

# Department of Biology & Biochemistry

## Mission Statement

The mission of the Department of Biology and Biochemistry is to teach students the foundational concepts and skills of the sciences through a Christian worldview. Students are trained to apply the scientific method, to analyze observations quantitatively and qualitatively, and to integrate knowledge between scientific disciplines. Students learn to value scientific inquiry as a means of exploring God's general revelation in the natural world.

The Department of Biology & Biochemistry prepares students for careers in science and for a wide variety of professional schools, including graduate programs in biology, biochemistry, and health professions such as medicine, nursing, physician assistant, dentistry, chiropractic, pharmacy, and physical therapy. Biology and biochemistry exert more influence in our society than ever before, and the department strives to be in the vanguard of an approach to education based on inquiry and critical thinking within the framework of a Christian worldview.

**NOTE:** WHEN A STUDENT RECEIVES A "U" GRADE FOR THE LAB PORTION OF A SCIENCE COURSE, HE/SHE RECEIVES CREDIT FOR THE COURSE, BUT THE COURSE DOES NOT COUNT FOR LABORATORY SCIENCE CREDIT IN CORE CURRICULUM.

## Biochemistry Major

### Bachelor of Science

Biochemistry is the study of carbohydrates, proteins, lipids, nucleic acids, and the processes of these molecules in the body. A rapidly developing and relatively new discipline within the sciences, biochemistry intersects with physiology, medicine, cell biology, genetics, etc. In recent years the pace of biochemical discovery has accelerated due to the profound transformation wrought by recombinant DNA technology. Biochemistry majors will be well prepared to enter the work force or pursue graduate degrees, medical school, or other professional training. The degree is granted upon completion of credits specified on pages 48–49 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science courses PHY1101/1101L or 1201/1201L; mathematics course MAT2121.
- **Biochemistry majors** must receive a C- or better in all prerequisite courses. In addition, biochemistry majors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

### Required Courses . . . . . 47–48 cr

BIO1011/1011L	Principles of Biology I . . . . .	4
BIO1012	Principles of Biology II . . . . .	4
BIO3235/3235L	Biochemistry . . . . .	5
BIO3246/3246L	Genetics or	
BIO4841/CHE4841	Research/Chemistry Research. . . . .	4–5
BIO3335	Molecular Medicine . . . . .	4
BIO4359L	Biotechnology Lab . . . . .	2
BIO4835	Senior Seminar [OCE, WCE] . . . . .	2
CHE1021/1021L	Principles of Chemistry I . . . . .	4
CHE1022/1022L	Principles of Chemistry II . . . . .	4
CHE3101/3101L	Organic Chemistry I . . . . .	5
CHE3102/3102L	Organic Chemistry II . . . . .	5
PHY1102/1102L	Fundamentals of Physics II . . . . .	4

Students are strongly encouraged to take additional BIO courses to count towards the general elective requirements.

WCE = WRITTEN COMMUNICATION EMPHASIS  
 OCE = ORAL COMMUNICATION EMPHASIS.  
 SEE PAGE 50 FOR EXPLANATION AND PREREQUISITES.

# Biology Major

## Bachelor of Science

Through a sequence of core courses, the biology major provides students with a comprehensive study of the various sub-disciplines of biology including cell and molecular biology, organismal biology, genetics, and ecology. Opportunities for research, independent study, and practical internships further strengthen each student's degree and résumé. The major is a flexible program that contains four unique tracks: Cellular and Molecular Biology, General Biology, and Pre-Medical/Pre-Professional Biology. After completing the biology core requirements, students are able to select from a wide variety of science electives to prepare for any profession in the biological sciences: Clinical Health Sciences, including medical, dental, veterinary, physician assistant, doctor of nurse practitioner, public health, physical therapy, chiropractic, etc.; Research Sciences, including biomedical industry, M.S. and Ph.D. programs in cellular and molecular biology, plant and environmental science, forensic science, genetics, etc. The degree is granted upon completion of credits specified on pages 48–49 (40 credits must be successfully completed in 3000- or 4000-level courses).

