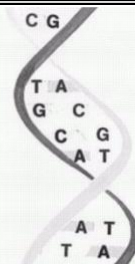

Manual for Undergraduate Studies

Molecular Genetics



Department of Molecular Genetics

105 Biological Sciences Building 484 West 12th Avenue
Columbus OH 43210-1292 USA

Telephone 614/292-8084 Facsimile 614/292-4466

<http://molgen.osu.edu/>

Updated 01/17/2024

105 Biological Sciences Building, 484 West 12th Avenue, Columbus OH 43210-1292 USA
Telephone 614/292-8084 FAX 614/292-4466 <http://molgen.osu.edu/>

2

Planning a Major program.

All students are encouraged to meet with their departmental faculty advisor (see page 2) during their first year or as soon as they begin considering a molecular genetics major program. It is strongly encouraged that students begin the molecular genetic core courses in their second year ([see sample curriculum](#)). To ensure timely progress through the major, students are also encouraged to regularly meet with their Arts and Sciences advisor and departmental faculty advisor throughout their undergraduate career, particularly since many genetics courses are only offered once each academic year.

General Education Requirements

For students following the Legacy GE (or GEL), completion of the Molecular Genetics major satisfies the GEL – Data Analysis requirement.

For students following the New GE (or GEN), completion of the Molecular Genetics major satisfies the GEN embedded literacies of Data Analysis, and Technology. All students seeking additional experience in statistical material can take Molecular Genetics 5650.

For students admitted under the new General Education requirements, the advanced writing embedded literacy requirement will be satisfied via completion of the major core. For all students this should include:

- Completion of MOLGEN 5601 Molecular Genetics Lab OR MOLGEN 5602 Cell and Developmental Biology Lab

OR

- Substitution of Undergraduate Research (MOLGEN4998 or MOLGEN4998H) for the core requirement for MOLGEN 5601 or MOLGEN 5602

Completion of one semester of MOLGEN 4503 Molecular Genetics Writing Project also fulfills the embedded literacy requirement with the approval of your departmental faculty advisor, but this option is rarely needed. IMPORTANT NOTE: MOLGEN 4503 can ONLY be taken with prior permission from the instructor. Do NOT register for any section of MOLGEN 4503 without first identifying a faculty member who is able to oversee the class.

Including Undergraduate research in in your major program

Students who complete 4 semester credit hours of Undergraduate Research (generally MOLGEN 4998 or 4998H) over two semesters may substitute 3 credits of independent research for the requirement to complete MOLGEN 5601 or MOLGEN 5602.

- Your departmental faculty advisor must approve this substitution.
- Credit hours can be completed in a Molecular Genetics lab or a non-Molecular Genetics lab, but you must in seek approval from your departmental faculty advisor in advance, who will confirm that the proposed research experience is an appropriate substitute for the requirement to complete MOLGEN 5601 or MOLGEN 5602.
- You must complete a short paper describing your research experience and submit it to your departmental faculty advisor by the last day of exam week of the semester in which you earn your fourth credit 4998/4998H in order to substitute 3 credits of MOLGEN 4998 or 4998H for the requirement to complete MOLGEN 5601 or 5602
- An outline of the expectations for the research description is found in Appendix A of this handbook

If not used in place of Molecular Genetics 5601 or 5602, three credits of independent research may count as an elective in the major. In this situation, you are NOT required to submit a research description.

[Sample curricula are linked here.](#)

IMPORTANT NOTES:

- Courses in the major must be approved by your departmental faculty advisor
- A minimum grade of C- is required in each course in the major (Core requirements and Electives)
- No more than 3 credit hours graded S/U (Satisfactory/Unsatisfactory) can count towards the 30-hour major
- No more than 3 credit hours taken at the 2000-level can count towards the 30-hour major
- At least 30 semester credit hours are required for the molecular genetics major. Lists of core and elective courses [begin here](#)
- Double majors must consist of at least 18 unique hours in each major. Meet with your Arts and Sciences advisor to discuss a double major curriculum

Molecular Genetics Undergraduate Major

30 semester hours are required for the major

Important Note: No more than 3 hours of S/U graded courses can count towards the 30 required hours

Part A. Required Prerequisites (do not count toward the 30-credit hour major)

1. Bio 1113.01 (4) or 1113.02 (5) AND Bio 1114.01 (4) or 1114.02 (5)
2. Chem 1210 (5) AND Chem 1220 (5)
3. Chem 2510 (4), 2520 (4), 2540 (2), AND 2550 (2)
4. Math 1151 (5) OR Math 1156 (5)
5. Physics 1200 (5) AND 1201 (5)

Honors or more advanced versions for any of these courses are acceptable.

Part B. Core Requirements (the core comprises at least 19 credit hours of the 30 credit hour major):

1. Biochemistry 4511 (4) OR Biochemistry 5613 (3) AND Biochemistry 5614 (3)
2. MOLGEN 4606 *Molecular Genetics* (4).
3. MOLGEN 5607 *Cell Biology* (3) or MOLGEN 5607E (4)
4. MOLGEN 5608 *Genes and Development* (3) or MOLGEN 5608E (4)
5. MOLGEN 5645 *Quantitative, Population and Evolutionary Genetics* (2)
6. MOLGEN 5601 *Molecular Genetics Lab* OR MOLGEN 5602 *Cell and Developmental Biology Lab*

(Note: MOLGEN 5601 and MOLGEN 5602 are 4 semester credits in the autumn and spring semesters, 3 semester credits in the summer session).

Both lab courses require either MOLGEN 4606 or MOLGEN 4500 as a prerequisite.

MOLGEN majors who complete 4 semester credit hours of Undergraduate Research (generally MOLGEN 4998 or 4998H) over two semesters and submit a satisfactory research description to their faculty advisor may substitute 3 credits of independent research for the core MOLGEN laboratory requirement. If not substituted for the MOLGEN laboratory core requirement, 1-3 credit hours of independent research may count as a major elective (in this circumstance no written research description is required). If you plan to do independent research in a lab outside of Molecular Genetics, speak to your departmental faculty advisor PRIOR to registering in order to confirm that the credits will count towards the major.

Please note that while we are only permitted to count three credit hours of S/U graded courses towards the 30-credit hour major, additional credits of MOLGEN 4998/4998H/4999/4999H still count towards your credits needed for graduation.

Part C. Electives (choose at least 3 electives from the following lists; electives plus the core must total at least 30 credit hours. At least one course totaling at least 2 credit hours must be taken from within the department. No more than three credit hours at the 2000 level can count towards the 30 credit-hour major):

C.1 Electives requiring at most MG4606 or MG4500 as prerequisites

MOLGEN 2220H (*) *Introduction to Molecular Life Sciences: Research Opportunities and Career Options* (1)

MOLGEN 2690 (*) *Genes and Society* (3)

MOLGEN 3300 (*) *Plant Biology* (3)

MOLGEN 3436 (*) *Plant Physiology* (3)

MOLGEN 4503 *Molecular Genetics Writing Project* (1)

MOLGEN 4581S *BioEYES: Hands-on STEM learning with zebrafish* (1) (No more than 3 semester credit hours of S/U coursework can count towards the 30-credit hour major.)

