

# MOLECULAR BIOLOGY AND GENETICS (MBG)

## Department of Molecular and Cellular Biology, College of Biological Science

The B.Sc. program with a Major in Molecular Biology and Genetics is a broadly based program in genetics including related areas of cell and molecular biology. In consultation with the Faculty Advisor, students can choose a general program or can focus their courses in areas such as molecular biology, cell biology, developmental biology, genetics, or agricultural genetics. The program qualifies students for postgraduate training in cell or molecular biology and genetics including clinical genetics and genetic counselling, and provides an excellent background for careers in biotechnology, toxicology, agriculture and medical research.

## Major Requirements (Honours)

This is a major within the degree: Bachelor of Science.

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major may wish to consult the Faculty Advisor.

A total of 20.00 credits is required to complete the major.

Students lacking Grade 12 or 4U Biology, Chemistry or Physics should follow the revised schedule of study for this major found at [https://www.uoguelph.ca/bsc/revised\\_SS/](https://www.uoguelph.ca/bsc/revised_SS/).

Code	Title	Credits
<b>Semester 1</b>		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1040	General Chemistry I	0.50
MATH*1080	Elements of Calculus I	0.50
PHYS*1080	Physics for Life Sciences	0.50
0.50 Liberal Education electives		0.50
<b>Semester 2</b>		
BIOL*1070	Discovering Biodiversity	0.50
BIOL*1080	Biological Concepts of Health	0.50
CHEM*1050	General Chemistry II	0.50
PHYS*1070	Physics for Life Sciences II	0.50
0.50 Liberal Education electives		0.50
<b>Semester 3</b>		
BIOC*2580	Introduction to Biochemistry	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
MICR*2420	Introduction to Microbiology	0.50
STAT*2040	Statistics I	0.50
0.50 Liberal Education electives		0.50
<b>Semester 4</b>		
BIOC*3560	Structure and Function in Biochemistry	0.50
CHEM*2700	Organic Chemistry I: Fundamentals	0.50
MCB*2050	Molecular Biology of the Cell	0.50
MICR*2430	Methods in Microbial Culture and Physiology	0.50

0.50 Liberal Education electives		0.50
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### Semester 5

MBG*3040	Molecular Biology of the Gene	0.50
MBG*3350	Laboratory Methods in Molecular Biology	0.75
Electives or restricted electives to a maximum of 2.75 total credits in this semester		1.50

### Semester 6

2.50 electives or restricted electives		2.50
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### Semester 7

2.50 electives or restricted electives		2.50
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### Semester 8

2.50 electives or restricted electives		2.50
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## Restricted Electives

**Note:** Some courses have prerequisites, so be sure to consult the undergraduate calendar.

- A minimum of 2.00 credits of Liberal Education electives is required. The list of Liberal Education electives for B.Sc. students can be found at: <https://www.uoguelph.ca/bsc/>
- Physiology Elective - 0.50 credits

Code	Title	Credits
BIOM*3200	Biomedical Physiology	1.00
BOT*3310	Plant Growth and Development	0.50
HK*2810	Human Physiology I - Concepts and Principles	0.50
ZOO*3600	Comparative Animal Physiology I	0.50

- Subject Area Electives - 4.50 credits of which 2.00 credits must be at the 4000 level.

Code	Title	Credits
BIOC*4050	Protein and Nucleic Acid Structure	0.50
BIOL*3020	Population Genetics	0.50
BIOL*3300	Applied Bioinformatics	0.50
MBG*2400	Fundamentals of Plant and Animal Genetics	0.50
MBG*3050	Human Genetics	0.50
MBG*3060	Quantitative Genetics	0.50
MBG*3100	Plant Genetics	0.50
MBG*3660	Genomics	0.50
MBG*4030	Animal Breeding Methods and Applications	0.50
MBG*4040	Genetics and Molecular Biology of Development	0.50
MBG*4110	Epigenetics	0.50
MBG*4160	Plant Breeding	0.50
MBG*4240	Applied Molecular Genetics in Medicine and Biotechnology	0.50
MBG*4300	Plant Molecular Genetics	0.50
MCB*3010	Dynamics of Cell Function and Signaling	0.50
MCB*4010	Advanced Cell Biology	0.50
MCB*4020	Communication in Molecular and Cellular Biology	0.50