## Cellular and Molecular Biology Track (49–51 cr)

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

### Biology Core ..... 19 cr

BIO1011/1011L	Principles of Biology I	4
BIO1012	Principles of Biology II	4
BIO2113/2113L	Principles of Biology III	4
BIO4835	Senior Seminar [OCE, WCE]	2
CHE3101/3101L	Organic Chemistry I	5

### Required Courses ..... 26–27 cr

BIO3145/3145L	Microbiology	4
BIO3246/3246L	Genetics	5
BIO3347	Cell Physiology <b>or</b>	
BIO3348/3348L	Cell Biology	4–5
CHE1022/1022L	Principles of Chemistry II	4
CHE3102/3102L	Organic Chemistry II	5
PHY1101/1101L	Fundamentals of Physics I <b>or</b>	
PHY1201/1201L	Engineering Physics I	4

### Selectives ..... 4–5 cr

BIO3157/3157L	Human Anatomy	4
BIO3158/3158L	Human Physiology	4
BIO3235/3235L	Biochemistry	5
BIO3236	Immunology	4
BIO3335	Molecular Medicine	4
BIO4355	Developmental Biology	4
BIO4359L	Biotechnology Lab	2
BIO4841/CHE4841	Research/Chemistry Research	1–4
BIO4995	Biology Internship	1–4
MAT courses numbered 2122 or higher		
PHY courses numbered 1102 or higher		
Au Sable Institute* courses		

Students are strongly encouraged to take additional BIO, MAT, PHY, or CHE courses to count towards the general elective requirements and gain experience through research or internship opportunities.

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\* SEE RELATED INFORMATION ON PAGES 20, 37–38, 192

## BIOLOGY &amp; BIOCHEMISTRY

## General Biology Track (50 cr)

- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

**Biology Core** ..... 19 cr

BIO1011/1011L	Principles of Biology I	4
BIO1012	Principles of Biology II	4
BIO2113/2113L	Principles of Biology III	4
BIO4835	Senior Seminar [OCE, WCE]	2
CHE3101/3101L	Organic Chemistry I	5

**Required Courses** ..... 9 cr

BIO3246/3246L	Genetics	5
PHY1101/1101L	Fundamentals of Physics I or	
PHY1201/1201L	Engineering Physics I	4

**Biology Electives** ..... 22 cr

BIO1025	Medical Terminology	2
BIO2015	Sustainable Urban Agriculture	2
BIO2116/2116L	Animal Biology	4
BIO2825/2825L	Honors Topics in Biology	2 or 4
BIOX805	Topics in Biology	2-4
BIO3015/3015L	Field Ornithology	4
BIO3145/3145L	Microbiology	4
BIO3157/3157L	Human Anatomy	4
BIO3158/3158L	Human Physiology	4

BIO3159	Pathophysiology	3
BIO3175/3175L	Ecology	4
BIO3235/3235L	Biochemistry	5
BIO3236	Immunology	4
BIO3276/3276L	Field Biology	4
BIO3277/3277L	Conservation Biology	4
BIO3347	Cell Physiology	4
BIO3348/3348L	Cell Biology	5
BIO3335	Molecular Medicine	4
BIO4355	Developmental Biology	4
BIO4841/CHE4841	Research/Chemistry Research	1-4
Au Sable Institute* courses		4-8
Additional BIO-prefix courses numbered 2116 or higher		
MAT-prefix courses numbered 2055 or higher		

Students are strongly encouraged to take additional BIO, MAT, PHY or CHE courses to count towards the general elective requirements and gain experience through research or internship opportunities.

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## Pre-Medical/Pre-Professional Biology Track (56-58 cr)

- **Theological Philosophy** course in core curriculum: PHI2016.
- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course CHE1021/1021L\*; mathematics course MAT2055 or higher.
- **For all natural science courses**, must receive a C- or better in all prerequisite courses. In addition, biology majors and minors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, and PHY prefixes in order to graduate.

**Biology Core** ..... 19 cr

BIO1011/1011L	Principles of Biology I*	4
BIO1012	Principles of Biology II	4
BIO2113/2113L	Principles of Biology III	4
BIO4835	Senior Seminar [OCE, WCE]	2
CHE3101/3101L	Organic Chemistry I*	5

**Required Courses** ..... 31 cr

BIO2116/2116L	Animal Biology or	
BIO3335	Molecular Medicine	4
BIO3235/3235L	Biochemistry*	5
BIO3246/3246L	Genetics	5
CHE1022/1022L	Principles of Chemistry II*	4
CHE3102/3102L	Organic Chemistry II*	5
PHY1101/1101L	Fundamentals of Physics I* or	
PHY1201/1201L	Engineering Physics I*	4
PHY1102/1102L	Fundamentals of Physics II* or	
PHY1202/1202L	Engineering Physics II*	4

**Selectives** ..... 6-8 cr

BIO1025	Medical Terminology	2
BIO3145/3145L	Microbiology	4
BIO3157/3157L	Human Anatomy*	4
BIO3158/3158L	Human Physiology*	4
BIO3159	Pathophysiology	3
BIO3236	Immunology	4

BIO3347	Cell Physiology	4
BIO3348/3348L	Cell Biology	5
BIO4355	Developmental Biology	4
BIO4841/CHE4841	Research*/Chemistry Research*	1-4
BIO4995	Biology Internship	1-4
Au Sable Institute** courses		4

Students desiring to take BIO3157 Human Anatomy and BIO3158 Human Physiology are encouraged to declare a health sciences minor.