MOLGEN 4591S *DNA Fingerprinting Workshop* (1) (No more than 3 semester credit hours of S/U coursework can count towards the 30-credit hour major.)

MOLGEN 4700 *Molecular Cell and Developmental Biology* (3) (NOTE: this course is designed for students in the Molecular Genetics minor and in other biology majors, but in some cases, this course may be taken prior to 5607 or 5608 and count as an elective in the Molecular Genetics major. Molecular Genetics majors interested in this option MUST receive permission from their departmental faculty advisor BEFORE enrolling in MOLGEN 4700).

MOLGEN 4703 *Human Genetics* (3)

MOLGEN 4998 (or 4998H) *Undergraduate Research* and/or MOLGEN 4999 (or 4999H) *Thesis Research* (Up to 3 credit hours can count towards the 30-credit hour major requirement (see page 4). No more than 3 semester credit hours of S/U coursework can count towards the 30 credit hour major. MOLGEN 4999 or 4999H hours that satisfy a thesis requirement can NOT be substituted for the lab requirement OR count as an elective).

MOLGEN 5193 *Individual Studies* (1-3) (No more than 3 semester credit hours of 5193 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the 30-credit hour major)

MOLGEN 5194 *Group Studies* (1-3) (No more than 3 semester credit hours of 5194 can count towards the major.

MOLGEN 5300 *Cancer Genetics* (3)

MOLGEN 5632 *Insect Molecular Genetics* (2)

MOLGEN 5650 *Analysis and Interpretation of Biological Data* (3)

MOLGEN 5797 *Study at a Foreign Institution* (1-15) (No more than 3 semester credit hours of 5797 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the major.)

MOLGEN 5798 *Study Tour: Domestic* (1-15) (No more than 3 semester credit hours of 5798 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the major.)

MOLGEN 5800 *Organelle Biology* (2)

* **Note:** MOLGEN 2220H, MOLGEN 2690, MOLGEN 3300, and MOLGEN 3436 *do not require* MOLGEN 4500 or MOLGEN 4606 as a prerequisite

C.2 Electives requiring additional prerequisites.

Please consult the course catalog (<https://registrar.osu.edu/courses/>) **or meet with your Arts and Sciences or departmental faculty advisor for more information.**

Completion of a subset of the MOLGEN Core (MOLGEN 4606, 5607, 5608, and 5645) is a prerequisite for many 5000-level MOLGEN courses.

MOLGEN 5623 *Genetics and Genomics* (2)

MOLGEN 5700 *Systems of Genetic Analysis* (3)

MOLGEN 5701 *DNA Transactions and Gene Regulation* (3)

MOLGEN 5705 *Advances in Cell Biology* (2)

MOLGEN 5715 *Developmental Genetics* (2)

These courses are offered infrequently. Please check with your advisors:

MOLGEN 5630 *Plant Physiology* (3)

MOLGEN 5643 *Plant Anatomy* (3)

MOLGEN 5733 *Advanced Human Genetics* (2)

MOLGEN 5735 *Plant Biochemistry* (3)

MOLGEN 5795 *Special Topics in Molecular Genetics* (1-3)

MOLGEN 5796 *Current Topics in Signal Transduction* (1 or 2)

C.3 Electives offered by other departments that can be used towards the molecular genetics major (please consult the course catalog for prerequisites). *

Biochem 5621 *Introduction to Biological Chemistry Laboratory* (4)

EEOB 4520 *Comparative Physiology* (3)

Micro 4000.01 or 4000.02 *General Microbiology* (4)

Micro 4100 *General Microbiology* (5)

Micro 4130 *Microbial Genetics* (3)

Micro 4140 *Molecular Microbiology Lab* (3)

Micro 5122 *Immunology* (3)

Micro 5161 *Introduction to Computational Genomics* (3)

Neuroscience 4050H *Neurogenetics* (3)

Psychology 5602 *Behavioral Genetics* (3)

* Note: Other elective courses may be substituted with permission of your departmental faculty advisor.

Molecular Genetics Undergraduate Major with a Plant Cellular and Molecular Biology (PCMB) Specialization

Part A. Required Prerequisites (do not count toward the 30 credit hour major)

- Bio 1113.01 (4) or 1113.02 (5) AND Bio 1114.01 (4) or 1114.02 (5)
- Chem 1210 (5) AND Chem 1220 (5)
- Chem 2510 (4), 2520 (4), 2540 (2), AND 2550 (2)
- Math 1151 (5) OR Math 1156 (5)
- Physics 1200 (5) AND 1201 (5)

Honors or more advanced versions for any of these courses are acceptable.

Part B. Core Requirements (the core comprises at least 20 credit hours):

1. Biochemistry 4511 (4) OR Biochemistry 5613 (3) AND Biochemistry 5614 (3)
2. MOLGEN 4606 *Molecular Genetics* (4).
3. MOLGEN 5607 *Cell Biology* (3) or MOLGEN 5607E (4)
4. MOLGEN 5608 *Genes and Development* (3) or MOLGEN 5608E (4)
5. MOLGEN 3300 *General Plant Biology* (3)
6. MOLGEN 3436 *Introductory Plant Physiology* (3)

Part C. Electives: (choose at least 3 electives from the following list: At least one course totaling at least 2 credit hours must be taken from within the department. No more than three credit hours at the 2000 level can count towards the 30 credit-hour major. Electives plus the core must total at least 30 credit hours. Students following the New General Education must work with their departmental faculty advisor to ensure their major elective coursework includes the advanced writing embedded literacy):

C.1 Electives requiring only MG4606 or MG4500 as prerequisites

MOLGEN 4503 *Molecular Genetics Writing Project with a plant focus* (1)

MOLGEN 4998 (or 4998H) *Undergraduate Research* and/or MOLGEN 4999 (or 4999H) *Thesis Research with a plant focus* (up to 3 semester credit hours can count towards the 30-credit hour major requirement. No more than 3 semester credit hours of S/U coursework can count towards the 30-credit hour major). Note that MOLGEN 4999 or 4999H hours that satisfy a thesis requirement can NOT be substituted for the lab requirement OR count as an elective)

MOLGEN 5193 *Individual Studies* (1-3) with a plant focus (No more than 3 semester credit hours of 5193 can count towards the major. No more than 3 semester credit hours of S/U coursework can count towards the 30-credit hour major)

MOLGEN 5194 *Group Studies* (1-3) with a plant focus (No more than 3 semester credit hours of 5194 can count towards the major).

MOLGEN 5601 *Molecular Genetics Lab* or MOLGEN 5602 *Cell and Developmental Biology Lab with a plant module* (3-4)

MOLGEN 5797 *Study at a Foreign Institution* (1-15) with a plant focus (No more than 3 semester credit hours of 5797 or 5798 can count towards the major)

MOLGEN 5798 *Study Tour: Domestic* (1-15) with a plant focus (No more than 3 semester credit hours of 5797 or 5798 can count towards the major)

MOLGEN 5795 *Special Topics in Molecular Genetics* (with a plant focus) (1-3)

MOLGEN 5800 *Organelle Biology* (2)

C.2 Electives requiring additional prerequisites.