MCB*4500	Research Project in Molecular and Cellular Biology I	1.00
MCB*4510	Research Project in Molecular and Cellular Biology	1.00
MCB*4600	Topics in Molecular and Cellular Biology	0.50
MICR*3240	Microbial Physiology and Genetics	0.50
MICR*3330	World of Viruses	0.50
MICR*4330	Molecular Virology	0.50
MICR*4540	Microbial Cell Biology	0.50
NEUR*3100	Molecular Mechanisms of Neurological Disorders	0.50
STAT*2050	Statistics II	0.50

## Credit Summary

(20.00 Total Credits)

Code	Title	Credits
	First year science core	4.00
	Required science courses semesters 3 - 8	5.25
	Restricted electives (2 and 3 in restricted electives list)	5.00
	Approved Science Electives	1.75
	Liberal Education Electives (1 in restricted elective list)	2.00
	Free Electives - any approved elective for B.Sc. Students	2.00
<b>Total Credits</b>		<b>20</b>

Of the total credits required, students are required to complete 16.00 credits in science of which a minimum of 2.00 credits must be at the 4000 level and an additional 4.00 credits must be at the 3000 or 4000 level.

## Co-op Requirements (Honours)

This is a major within the degree: Bachelor of Science.

The Co-op program in Molecular Biology and Genetics is a five year program, including four work terms. Students must follow the academic work schedule as outlined below (also found on the Co-operative Education website: <https://www.recrutguelp.ca/cecs/>).

## Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2	Off
2	Academic Semester 3, COOP*1100	Academic Semester 4	COOP*1000 Work Term I
3	Academic Semester 5	COOP*2000 Work Term II	COOP*3000 Work Term III
4	COOP*4000 Work Term IV	Academic Semester 6	Off
5	Academic Semester 7	Academic Semester 8	N/A

Please refer to the Co-operative Education program policy with respect to work term performance grading, work term report grading and program completion requirements.

For additional program information students should consult with their Co-op Co-ordinator and Co-op Faculty Advisor, listed on the Co-operative Education web site.

## Credit Summary

(22.00 Total Credits)

Code	Title	Credits
	First year science core	4.00
	Required science courses semesters 3 - 8	5.25
	Restricted electives (2 and 3 in restricted electives list)	5.00
	Approved Science Electives	1.75
	Liberal Education Electives (1 in restricted elective list)	2.00
	Free Electives - any approved elective for B.Sc. Students	2.00
	Co-op Work Terms	2.00
<b>Total Credits</b>		<b>22</b>

## Recommended Program Sequence

A total of 20.00 credits is required to complete the major.

Students lacking Grade 12 or 4U Biology, Chemistry or Physics should follow the revised schedule of study for this major found at [https://www.uoguelph.ca/bsc/revised\\_SS/](https://www.uoguelph.ca/bsc/revised_SS/).

Code	Title	Credits
<b>Semester 1 - Fall</b>		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1040	General Chemistry I	0.50
MATH*1080	Elements of Calculus I	0.50
PHYS*1080	Physics for Life Sciences	0.50
0.50 Liberal Education electives		0.50
<b>Semester 2 - Winter</b>		
BIOL*1070	Discovering Biodiversity	0.50
BIOL*1080	Biological Concepts of Health	0.50
CHEM*1050	General Chemistry II	0.50
PHYS*1070	Physics for Life Sciences II	0.50
0.50 Liberal Education electives		0.50
<b>Summer Semester</b>		
No academic semester or work term		
<b>Semester 3 - Fall</b>		
BIOC*2580	Introduction to Biochemistry	0.50
COOP*1100	Introduction to Co-operative Education	0.00
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
MICR*2420	Introduction to Microbiology	0.50
STAT*2040	Statistics I	0.50
0.50 Liberal Education electives		0.50
<b>Semester 4 - Winter</b>		
BIOC*3560	Structure and Function in Biochemistry	0.50
CHEM*2700	Organic Chemistry I: Fundamentals	0.50
MCB*2050	Molecular Biology of the Cell	0.50
MICR*2430	Methods in Microbial Culture and Physiology	0.50
0.50 Liberal Education electives		0.50

