

BIOLOGY WITH MOLECULAR BIOLOGY EMPHASIS (BS)

Recent advances in genetics, molecular biology, and related biotechnologies have created a strong demand for college graduates with training in these areas. Hands-on experience in the use of the latest molecular techniques is particularly important to this training.

The BS in Biology with Molecular Biology emphasis program is designed for students seeking a rigorous, laboratory-intensive curriculum to prepare them for health-related professions, research jobs, or graduate programs in a number of areas related to molecular biology. The curriculum includes the same foundational lecture and laboratory courses in the areas of cell biology, genetics, and ecology taken by general Biology majors. Additional coursework focuses specifically on topics related to molecular biology.

Related Programs

Major

- Biology (BS) (<https://catalog.luc.edu/undergraduate/arts-sciences/biology/biology-bs/>)
- Biology with Ecology Emphasis (BS) (<https://catalog.luc.edu/undergraduate/arts-sciences/biology/biology-ecology-emphasis-bs/>)

Curriculum

This specialized Biology major requires 37 credit hours including 9 required Biology courses (21 credit hours) and Biology elective courses (16 credit hours) plus cognate courses in Calculus, Chemistry and Physics. This track allows students to receive the strong background in fundamental biology required of all Biology majors, while also specializing in the area of molecular biology. Students will follow the program outlined below.

Code	Title	Hours
Biology Courses: Required		
BIOL 101	General Biology I	3
BIOL 111	General Biology I Lab	1
BIOL 102	General Biology II	3
BIOL 112	General Biology II Lab	1
BIOL 251	Cell Biology	3
BIOL 265	Ecology	3
BIOL 282	Genetics	3
BIOL 283	Genetics Laboratory	1
BIOL 366	Cell Physiology & Biochemistry	3
Biology Courses: Electives		16
Select one of the following:		3
BIOL 382	Molecular Genetics	
BIOL 387	Genomics	
BIOL 388	Bioinformatics	
Select one of the following:		1-4
BIOL 366L	Cell Physiology & Biochemistry Lab	
BIOL 390	Molecular Biology Laboratory	
BIOL 396M	Research (Molecular Emph) ¹	
BIOL 397M	Course-based Undergraduate Research Experience in Biology (Molecular Emph)	

BIOL 398M	Internship in Biology (Molecular Emph) ¹	
Select 9-12 credit hours of the following: ²		9-12
At least one (1) elective course must include a laboratory component. ³		
BIOL 252	Cell Biology Laboratory ³	
BIOL 296	Introduction to Research ⁴	
BIOL 302	General Microbiology Lec/Lab ³	
BIOL 307	Biology of Stem Cells	
BIOL 315	Introductory Immunology Lec/Lab ³	
BIOL 317	Models of Human Disease	
BIOL 318	General Virology	
BIOL 319	Evolution	
BIOL 344	Microbial Evolution and Human Well-being	
BIOL 351	Sleep/Circadian Rhythms	
BIOL 352	Neurobiology of Feeding in Health and Disease	
BIOL 366L	Cell Physiology & Biochemistry Lab ^{3,5}	
BIOL 377	Molecular Pathogenesis	
BIOL 380	Genetics and Evolution of Development	
BIOL 381	Epigenetics	
BIOL 382	Molecular Genetics ⁵	
BIOL 383	Population Genetics	
BIOL 384	Microbial Pathogenesis of Infectious Disease	
BIOL 387	Genomics ⁵	
BIOL 388	Bioinformatics ⁵	
BIOL 390	Molecular Biology Laboratory ^{3,5}	
BIOL 392	Metagenomics	
BIOL 394M	Special Topics in Biology Laboratory (Molecular Emph) ³	
BIOL 395M	Special Topics in Biology (Molecular Emph)	
BIOL 396M	Research (Molecular Emph) ^{1,3,5}	
BIOL 397M	Course-based Undergraduate Research Experience in Biology (Molecular Emph) ^{3,5}	
BIOL 398M	Internship in Biology (Molecular Emph) ^{1,3,5}	
BIOL 399M	Individual Study (Molecular Emph)	
PHYS 371	Biophysics	