Students are strongly recommended to have a GPA of 3.5 or higher in order to be competitive for professional programs. Students are strongly encouraged to take additional BIO courses and PSY1005, 2108, and SOC1035 to count towards the 16 credits in the enhanced curriculum (free electives) needed for the total of 125 credits for the degree program. Courses should be selected based in part on material covered in entrance exams and requirements for the student's desired professional program. Additionally, students should gain experience through research or internship opportunities.

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\* COURSES TYPICALLY NEEDED FOR THE MCAT OR MEDICAL SCHOOL RÉSUMÉ  
\*\* SEE RELATED INFORMATION ON PAGES 20, 37-38, 192

**Biology Minor** ..... 16 cr

**Required Courses:** BIO1011/1011L, BIO1012; BIO2113/2113L; 4 credits selected from courses with BIO prefix numbered 3000 or higher.

**Chemistry Minor** ..... 17-18 cr

**Required Courses:** CHE1021/1021L, 1022/1022L, 3101/3101L; one course selected from CHE3102/3102L, BIO3235/3235L, 3335.

**Environmental Science Minor** ..... 16 cr

**Required Courses:** BIO2113/2113L, 3175/3175L, SCI1010/1010L; 4 credits selected from 2116/2116L, 3276/3276L, 3277/3277L, approved topics courses, or department chair-approved courses from Au Sable Institute.\*

\*SEE RELATED INFORMATION ON PAGES 20, 37-38, 192

**Science Minor** ..... 16 cr

**Required Courses:** 16 credits in courses with BIO, CHE, or PHY prefixes (must include courses from at least two disciplines)

**Science and Theology Minor** ..... 20 cr**Required Courses:**

- Two courses (8 credits) with BIO, CHE, PHY, or SCI prefix
- 8 credits selected from BIA/BIB prefix (2-4 credits); BIO4841 (2-4 cr); BIO4995 (2-4 credits); PHI3035; PHI3805 (Topics); SCI1008; one additional BIO-, CHE-, PHY-, or SCI-prefix course (4 credits)
- SCI3037

**Health Sciences Major**

## Bachelor of Science

The Health Sciences major is primarily intended for students who intend to pursue the Masters in Nursing, Masters in Physician Assistant, Doctor of Physical Therapy, Masters in Nutrition, Masters in Public Health, etc. The degree is granted upon completion of credits specified on pages 48-49 (40 credits must be successfully completed in 3000- or 4000-level courses).

- **Theological Philosophy** course in core curriculum: PHI2016
- **Scientific & Quantitative Literacy** courses in core curriculum: natural science course BIO1011/1011L; mathematics course MAT2055.
- **Health Sciences majors** must receive a C- or better in all prerequisite courses. In addition, Health Sciences majors must have a cumulative grade point average of at least 2.0 in all courses with BIO, CHE, HPE, and HSC prefixes in order to graduate.

**Required Courses** ..... 45-46 cr

BIO1025	Medical Terminology	..... 2
BIO3145/3145L	Microbiology	..... 4
BIO3157/3157L	Human Anatomy	..... 4
BIO3158/3158L	Human Physiology	..... 4
BIO3159	Pathophysiology	..... 3
CHE1021/1021L	Principles of Chemistry I	..... 4
CHE1022/1022L	Principles of Chemistry II or	
CHE3101/3101L	Organic Chemistry I	..... 4-5
HPE3006	Human Nutrition	..... 4

HSC4835	Senior Seminar for the Health Sciences [OCE, WCE]	.2
HSC4995	Health Sciences Internship	..... 2
PSY1005	Introduction to Psychology	..... 4
PSY2108	Lifespan Psychology	..... 4
	BIO-prefix course numbered 1012 or above	..... 4

Work experience as a Certified Nursing Assistant is highly recommended.

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**Health Sciences Minor** ..... 24 cr

**Required Course:** BIO1011/1011L; select 20 credits from the following: BIO-, CHE-, HPE-, KIN-, PHY-, PSY-, or SOC-prefix courses, or other courses approved by the Dean of the College of Behavioral & Natural Sciences. BIO1009/1009L may not be counted in the minor.

**Beta Beta Beta Biological Society**

This prestigious National Biology Honors Society exists to provide educational and service opportunities to biology students. Membership is based upon sophomore class standing and earned GPA. Members plan and participate in society-sponsored activities such as guest speakers, career round-table discussions, field trips, research presentations, community service, and social gatherings.