Please consult the course catalog (<https://registrar.osu.edu/courses/>) or meet with your departmental faculty advisor for more information.

MOLGEN 5630 *Plant Physiology* (3)

MOLGEN 5643 *Plant Anatomy* (3)

MOLGEN 5735 *Plant Biochemistry* (3)

* Note: Other elective courses may be substituted with permission of your departmental faculty advisor.

Sample 4-Year Plan 1

(Placed into Calculus/Math Placement Test Score of L) MOLGEN 4606 in Autumn

Year 1 – Autumn		Year 1 – Spring	
ARTSSCI 1100.07 (College Survey)	1	Chem 1220	5
Math 1151 or 1156	5	Bio 1113.01	4
Chem 1210	5	GE: Foreign Language 1	4
GE or MOLGEN Major Elective*	3	GE or MOLGEN Major Elective*	3
GENED 1201 (Launch Seminar)	1		
Semester Total	15	Semester Total	16
		Year 1 Total	31
Year 2 – Autumn		Year 2 – Spring	
Chem 2510	4	Chem 2520	4
Chem 2540	2	Chem 2550	2
Bio 1114.01	4	Biochem 4511 or MOLGEN 5601**	4
MOLGEN 4606	4	GE: Foreign Language 3	4
GE: Foreign Language 2	4	GE or Free Elective	3
Semester Total	18	Semester Total	17
		Year 2 Total	35
Year 3 – Autumn		Year 3 – Spring	
Biochem 4511 or MOLGEN 5602**	4	MOLGEN 5608	3
MOLGEN 5607	3	MOLGEN Major Elective*	2 – 3
Physics 1200	5	Physics 1201	5
GE	3	GE	3
		GE	3
Semester Total	15	Semester Total	16 – 17
		Year 3 Total	31 – 32
Year 4 – Autumn		Year 4 – Spring	
MOLGEN 5645	2	MOLGEN Major Elective*	2 – 3
MOLGEN Major Elective*	2 – 3	GE or MOLGEN Major Elective*	3
GE or MOLGEN Major Elective*	3	Free Elective (as needed)	3 – 4
GE or Free Elective (as needed)	3	Free Elective (as needed)	3 – 4
Free Elective (as needed)	2 – 3	GENED 4001 (Reflection)	1
Semester Total	12 – 14	Semester Total	13 – 15
		Year 4 Total	25 – 29
*MOLGEN major elective courses vary from 1-5 credits. Some MOLGEN electives (e.g. 2220H, 2690, 3300, 3436) can be taken during Year 1. MOLGEN major coursework including electives must total at least 30 credits.			
**Either MOLGEN 5601 or 5602 is required		Grand Total	121+ Credit Hours

Sample 4-Year Plan 2

(Placed into Calculus/Math Placement Test Score of L) MOLGEN 4606 in Spring

Year 1 – Autumn		Year 1 – Spring	
ARTSSCI 1100.07 (College Survey)	1	Chem 1220	5
Math 1151 or 1156	5	Bio 1113.01	4
Chem 1210	5	GE: Foreign Language 1	4
GE or MOLGEN Major Elective*	3	GE or MOLGEN Major Elective*	3
GENED 1201 (Launch Seminar)	1		
Semester Total	15	Semester Total	16
		Year 1 Total	31
Year 2 – Autumn		Year 2 – Spring	
Chem 2510	4	Chem 2520	4
Chem 2540	2	Chem 2550	2
Bio 1114.01	4	MOLGEN 4606	4
GE: Foreign Language 2	4	GE: Foreign Language 3	4
GE or MOLGEN Major Elective*	3	GE	3
Semester Total	17	Semester Total	17
		Year 2 Total	34
Year 3 – Autumn		Year 3 – Spring	
Biochem 4511 or MOLGEN 5602**	4	Biochem 4511 or MOLGEN 5601**	4
MOLGEN 5607	3	MOLGEN 5608	3
Physics 1200	5	Physics 1201	5
GE	3	MOLGEN Major Elective*	2 – 3
		GE	3
Semester Total	15	Semester Total	17 – 18
		Year 3 Total	32 – 34
Year 4 – Autumn		Year 4 – Spring	
MOLGEN 5645	2	MOLGEN Major Elective*	2 – 3
MOLGEN Major Elective*	2 – 3	GE or MOLGEN Major Elective*	3
GE or MOLGEN Major Elective*	3	GE or Free Elective (as needed)	3 – 4
GE or Free Elective (as needed)	3	Free Elective (as needed)	3 – 4
Free Elective (as needed)	2 – 3	GENED 4001 (Reflection)	1
Semester Total	12 – 14	Semester Total	13 – 15
		Year 4 Total	25 – 29
*MOLGEN major elective courses vary from 1-5 credits. Some MOLGEN electives (e.g. 2220H, 2690, 3300, 3436) can be taken before MOLGEN 4606. MOLGEN major coursework including electives must total at least 30 credits.			
**Either MOLGEN 5601 or 5602 is required		Grand Total	121+ Credit Hours

Molecular Genetics Undergraduate Minor

Required prerequisites

- Biology 1113(.01 or .02) and Biology 1114(.01 or .02)
- Chemistry 1210 and 1220

Honors or more advanced versions of these prerequisite courses can be substituted.

Required Core Courses

One of the following courses:

- MOLGEN 4500 (3) or MOLGEN 4500E (4)
- MOLGEN 4606 (4)

AND

At least two of the following courses:

- MOLGEN 5607 (3) or 5607E (4)
- MOLGEN 5608 (3) or 5608E (4)
- MOLGEN 4700 (3)
- MOLGEN 5645 (2)

Elective Courses

(Core plus electives must total at least 14 semester credit hours; no more than 3 semester credit hours can be graded S/U and count towards the Minor. Additional courses from the core list can count as electives once the core is completed)

- | | |
|------------------------------|-----------------------------|
| • MOLGEN 2220H (1) | • MOLGEN 5194 (1-3) |
| • MOLGEN 2690 (3) | • MOLGEN 5300 (3) |
| • MOLGEN 4503 (1) | • MOLGEN 5601 or 5602 (3-4) |
| • MOLGEN 4581S (1) | • MOLGEN 5623 (2) |
| • MOLGEN 4591S (1) | • MOLGEN 5632 (2) |
| • MOLGEN 4703 (3) | • MOLGEN 5650 (3) |
| • MOLGEN 4998 or 4998H (1-3) | • Micro 4130 (3) |
| • MOLGEN 5193 (1-3) | • Micro 5161 (3) |

Alternative elective(s) may be approved by your departmental faculty advisor

A minimum grade of C- is required in each course in the molecular genetics minor

Plant Biology Undergraduate Minor

Required prerequisites

- Biology 1113(.01 or .02) and Biology 1114(.01 or .02)
- Chemistry 1210 and 1220

Honors or more advanced versions of these courses are acceptable.