Chemistry

CHEM 160	Chemical Structure and Properties	3
or CHEM 101	General Chemistry A Lecture/Discussion	
or CHEM 105	Chemical Principles	
CHEM 161	Chemical Structure and Properties Laboratory	1
or CHEM 105	Chemical Principles	
or CHEM 111	General Chemistry Lab A	
CHEM 180	Chemical Reactivity I	3
or CHEM 221	Organic Chemistry I Lec/Disc	
or CHEM 223	Organic Chemistry A Lec/Disc	
CHEM 181	Chemical Reactivity I Lab	1
or CHEM 221	Organic Chemistry I Lec/Disc	
or CHEM 225	Organic Chemistry Lab A	
CHEM 240	Chemical Reactivity II	3
or CHEM 222	Organic Chemistry II Lec/Disc	
or CHEM 224	Organic Chemistry B Lec/Disc	
CHEM 241	Chemical Reactivity II Laboratory	1
or CHEM 222	Organic Chemistry II Lec/Disc	

or CHEM 226	Organic Chemistry Lab B	
CHEM 260	Quantitative Methods in Chemistry	3
or CHEM 102	General Chemistry B Lecture/Discussion	
or CHEM 106	Basic Inorganic Chemistry	
CHEM 261	Quantitative Methods in Chemistry Laboratory	1
or CHEM 106	Basic Inorganic Chemistry	
or CHEM 112	General Chemistry Lab B	
Mathematics		
MATH 131	Applied Calculus I	3-4
or MATH 161	Calculus I	
MATH 132	Applied Calculus II	3-4
or MATH 162	Calculus II	
Physics		
PHYS 111	College Physics I Lec / Dis	3
or PHYS 121	College Physics I with Calculus Lecture/Discussion	
or PHYS 125	General Physics I Lec/Dis	
PHYS 111L	College Physics Laboratory I	1
PHYS 112	College Physics II Lec/Disc	3
or PHYS 122	College Physics II with Calculus Lecture/Discussion	
or PHYS 126	General Physics II Lec/Dis	
PHYS 112L	College Physics Lab II	1
Total Hours		67

¹ A maximum of 3 total credits of either BIOL 396M Research (Molecular Emph) OR BIOL 398M Internship in Biology (Molecular Emph) (but NOT both) count as toward the BIOM-BS degree.

² Special topics courses (BIOL 377, BIOL 394M, BIOL 395M, BIOL 397M) can be taken multiple times for credit as long as the course topic is different.

³ Counts as a Laboratory course.

⁴ BIOL 296 Introduction to Research can be taken multiple times, but only a maximum of 2 credit hours count as Biology Electives.

⁵ If not taken to fulfill another requirement.

Suggested Sequence of Courses

The below sequence of courses is meant to be used as a suggested path for completing coursework. An individual student's completion of requirements depends on course offerings in a given term as well as the start term for a major or graduate study. Students should consult their advisor for assistance with course selection.

The biology department recommends that students pursuing the BS in Biology with Molecular Biology Emphasis complete their required classes in the following sequence. Requirements include courses in Biology (BIOL), Chemistry (CHEM), Mathematics (MATH) and Physics (PHYS):

Course	Title	Hours
First Semester		
BIOL 101	General Biology I	3
BIOL 111	General Biology I Lab	1
CHEM 160	Chemical Structure and Properties	3
CHEM 161	Chemical Structure and Properties Laboratory	1
MATH 131	Applied Calculus I	3
Hours		11

Second Semester

BIOL 102	General Biology II	3
BIOL 112	General Biology II Lab	1
CHEM 180	Chemical Reactivity I	3
CHEM 181	Chemical Reactivity I Lab	1
MATH 132	Applied Calculus II	3
Hours		11

