIP IN BIOTECHNOLOGY (ELR) | 4-6 |
| or | or INDIVIDUAL INVESTIGATION IN | |
| BTEC 40196 | BIOTECHNOLOGY (ELR) | |
| CHEM 40251 | ADVANCED BIOLOGICAL CHEMISTRY LABORATORY (WIC) | 2 |
| CHEM 40262 | BIOCHEMISTRY: METABOLISM AND GENE EXPRESSION | 3 |
| Major Elective | | 3 |
| Credit Hours | | 12 |
| Minimum Total Credit Hours: | | 120 |

University Requirements

All students in a bachelor's degree program at Kent State University must complete the following university requirements for graduation.

NOTE: University requirements may be fulfilled in this program by specific course requirements. Please see Program Requirements for details.

| | |
|--|-------------------------|
| Flashes 101 (UC 10001) | 1 credit hour |
| Course is not required for students with 30+ transfer credits (excluding College Credit Plus) or age 21+ at time of admission. | |
| Diversity Domestic/Global (DIVD/DIVG) | 2 courses |
| Students must successfully complete one domestic and one global course, of which one must be from the Kent Core. | |
| Experiential Learning Requirement (ELR) | varies |
| Students must successfully complete one course or approved experience. | |
| Kent Core (see table below) | 36-37 credit hours |
| Writing-Intensive Course (WIC) | 1 course |
| Students must earn a minimum C grade in the course. | |
| Upper-Division Requirement | 39 credit hours |
| Students must successfully complete 39 upper-division (numbered 30000 to 49999) credit hours to graduate. | |
| Total Credit Hour Requirement | 120 credit hours |

Kent Core Requirements

| | |
|---|--------------|
| Kent Core Composition (KCMP) | 6 |
| Kent Core Mathematics and Critical Reasoning (KMCR) | 3 |
| Kent Core Humanities and Fine Arts (KHUM/KFA) (min one course each) | 9 |
| Kent Core Social Sciences (KSS) (must be from two disciplines) | 6 |
| Kent Core Basic Sciences (KBS/KLAB) (must include one laboratory) | 6-7 |
| Kent Core Additional (KADL) | 6 |
| Total Credit Hours: | 36-37 |

Program Learning Outcomes

Graduates of this program will be able to:

1. Apply knowledge and information to complex issues in biotechnology.
2. Use problem-solving and data-gathering skills to comprehend issues in biotechnology.
3. Develop inductive reasoning and technical communications skills in the context of working in a complex group environment.
4. Analyze scientific papers and expand skills for listening to and critiquing scientific seminars based on the literature or current research.
5. Effectively communicate scientific information.
6. Develop collaborative working relationships with research mentors and laboratory members.

Full Description

The Bachelor of Science degree in Biotechnology is an interdisciplinary program that provides a strong academic foundation in biological sciences and chemistry, practical training in the various biotechnologies and a solid understanding of their application in industry and biomedicine. The science of biotechnology extends across many areas of biology and chemistry and provides cutting-edge technology tools for modern biology and biomedical research. The curriculum includes a research experience at Kent State and/or an internship at a biotechnology company.

Biotechnology graduates have employment opportunities in biomedical research and in the rapidly growing biotechnology and pharmaceutical industries.