Required Core Course

- MOLGEN 3300 General Plant Biology (3)

Elective Courses

(Electives must total at least 11 semester credit hours; no more than 3 semester credit hours can be graded S/U and count towards the Minor)

MOLGEN 3436 Introductory Plant Physiology (3)

MOLGEN 4503 Molecular Genetics Writing Project on a plant topic (1)

MOLGEN 4998 or 4998H (or 4999 or 4999H) Undergraduate Research (in a plant lab). (1-3). Credit hours of 4999 or 4999H that are fulfilling a requirement for a research thesis can NOT count towards the minor

MOLGEN 5193 Individual Studies on a plant topic (1-3).

MOLGEN 5194 Group Studies on a plant topic (1-3).

MOLGEN 5601 Molecular Genetics Lab or 5602 Cell and Developmental Biology Lab with a plant module (3-4)

MOLGEN 5630 Plant Physiology (3)

MOLGEN 5643 Plant Anatomy (3)

MOLGEN 5735 Plant Biochemistry (3)

Alternative elective(s) may be approved by your departmental faculty advisor
The minor program must be approved by your departmental faculty advisor.

A minimum grade of C- is required in each course in the plant biology minor

Molecular Genetics 4503: Molecular Genetics Writing Project

Who should take MOLGEN 4503?

MOLGEN 4503 is appropriate for students who wish to develop their writing skills while conducting library research on a topic of interest to them. This course also provides one mechanism to complete the Advanced Writing embedded literacy requirement in the New General Education program.

How do I enroll in MOLGEN 4503?

PRIOR TO ENROLLMENT IN MOLGEN 4503, YOU MUST FIRST OBTAIN PERMISSION FROM A FACULTY MEMBER WHO IS WILLING TO SUPERVISE YOU.

You should first match your interests with one or more faculty. The faculty and their interests are listed in the Molecular Genetics Undergraduate Handbook or from the departmental web site (<http://molgen.osu.edu/>). After you have chosen one or more faculty as potential MOLGEN 4503 advisors, you should make appointments to visit them and discuss the potential project. After a faculty member has agreed to advise you, you will need to provide written documentation from this supervising faculty member to your Arts and Sciences advisor, who will help you register for MOLGEN 4503.

After I enroll in MOLGEN 4503, what will I do?

What will be expected of you will depend, to some extent, on the supervising faculty member. A paper (normally 10-15 pages double spaced) and a 15-minute oral presentation are required in all cases. The oral presentations are often given at lab meetings of the supervising faculty's lab group. Generally, it is good to make an appointment with the supervising faculty member as early as possible in the semester so that you can clarify requirements and schedule. In most cases, you will be expected to carry out a thorough literature search of your topic, prepare an outline for the paper and one or more draft versions of the paper before preparing and submitting the final version. You should meet with the supervising faculty member at each stage to discuss your progress and have her/him critique your outline and drafts.

If you have questions, or a problem develops, you may contact your departmental faculty advisor:

Research Opportunities for Undergraduates in Molecular Genetics

Doing something with your own two hands is the best way to truly understand it. Today, biologists can analyze and manipulate the genetic material of almost any organism -- decoding the DNA sequence, determining the functions of genes and proteins, and even altering the genome directly. This means that a rigorous program in the life sciences must include an intensive laboratory experience. Just as twenty years ago every biologist had to know how to use a microscope, today's students must be familiar with methods such as recombinant DNA techniques and big data analysis. Your access to any career in the life sciences will be improved through hands-on experience in modern laboratory techniques.

The academic program in the Department of Molecular Genetics has been designed to facilitate this critical experience for all of our majors:

1. An optional course for first and second-year students called "*Introduction to Molecular Life Sciences: Research Opportunities and Career Options*" will introduce you to a wide range of possible future careers and give you contact with departmental faculty who can supervise undergraduate research projects.
2. The Department offers two laboratory courses involving rigorous and intensive training in molecular biology and molecular genetics (*Eukaryotic Molecular Genetics Laboratory*) and in cell biology and developmental biology (*Eukaryotic Cell and Developmental Biology Laboratory*), exposing our majors to a wide variety of techniques and exercises.
3. Our students are encouraged to earn credit working in one of our research laboratories under the umbrella of *Undergraduate Research in Molecular Genetics* or *Honors Research*. This research experience allows the student to focus on a specific area of the field and gives exposure to modern research techniques, mentored by a university faculty member. Over 60% of our majors complete independent mentored research, with some authoring published papers or giving presentations at national meetings

The most frequently asked question is "***Why should I spend my time and effort on an undergraduate research project?***" There are several answers to this question:

1. Research helps coursework become "real". Doing research with your own hands helps you understand how science is conducted: the scientific method, controls, and testing hypotheses. This will synergize with your success in other courses.
2. Research experience is essential for students planning to pursue a Ph.D. in the biological sciences, and will strengthen an application for medical or other professional school. Research experience provides evidence to admissions committees that you have done more than merely pass classes with high grades. Tangible signs of success -- such as your name on a scientific publication, an honors thesis, or obtaining scholarships or awards for research will increase the impact of your application.
3. Working in a laboratory allows you to get to know a faculty member outside the classroom. Our faculty members have national and international reputations in the scientific community, and their letters of recommendation are an important component of successful applications to graduate school or to potential employers.
4. Some students will seek work as laboratory technicians. Because of the costs in both time and money required to train new employees, biotechnology and pharmaceutical companies tend to favor applicants with hands-on laboratory experience.
5. Finally, most students find that performing original research and making new scientific findings is exciting and intellectually gratifying.

Getting Started in Research:

The faculty of the Department of Molecular Genetics conducts research in genetics, molecular biology, cell biology and developmental biology. They approach scientific problems from the molecular to the population level in a number of different research areas using viruses, fungi, protists, plants and animals, as well as human beings. However, because all organisms are founded upon a uniform genetic plan, these diverse systems and organisms allow students the opportunity to explore essentially any aspect of the biology of plants and animals.

If you are interested in research experience you should talk with your departmental faculty advisor about your interests. This advisor may have ideas about appropriate research mentors in or outside the department. You can also browse the department web site (<http://molgen.osu.edu>) or websites of other departments at OSU for information about ongoing research projects in the labs of our faculty members. After reviewing this information, you should confer with your departmental faculty advisor about your top selections, and/or request meetings with the faculty mentors of greatest interest to discuss the possibility of doing research there. Once a faculty member agrees to supervise you, you can enroll in one-to-three credit hours per semester of **MOLGEN 4998/4998H**, *Undergraduate Research in Molecular Genetics*. At least initially, you will meet regularly with your faculty research mentor and their graduate students to receive the training necessary to implement the project.

The training period can last from one to several semesters, during which time you will accumulate credit hours toward their degree (only 3 semester hours of MOLGEN 4998/4998H may be counted toward the Molecular Genetics major, though more can be used toward degree completion). In most cases, after this training period, you become a valuable and productive member of the laboratory staff and may continue with more independent research in later semesters. Your goal should be to obtain sufficient data to warrant a publication in a respected journal. You can also pursue a written thesis (see “**Thesis Research for Molecular Genetics Students**” below).