Third Semester

BIOL 282	Genetics	3
BIOL 283	Genetics Laboratory	1
CHEM 240	Chemical Reactivity II	3
CHEM 241	Chemical Reactivity II Laboratory	1
Hours		8

Fourth Semester

BIOL 251	Cell Biology	3
or BIOL 265	or Ecology	
CHEM 260	Quantitative Methods in Chemistry	3
CHEM 261	Quantitative Methods in Chemistry Laboratory	1
Hours		7

Fifth Semester

BIOL 265	Ecology	3
or BIOL 251	or Cell Biology	
PHYS 111	College Physics I Lec / Dis	3
PHYS 111L	College Physics Laboratory I	1
Hours		7

Sixth Semester

BIOL 366	Cell Physiology & Biochemistry	3
BIOL 382	Molecular Genetics	3
or BIOL 387	or Genomics	
or BIOL 388	or Bioinformatics	
PHYS 112	College Physics II Lec/Disc	3
PHYS 112L	College Physics Lab II	1
Hours		10

Seventh Semester

Select one of the following:		1-4
BIOL 366L	Cell Physiology & Biochemistry Lab	
BIOL 390	Molecular Biology Laboratory	
BIOL 396	Research	
BIOL 398	Internship in Biology	
BIOL Elective Molecular		3-6
Hours		7

Eighth Semester

BIOL Elective Molecular	3
BIOL Elective Molecular	3
Hours	6
Total Hours	67

Transferring Credit

Transfer students seeking the BS in Biology with Molecular Biology Emphasis degree must take a minimum of 20 credit hours in Biology courses at Loyola. No more than 18 credit hours from another institution

may be applied to the BS in Biology with Molecular Biology Emphasis degree program.

significance of these experiments to enhance their understanding of molecular biology.

Course Repeat Rule

Effective with the spring 2009 semester, students are allowed only TWO attempts to pass Biology courses with a C- or better grade. The two attempts includes withdrawals (W).

The procedure for securing approval for a repeat: Students must come to the Biology Department, fill out a permission to register form, and obtain signatures of both the faculty instructor, and the Biology Chairperson or Assistant-Chairperson. A copy of this form is then submitted to the student's academic advisor to secure final permission for the repeat. After a second attempt to pass a Biology course, it is at the discretion of the Biology Chairperson or Assistant-Chairperson whether the student may repeat the course.

College of Arts and Sciences Graduation Requirements

All Undergraduate students in the College of Arts and Sciences are required to take two Writing Intensive courses (6 credit hours) as well as complete a foreign language requirement at 102-level or higher (3 credit hours) or a language competency test. More information can be found here (<https://www.luc.edu/cas/college-requirements/>).

Additional Undergraduate Graduation Requirements

All Undergraduate students are required to complete the University Core, at least one Engaged Learning course, and UNIV 101. SCPS students are not required to take UNIV 101. Nursing students in the Accelerated BSN program are not required to take core or UNIV 101. You can find more information in the University Requirements (<https://catalog.luc.edu/undergraduate/university-requirements/>) area.

Learning Outcomes

At the completion of the Undergraduate Biology with Molecular Biology Emphasis Major:

- Students will demonstrate developing mastery of the following Vision and Change core concepts and their related principals as they relate to the central dogma of molecular biology and how it impacts cellular and organismal processes: evolution (the diversity of life-forms that have evolved over time through mutations, selection and genetic change; structure and function (the basic units of biological structures that define the functions of all living things); information flow, exchange and storage (the influence of genetics on the control of the growth and behavior of organisms); pathways and transformations of energy and matter (the ways in which chemical transformation pathways and the laws of thermodynamics govern the growth and change of biological systems); and systems (the ways in which living things are interconnected and interact with one another).
- Students will be able to retrieve, synthesize, and critically evaluate scientific literature.
- Students will be able to communicate (orally and in writing) results and interpretation of scientific research.
- Students will be able to design and implement experiments that test predictive hypotheses, analyze data, report results, and interpret the