Summer Semester		
COOP*1000	Co-op Work Term I	0.50
Semester 5 - Fall		
MBG*3040	Molecular Biology of the Gene	0.50
MBG*3350	Laboratory Methods in Molecular Biology	0.75
Electives or restricted electives to a maximum of 2.75 total credits in this semester		1.50
Winter Semester		
COOP*2000	Co-op Work Term II	0.50
Summer Semester		
COOP*3000	Co-op Work Term III	0.50
Fall Semester		
COOP*4000	Co-op Work Term IV	0.50
Semester 6 - Winter		
2.50 electives or restricted electives		2.50
Summer Semester		
No academic semester or work term		
Semester 7 - Fall		
2.50 electives or restricted electives		2.50
Semester 8 - Winter		
2.50 electives or restricted electives		2.50

MBG*4110	Epigenetics	0.50
MBG*4160	Plant Breeding	0.50
MBG*4240	Applied Molecular Genetics in Medicine and Biotechnology	0.50
MBG*4300	Plant Molecular Genetics	0.50
MCB*3010	Dynamics of Cell Function and Signaling	0.50
MCB*4010	Advanced Cell Biology	0.50
MCB*4020	Communication in Molecular and Cellular Biology	0.50
MCB*4500	Research Project in Molecular and Cellular Biology I	1.00
MCB*4510	Research Project in Molecular and Cellular Biology	1.00
MCB*4600	Topics in Molecular and Cellular Biology	0.50
MICR*3240	Microbial Physiology and Genetics	0.50
MICR*3330	World of Viruses	0.50
MICR*4540	Microbial Cell Biology	0.50
MICR*4330	Molecular Virology	0.50
NEUR*3100	Molecular Mechanisms of Neurological Disorders	0.50
STAT*2050	Statistics II	0.50

## Restricted Electives

**Note:** Some courses have prerequisites, so be sure to consult the undergraduate calendar.

1. A minimum of 2.00 credits of Liberal Education electives is required. The list of Liberal Education electives for B.Sc. students can be found at: <https://www.uoguelph.ca/bsc/>
2. Physiology Elective - 0.50 credits

Code	Title	Credits
BIOM*3200	Biomedical Physiology	1.00
BOT*3310	Plant Growth and Development	0.50
HK*2810	Human Physiology I - Concepts and Principles	0.50
ZOO*3600	Comparative Animal Physiology I	0.50

3. Subject Area Electives 4.50 credits of which 2.00 credits must be at the 4000 level

Code	Title	Credits
BIOC*4050	Protein and Nucleic Acid Structure	0.50
BIOL*3020	Population Genetics	0.50
BIOL*3300	Applied Bioinformatics	0.50
MBG*2400	Fundamentals of Plant and Animal Genetics	0.50
MBG*3050	Human Genetics	0.50
MBG*3060	Quantitative Genetics	0.50
MBG*3100	Plant Genetics	0.50
MBG*3660	Genomics	0.50
MBG*4030	Animal Breeding Methods and Applications	0.50
MBG*4040	Genetics and Molecular Biology of Development	0.50

## Minor Requirements (Honours)

**This minor cannot be combined with a major in Molecular Biology and Genetics.**

A minor in Molecular Biology and Genetics requires 5.00 credits in Molecular Biology and Genetics chosen in consultation with the faculty advisor, and will include:

Code	Title	Credits
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
MCB*2050	Molecular Biology of the Cell	0.50
Select a minimum of 4.00 credits from the following:		
BIOC*3560	Structure and Function in Biochemistry	0.50
BIOC*4050	Protein and Nucleic Acid Structure	0.50
BIOL*3020	Population Genetics	0.50
BIOL*3300	Applied Bioinformatics	0.50
MBG*2400	Fundamentals of Plant and Animal Genetics	0.50
MBG*3040	Molecular Biology of the Gene	0.50
MBG*3050	Human Genetics	0.50
MBG*3060	Quantitative Genetics	0.50
MBG*3100	Plant Genetics	0.50
MBG*3350	Laboratory Methods in Molecular Biology	0.75
MBG*3660	Genomics	0.50
MBG*4030	Animal Breeding Methods and Applications	0.50
MBG*4040	Genetics and Molecular Biology of Development	0.50
MBG*4110	Epigenetics	0.50
MBG*4160	Plant Breeding	0.50
MBG*4240	Applied Molecular Genetics in Medicine and Biotechnology	0.50

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MBG*4300	Plant Molecular Genetics	0.50
MCB*3010	Dynamics of Cell Function and Signaling	0.50
MCB*4010	Advanced Cell Biology	0.50
MICR*3240	Microbial Physiology and Genetics	0.50
MICR*3330	World of Viruses	0.50
MICR*4540	Microbial Cell Biology	0.50
MICR*4330	Molecular Virology	0.50