Students are particularly encouraged to consider a summer research experience. This can be particularly fulfilling, because it allows you to immerse yourself in a research project full time. Scholarships and fellowships are available to support undergraduate summer research projects. Information on funding sources can be found at the Molecular Genetics (<https://molgen.osu.edu/research-scholarship-opportunities>) and Undergraduate Research Office (<https://ugresearch.osu.edu/current-researchers/funding-opportunities>) websites.

Thesis Research for Molecular Genetics Students

You may also complete a written thesis that leads to graduation with Research Distinction in Molecular Genetics. Generally, students complete two semesters of MOLGEN 4998/4998H before committing to this path. Students who wish to write a thesis must apply for graduation with research distinction through the College of Arts and Sciences, and must be enrolled in MOLGEN 4999/4999H (*Thesis Research in Molecular Genetics*) during the semester the thesis is defended. Graduation with research distinction requires a 3.0 minimum GPA and 4 hours of MOLGEN 4999. Graduation with honors and research distinction requires honors standing and 4 hours of MOLGEN 4999H (Note that these credits in 4999/4999H can not be applied to the 30-hour major). After successful completion of the thesis and with approval from the Arts and Sciences Committee the student is eligible for “Graduation with Research Distinction in Molecular Genetics,” or “Graduation with Honors and Research Distinction in Molecular Genetics.” Graduation with distinction is a mark of excellence that documents the student’s aptitude for research.

Because of the protracted training period of one-to-three semesters (or more), students who wish to write a thesis must begin their research well before their senior year. We recommend that students make initial contacts with potential research advisors early in their academic career. This contact can even occur before students begin their molecular genetics core courses, e.g. in the first or second year. This early start allows ample time for an initial training period during which the student can receive credit for MOLGEN 4998/4998H toward the major. It also provides the students with the opportunity to do summer research prior to planning the thesis and enrollment in MOLGEN 4999/4999H during the semester the thesis is written and presented.

Summer research experience is especially important for students interested in writing a thesis, because it provides a significant period during which the student can dedicate their time to their research project without the distraction of heavy coursework. A number of scholarships are available to undergraduate researchers for summer support, and in some cases, the departmental faculty advisor may be able to provide support. Interested students should contact the Undergraduate Research or Honors offices for recent information regarding funding sources for undergraduate research. Information on funding sources can be found at the Molecular Genetics (<https://molgen.osu.edu/research-scholarship-opportunities>) and Undergraduate Research Office (<https://ugresearch.osu.edu/current-researchers/funding-opportunities>) websites.

The honors program in Molecular Genetics is a research-experience based curriculum, and honors students are particularly encouraged to participate. Although undergraduate honors research is not required for graduation, the Department strongly emphasizes the importance of this research experience.

A WARNING ABOUT GRADES: It is absolutely essential that students perform to their best abilities in the classroom. On one hand, undergraduate research is an attractive part of the educational process; on the other hand, working in a lab takes one away from other endeavors, such as free time and study time. Because grades are important, we advocate that students with marginal grades (below a 3.0 GPA) spend their time improving their course performance rather than devoting the time to research.

Appendix A

Expectations for 4998/4998H Research descriptions.

Students who complete 4 semester credit hours of Undergraduate Research (generally MOLGEN 4998 or 4998H) over two semesters may substitute 3 credits of independent research for the requirement to complete MOLGEN 5601 or MOLGEN 5602. You must complete a short paper describing your research experience and submit it to your departmental faculty advisor by the last day of semester 2 of your undergraduate research experience in order to substitute 3 credits of MOLGEN 4998 or 4998H for the requirement to complete MOLGEN 5601 or 5602.

A complete research description will generally be 3-5 single spaced pages not counting references. A research description should include:

- A clear statement of a research question or project goals
- Sufficient scientific background to help an educated reader understand why the project or question are interesting
- A description of the progress made (including techniques used and data generated)
- A discussion section. Depending on the project outcomes this may
 - Discuss the data generated and engage with plans for the next steps in the project or
 - Discuss reasons why the project was not completed and suggest alternative approaches

Figures are welcome and should include figure legends

All sources should be cited in the text with a complete citation appearing in the bibliography

Please Note:

- The research description is a scholarly document and is subject to all relevant expectations regarding academic integrity
- The description must represent your own work and be written entirely in your own words.
- If the "progress made" description includes the work of more than one individual, then you must clearly state what part(s) you did, or your role(s) in the work.

The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct. Suspected cases of academic misconduct will be reported to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct, the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

Appendix B: Combined BS/MS in Molecular Genetics

The Molecular Genetics combined BS/MS degree program allows students to double-count some advanced Molecular genetics courses, normally taken by first-year graduate students in our program or other graduate programs, as elective credits for the fourth year of the undergraduate major. By double-counting nine credits of these electives for both the undergraduate and graduate degrees, a student in the combined degree program can fulfill the undergraduate degree requirements generally in their fourth year and be able to complete the remaining requirements for the Master's degree in an additional year. We anticipate that these students may:

1. enhance their credentials to increase competitiveness for professional school, PhD programs, or other career paths.
2. increase their research experiences before committing to a research-based career path.
3. increase their breadth or explore the field of molecular genetics.

Admission to the combined BS/MS program requires that the student:

- be in good academic standing (with at least a 3.5 GPA)
- have completed MOLGEN4606 and at least one additional MOLGEN core class
- identify a Molecular Genetics faculty member who will oversee their MS exam
- Work with the Molecular Genetics faculty and professional advisor to outline their planned coursework to complete the program.

GRE scores are not required for admission. Applications will be reviewed by the Molecular Genetics Department Graduate Studies Committee to assess the readiness of the student for accelerated studies. Upon admission, the Molecular Genetics faculty member identified by the student and approved by the GSC chair will serve as the student's BS/MS advisor. A committee consisting of the advisor and one additional Molecular Genetics faculty member will oversee the final MS exam (written exam only for Plan A, written and oral exam for Plan B).

The undergraduate BS degree in Molecular Genetics requires completion of 121 credit hours including the Molecular Genetics major. The MS degree requires 30 credit hours of coursework taken at the Master's level, and 9 of these credit hours can be applied towards the fulfillment of undergraduate major elective credits, allowing students can complete the combined degree in five (or occasionally four, for students with significant credits at entry to OSU) years. All coursework at the 5000 level or above that is approved as an elective for the Molecular Genetics BS is eligible to count towards the 9 credit hours that count towards both the BS and MS.

Completion of the MS degree requires coursework in four "pillars" of genetics. In the combined BS/MS, all Molecular Genetics core courses (Molgen 4606, 5607/E, 5608/E, 5645, and 5601 or 5602) must be taken at the BS level as part of the core, but completion of the BS core fulfills the MS requirement for coursework in each pillar.

Students in the combined BS/MS degree program who are doing laboratory research as undergraduates (MOLGEN 4998(H)/4999(H)) can receive research distinction (including honors) with the BS component, but those credit hours may not count towards the MS. Students who wish to continue or begin research during the MS degree years will enroll in MOLGEN7999-Thesis Research, and may complete a thesis as part of the Plan A MS degree.

A student in the combined degree program can elect to leave the program without penalty. The completed graduate courses will continue to count as elective credits towards the student's Molecular Genetics BS degree.

Overview of BS/MS program in Molecular Genetics:

Application Requirements:

1. Junior year or completion of 90 credit hours
2. 3.5 GPA required (please note this is a Graduate School requirement that can not be waived or appealed)
3. Completion of MOLGEN 4606 and at least one additional core course
4. Identification of a faculty member in Molecular Genetics who is willing to oversee the MS exam

Degree timeline: 3 years BS + 1-2 years MS

General requirements:

1. A minimum of 30 total semester credit hours must be completed at the graduate level with a GPA of 3.0.
2. Of the 30 total graduate credit hours, a minimum of 8 semester credit hours must be Molecular Genetics courses at the 5000 level or above, excluding credits for classes graded on an S/U basis.
3. 9 credit hours can double count for the BS and MS. These credits will count as elective credits for the BS degree.
4. At least one course in each of the 4 pillars of Molecular Genetics (genetics/genomics, molecular biology, cell biology, and developmental biology) must be completed. Coursework completed at the 5000 level or higher as part of the BS degree can fulfill this requirement without counting towards the 9 credit hours of double counted coursework, and most Molecular Genetics majors will complete this requirement as part of the BS.
5. Completion of MOLGEN7600
6. The student must identify a “sponsoring faculty member” (the research advisor if the student plans a thesis option, the faculty member who will oversee the 5193 enrollment if non-thesis). This faculty member must supply a letter of recommendation when the student applies.
7. Required core coursework for the Molecular Genetics BS may not be double counted for the MS degree.

Thesis-based (Plan A) Masters requirements

All general requirements above must be fulfilled. In addition the Plan A MS requires

1. Completion of a minimum of 8 semester credit hours of research (MG 7999).
2. Satisfactory completion of a written thesis that is approved by the student's committee and submitted to the Graduate School as described in the Graduate School Handbook.
3. Satisfactory completion of a final oral exam.
4. The examining committee shall consist of the advisor for MG7999 credits and one additional Molecular Genetics faculty member

Non-thesis-based (Plan B) Masters requirements

All general requirements above must be fulfilled. In addition

- Satisfactory completion of a final written and oral exam, generally in the context of MG 5193 (Individual Studies).
- The examining committee shall consist of the faculty instructor for MG5193 credits and one additional Molecular Genetics faculty member

Application process for Combined BS/MS degree

Graduate School policies governing combined degree programs can be found in [Section 8.1 of the Graduate School Handbook](#).

Interested students should discuss options with their departmental faculty advisor and their ASC or Honors advisor.

1. The application process requires submission of a complete curricular plan that defines all coursework that will be taken to complete the BS and MS, and designates which coursework is double-counted and which is MS-specific. This should be created in collaboration with your departmental faculty advisor, your ASC advisor, and the faculty member who will supervise your MS exam using the attached advising forms and the template for BS/MS application coursework
2. You **must** identify a faculty member who will oversee the MS exam before application
 - a. If you are going to complete a thesis (Plan A), this would likely be your research advisor
 - b. If you intend to pursue a PlanB MS program, you will need to identify a faculty member who will oversee your MS exam in the context of MOLGEN5193
 - c. This faculty member should be indicated in your application in response to the question "If you have identified a faculty member in Molecular Genetics who has agreed to serve as your mentor in the program please indicate their full name here" and is required to submit a letter of reference for your application.

You will apply for the Molecular Genetics MS program at the Grad school application site, indicating that you will pursue a combined degree.

You **must** be accepted to the MS program BEFORE taking any courses that are double counted.

- Applications are accepted in the Autumn for the following Spring (due date October 15) and in the Spring for the following Fall (due date March 15). Time your application accordingly.

The application requires the following:

1. Personal Statement
2. CV/resume
3. Complete list of all coursework that will be taken to complete the MS, including which courses are double counted
4. One reference letter, from the faculty member that will oversee your thesis or MS exam

Please note:

- There is an application fee for the application process.
- After acceptance to the program you can take courses to complete your BS, courses that are double counted as BS electives and towards the MS, and courses that are counted solely for your MS degree. No coursework taken prior to your admission to the graduate program can count towards the MS degree even as a double counted class
- You must file a "[Combined Degree Program](#)" form at [gradforms](#) that lists the courses that will double count in the BS and MS by at least two weeks prior to the beginning of the semester you will take your first double-counted class.
- You should enroll in the undergraduate section of any classes that count towards both the BS and MS (double counted classes) but in the graduate section of any classes that count only towards the MS degree. **Make sure you sign up for the right section!**
- Once you complete your BS-specific and double-counted courses and are taking only MS-specific courses, tuition will be charged at the (higher) graduate tuition rate. However, full time status at the graduate level can be as low as 10 credit hours.
- Students who enter OSU with significant credits may be able to complete the combined degree in 4 years with careful planning. This would almost certainly require application to the combined program at the end of the second year on campus or during Autumn of the third year on campus, after the completion of 90 total credits and of 4606 and an additional core course.

Molecular Genetics BS/MS Advising form

Student ID #: _____

Expected Graduation Term: _____ Student Name.#: _____

Second Major: _____

Minor: _____

Part A: General Education not fulfilled by Part B

Should complete majority prior to starting MS courses

GE Category	Course Number	Credit Hours	Grade	Term Taken
Writing		3		
		3		
Literature		3		
VPA		3		
Soc. Sci. 1:		3		
Soc. Sci. 2:		3		
Historical Study		3		
Cultures & Ideas		3		
Foreign Language		4		
		4		
		4		
Social Diversity*		3		
Global Studies*		3		
		3		

*Courses in these areas can overlap with another GE category when applicable

Part B: Major Prerequisites

Should be completed prior to starting MS courses

Course	Credit Hours	Grade	Term Taken	Course	Credit Hours	Grade	Term Taken
Math 1151	5			Chem 1210	5		
OR Math 1156	5			Chem 1220	5		
Bio 1113	4			Chem 2510	4		
Bio 1114	4			Chem 2520	4		
Physics 1200	5			Chem 2540	2		
OR Physics 1250	5			Chem 2550	2		
Physics 1201	5						
OR Physics 1251**	5						

Honors courses can substitute where available

**Math 1152 is a prerequisite/co-requisite for Physics 1251

Molecular Genetics BS/MS Advising form p2

Part C: Molecular Genetics BS Core

Course	Title	Major Credit Hours	Grade	Term Taken
BIOCHEM 4511	Intro to Biological Chemistry	4		
OR BIOCHEM 5613^	Biochemistry and Molecular Biology 1	3		
OR BIOCHEM 5614^	Biochemistry and Molecular Biology 2	3		
MOLGEN 4606	Molecular Genetics	4		
MOLGEN 5607	Cell Biology	3		
OR MOLGEN 5607E		4		
MOLGEN 5608	Genes and Development	3		
OR MOLGEN 5608E		4		
MOLGEN 5645	Quantitative, Population, and Evolutionary Genetics	2		
MOLGEN 5601	Molecular Microbiology Lab	4		
OR MOLGEN 5602	Cell and Developmental Biology Lab	4		

^ Both Biochem 5613 & 5614 must be completed as substitution for Biochem 4511

MolGen 4606 and at least 1 more course in Part C MUST be completed prior to starting MS courses

OSU GPA must be ≥ 3.5 prior to starting MS courses

Part D: Molecular Genetics BS Electives/MS Requirements

up to 9 credit hours can count towards both the BS and MS degrees

Course	Title	BS Credit Hours	MS Credit Hours	Grade	Term(s) Taken	Mark if S/U
MOLGEN7600	First Year Student Orientation	0	1			
MOLGEN						
MOLGEN						
MOLGEN						
MOLGEN						
MOLGEN						
MOLGEN						
MOLGEN						
Space for Additional Approved Coursework						

Molecular Genetics BS/MS Advising form p3

Breadth requirement: at least one course at the 5000 level or above in each of the pillars of Molecular Genetics. For Molecular Genetics majors this is generally fulfilled by completion of the core.

Pillar	Course	Title
Genetics/Genomics		
Molecular Biology		
Cell Biology		
Developmental Biology		

BS Degree

Major Core Credits (≥ 19): _____

Major Elective Credits (≥ 6): _____

Major Credits not graded S/U (≥ 27): ____

Total BS Major Credits (≥ 30): _____

Upper Division Credits (≥ 39): _____

Total BS Degree Credits (≥ 121): _____

MS Degree

MOLGEN7600 (1): _____

Molgen Credits not graded S/U (≥ 8): ____

Breadth requirement complete? _____

Total MS Degree Credits (≥ 30): _____

Directions: this form can be completed after the advising forms are approved by the Departmental faculty advisor, the ASC advisor, and (if relevant) the thesis advisor. The completed text can be pasted in response to the question “Please outline the specific coursework you plan to take to complete your intended degree (courses and expected year/semester). This plan should be completed in consultation with your faculty mentor (M.S. program) or your departmental faculty advisor (combined B.S./M.S. program) before submitting your application” on the application

Indicate whether your application is Plan A (Thesis based) or Plan B (non-thesis based)

Plan X

Dual-counted coursework: List the classes you intend to take (name and semester) that will count BOTH as upper level electives in the BS and as coursework for the MS. Can not exceed 9 credit hours and can not include coursework counting towards the BS Core. Include the course Name, number, number of credits, and the Year and Semester planned for enrollment

Course 1:

Course 2:

Course 3:

MS-specific Coursework: List the classes you intend to take (name and semester) that will count exclusively as coursework for the MS. Together with Dual counted courses must add up to 30 credits (a minimum of 8 semester credit hours must be Molecular Genetics courses at the 5000 level or above, excluding credits for classes graded on an S/U basis). MOLGEN 7600 (First-Year Student Orientation) is required for both plans, MOLGEN 5193 (Individual studies) is required for Plan-B, optional for Plan A. MOLGEN 7999 (Thesis Research) is required for Plan A and encouraged for Plan B). Include the course Name, number, number of credits, and the Year and Semester planned for enrollment. Lines can be added or deleted as necessary.

Course 1

Course 2

Course 3

Course 4

Course 5

Course 6

Course 7

Course 8

Course 9

Sample 5-year BS/MS plan A curriculum

(Placed into Calculus/Math Placement Test Score of L) MOLGEN 4606 in Autumn

Year 1 – Autumn		Year 1 – Spring	
ARTSSCI 1100.07 (College Survey)	1	Chem 1220	5
Math 1151 or 1156	5	Bio 1113	4
Chem 1210	5	GE: Foreign Language 1	4
GE	3	GE	3
GENED 1201 (Launch Seminar)	1		
Semester Total	15	Semester Total	16
		Year 1 Total	31
Year 2 – Autumn		Year 2 – Spring	
Chem 2510	4	Chem 2520	4
Chem 2540	2	Chem 2550	2
Bio 1114	4	Biochem 4511 or MOLGEN 5601**	4
MOLGEN 4606	4	GE: Foreign Language 3	4
GE: Foreign Language 2	4	GE	3
Semester Total	18	Semester Total	17
		Year 2 Total	35
Year 3 – Autumn		Year 3 – Spring	
Biochem 4511 or MOLGEN 5602**	4	MOLGEN 5608	3
MOLGEN 5607	3	MOLGEN BS Elective*	2 – 3
Physics 1200	5	Physics 1201	5
GE	3	GE	3
		GE	3
		Apply to MS Program	--
Semester Total	15	Semester Total	16 – 17
		Year 3 Total	31 – 32
Year 4 – Autumn		Year 4 – Spring	
MOLGEN 5645	2	MOLGEN BS/MS Elective*	3
MOLGEN BS/MS Elective*	3	MOLGEN BS/MS Elective*	3
GE	3	GE	3
Free Elective (as needed)	3	Free Elective(s) (as needed)	3 – 5
Free Elective (as needed)	1 – 3	GENED 4001 (Reflection)	1
Semester Total	12 – 14	Semester Total	13 – 15
		Year 4 Total	25 – 29
<p>*MOLGEN major elective courses vary from 1-5 credits. Some MOLGEN electives (e.g. 2220H, 2690, 3300, 3436) can be taken during Year 1. MOLGEN major coursework including electives must total at least 30 credits on BS degree. All course work at the 5000 level or above that is approved as an elective for the Molecular Genetics BS is eligible to count towards the 9 credit hours that count towards both the BS and MS.</p>			
**Either MOLGEN 5601 or 5602 is required		Grand Total for BS Degree	121+ Credit Hours

Year 5– Autumn		Year 5– Spring	
MOLGEN 7600	1	MOLGEN 7999	4
MOLGEN 7999	4	MOLGEN MS Elective	3
MOLGEN MS Elective	3	MOLGEN MS Elective	2-3
MOLGEN MS Elective	2-3	MOLGEN MS Elective	2-3
Semester Total	10 – 11	Semester Total	11 – 13
		Year 5 Total	21 – 24
		Grand Total for MS Degree	30+ Credit Hours

APPENDIX A.2 Sample 5-year BS/MS plan B curriculum

(Placed into Calculus/Math Placement Test Score of L) MOLGEN 4606 in Autumn

Year 1 – Autumn		Year 1 – Spring	
ARTSSCI 1100.07 (College Survey)	1	Chem 1220	5
Math 1151 or 1156	5	Bio 1113	4
Chem 1210	5	GE: Foreign Language 1	4
GE	3	GE	3
GENED 1201 (Launch Seminar)	1		
Semester Total	15	Semester Total	16
		Year 1 Total	31
Year 2 – Autumn		Year 2 – Spring	
Chem 2510	4	Chem 2520	4
Chem 2540	2	Chem 2550	2
Bio 1114	4	Biochem 4511 or MOLGEN 5601**	4
MOLGEN 4606	4	GE: Foreign Language 3	4
GE: Foreign Language 2	4	GE	3
Semester Total	18	Semester Total	17
		Year 2 Total	35
Year 3 – Autumn		Year 3 – Spring	
Biochem 4511 or MOLGEN 5602**	4	MOLGEN 5608	3
MOLGEN 5607	3	MOLGEN BS Elective*	2 – 3
Physics 1200	5	Physics 1201	5
GE	3	GE	3
		GE	3
		Apply to MS Program	--
Semester Total	15	Semester Total	16 – 17
		Year 3 Total	31 – 32
Year 4 – Autumn		Year 4 – Spring	
MOLGEN 5645	2	MOLGEN BS/MS Elective*	3
MOLGEN BS/MS Elective*	3	MOLGEN BS/MS Elective*	3
GE	3	GE	3
Free Elective (as needed)	3	Free Elective(s) (as needed)	3 – 5
Free Elective (as needed)	1 – 3	GENED 4001 (Reflection)	1
Semester Total	12 – 14	Semester Total	13 – 15
		Year 4 Total	25 – 29

*MOLGEN major elective courses vary from 1-5 credits. Some MOLGEN electives (e.g. 2220H, 2690, 3300, 3436) can be taken during Year 1. MOLGEN major coursework including electives must total at least 30 credits. All course work at the 5000 level or above that is approved as an elective for the Molecular Genetics BS is eligible to count towards the 9 credit hours that count towards both the BS and MS.

**Either MOLGEN 5601 or 5602 is required

Grand Total for BS Degree

121+ Credit Hours

Year 5– Autumn		Year 5– Spring	
MOLGEN 7600	1	MOLGEN 5193	3
MOLGEN MS Elective	3	MOLGEN MS Elective	3
MOLGEN MS Elective	3	MOLGEN MS Elective	2-3
MOLGEN MS Elective	2-3	MOLGEN MS Elective	2-3
MOLGEN MS Elective	2-3		
Semester Total	11 – 13	Semester Total	10 – 12
		Year 5 Total	21 – 25
		Grand Total for MS Degree	30+ Credit Hours

Curricular map and pillars

(Pillars of Molecular Genetics: 1 – Genetics/Genomics; 2 – Molecular Biology; 3 – Cell Biology; 4 – Developmental Biology)

Course Number	Course Title	Credit Hours	Role in Major/MS degree	MS Program Pillar
Biochem 4511	Introduction to Biological Chemistry	4	Core BS	NA
MOLGEN 2220H	Intro to Molecular Life Sciences: Research Opportunities and Career Options	1	Elective BS	NA
MOLGEN/PHILOS 2690	Genes and Society	3	Elective BS	NA
MOLGEN 3300	General Plant Biology	3	Elective BS	NA
MOLGEN 3436	Introductory Plant Physiology	3	Elective BS	NA
MOLGEN 4503	Molecular Genetics Writing Project	1	Elective BS	NA
MOLGEN 4581S	BioEYES: Hands-on STEM learning with zebrafish in Columbus Public Elementary Schools	1	Elective BS	NA
MOLGEN 4591S	DNA Fingerprinting Workshops in Columbus Public Schools	1	Elective BS	NA
MOLGEN 4606	Molecular Genetics	4	Core BS	NA
MOLGEN 4703	Human Genetics	3	Elective BS	NA
MOLGEN 4998	Undergraduate Research in Molecular Genetics	1 to 3	Elective BS	NA
MOLGEN 4998H	Undergraduate Research in Molecular Genetics	1 to 3	Elective BS	NA
MOLGEN 4999	Thesis Research in Molecular Genetics	1 to 3	Elective BS	NA
MOLGEN 4999H	Thesis Research in Molecular Genetics	1 to 3	Elective BS	NA
MOLGEN 5193	Individual Studies	1 to 3	Elective BS Elective BS/MS Plan A Core BS/MS Plan B	Any pillar with GSC approval
MOLGEN 5194	Group Studies	1 to 3	Elective BS and BS/MS	Any pillar with GSC approval
MOLGEN 5300	Cancer Genetics	3	Elective BS and BS/MS	1 or 2
MOLGEN 5601	Eukaryotic Molecular Genetics Lab	3 or 4	Core BS	2 or 3
MOLGEN 5602	Eukaryotic Cell and Developmental Laboratory	3 or 4	Core BS	2,3, or 4
MOLGEN 5607	Cell Biology	3	Core BS	3
MOLGEN 5607E	Cell Biology	4	Core BS	3
MOLGEN 5608	Genes and Development	3	Core BS	4

MOLGEN 5608E	Genes and Development	4	Core BS	4
MOLGEN 5623	Genetics and Genomics	2	Elective BS and BS/MS	1
MOLGEN 5630	Plant Physiology	3	Elective BS and BS/MS	none
MOLGEN 5632	Insect Molecular Genetics	2	Elective BS and BS/MS	none
MOLGEN 5643	Plant Anatomy	3	Elective BS and BS/MS	4
MOLGEN 5645	Quantitative, Population, and Evolutionary Genetics	2	Core BS	1
MOLGEN 5650	Analysis and Interpretation of Biological Data	3	Elective BS and BS/MS	none
MOLGEN 5700	Systems of Genetic Analysis	3	Elective BS and BS/MS	1
MOLGEN 5701	DNA Transactions and Gene Regulation	4	Elective BS and BS/MS	2
MOLGEN 5705	Advances in Cell Biology	2	Elective BS and BS/MS	3
MOLGEN 5715	Developmental Genetics	2	Elective BS and BS/MS	4
MOLGEN 5733	Advanced Human Genetics	2	Elective BS and BS/MS	1
MOLGEN 5735	Plant Biochemistry	3	Elective BS and BS/MS	none
MOLGEN 5795	Special Topics in Molecular Genetics	1 to 3	Elective BS and BS/MS	Any pillar with GSC approval
MOLGEN 5796	Current Topics in Signal Transduction	1 to 2	Elective BS and BS/MS	2 or 3
MOLGEN 5797	Study at a Foreign Institution	1 to 3	Elective BS and BS/MS	Any pillar with GSC approval
MOLGEN 5798	Study Tour: Domestic	1 to 3	Elective BS and BS/MS	Any pillar with GSC approval
MOLGEN 5800	Organelle Biology	2	Elective BS and BS/MS	2 or 3
MOLGEN 7600	First-Year Student Orientation	1	Required BS/MS	none
MOLGEN 7741	Molecular Virology and Pathogenesis of Viruses	5	Elective BS/MS	1
MOLGEN 7890	Molecular Genetics Seminar	1	Elective BS/MS	none
MOLGEN 7999	Thesis Research	1-12	Required BS/MS plan A Elective BS/MS plan B	1
MOLGEN 7807	Gene Expression: Post-Transcriptional Control	3	Elective BS/MS	1 or 2