

MASTER OF SCIENCE IN CELL AND MOLECULAR BIOLOGY

The graduate program in Cell and Molecular Biology is an interdisciplinary, degree-granting program that comprises over 100 faculty members from 17 departments and 6 colleges who share common interests in cell and molecular biology. The M.S. program core includes coursework in molecular genetics, cell biology, and rigorous and ethical conduct of research. Students may also select additional courses in areas related to their interests. Two alternating graduate seminar series allow students to present their research and attend presentations by CSU faculty and nationally prominent scientists.

Core courses can typically be completed during the first year. The Plan A M.S. degree can be completed within two years. The Plan B M.S. degree can be completed within 3 semesters.

Most MS students are admitted with the support of a faculty advisor to oversee the research portion of their training. Current focus areas of research include but are not limited to, Cancer Biology; Gene Expression; Genome Structure, Evolution & Repair; Infectious Disease; Metabolism & Physiology; Microbiomes; Plant Molecular Biology, Prions & Neurobiology; Stem Cells & Development; Synthetic Biology and STEM Communication. Students are encouraged to complete coursework in computational/quantitative approaches, and an emphasis is placed on effective communication with various audiences. The CMB program supports a student association and aims to create an inclusive and welcoming culture for all.

Students interested in this program should refer to the Graduate and Professional Bulletin (<https://catalog.colostate.edu/general-catalog/graduate-bulletin/>) or the Cell and Molecular Biology website (<http://www.cmb.colostate.edu/>) for further details.

Learning Objectives

Graduates from our program will have strong foundations in core cell and molecular biology principles, state-of-the-art training in technical laboratory and computational skills, and leadership and communication skills necessary for professional achievement. Upon successful completion of the M.S. Plan A or Plan B program, students will be able to:

1. Demonstrate and apply detailed knowledge of the molecular processes by which genetic material is replicated, expressed, and regulated and/or the cellular processes involved in membrane formation, organelle biogenesis, cell communication/shape/motility and how these are linked with growth, aging, and death.
2. Evaluate primary research papers in the field of cell and molecular biology, including discerning the major questions/hypotheses being addressed, critically interpreting the data presented, assessing whether the conclusions are adequately supported by evidence, and relating the findings to the broader context and significance in the field.
3. Apply appropriate, ethical, and technically competent research practices to generate and analyze data and determine biological relevance.

4. Write publication-quality scientific manuscripts in the field of cell and molecular biology based on research findings (Plan A version), proposal, or literature review (Plan B version).

Plan A Effective Fall 2024

Code	Title	Credits
Required Courses:		
CM 510	Introduction to Cell and Molecular Biology	1
CM 544/MIP 544	Reproducible Biomedical Research Methods	3
CM 595	Independent Study	1-17
CM 699	Thesis	1-17
CM 792	Cell and Molecular Biology Seminar ²	1-2
CM 793	Seminar ²	1-2
Select one course from the following:		4
BC 563	Molecular Genetics	
BC 565	Molecular Regulation of Cell Function	
Ethics Elective (see list below)		1
Cell and Molecular Biology Electives ³		8
Program Total Credits:		30

A minimum of 30 credits are required to complete this program.

Ethics Electives

Code	Title	Credits
Select at least one course from the following:		
BC 601	Responsible Conduct in Biochemistry	1
GRAD 544	Ethical Conduct of Research	1
MIP 554	Research Policies and Regulations	1
NSCI 575/GRAD 575	Ethical Issues in Big Data Research	1

Cell and Molecular Biology Electives

[A minimum of 8 credits of electives related to the student's research area are required. Some possible options are listed, but this list is not exhaustive.](#)

Code	Title	Credits
AB 511	Microbiome of Plant Systems	3
ANEQ 505	Microbiome of Animal Systems	3
ANEQ 545	Molecular Methods in Animal Genetics	3
ANEQ 575	Computational Biology in Animal Breeding	3
BC 511	Structural Biology I	4
BC 563	Molecular Genetics	4
BC 565	Molecular Regulation of Cell Function	4
BC 571	Quantitative Biochemistry	1
BC 611	Structural Biology II	2
BC 663	Gene Expression	2
BC 665A	Advanced Topics in Cell Regulation: Microscopic Methods	2
BIOM 525/MECH 525	Cell and Tissue Engineering	3
BIOM 533/CIVE 533	Biomolecular Tools for Engineers	3

BMS 500	Mammalian Physiology I	4
BMS 501	Mammalian Physiology II	4
BZ 565/MIP 565	Next Generation Sequencing Platform/ Libraries	1
BZ 570	Molecular Aspects of Plant Development	3
BZ 576/BZ 476	Genetics of Model Organisms	4
CBE 560	Engineering of Protein Expression Systems	3
DSCI 511	Genomics Data Analysis in Python	2
DSCI 512	RNA-Sequencing Data Analysis	1
MIP 530	Advanced Molecular Virology	4
MIP 543	RNA Biology	3
MIP 545	Microbial Metagenomics/Genomics Data Analysis	2
MIP 670	Molecular Immunology and Immunogenetics	3
MIP 730/ERHS 730	Principles of Flow Cytometry & Cell Sorting	2
NB 501	Cellular and Molecular Neurophysiology	2
NB 503/BMS 503	Developmental Neurobiology	3

¹ Minimum 1 credit for each CM 595 and CM 699, with additional credits as needed to bring degree total to 30 credits, with approval of the graduate advisory committee.

² CM 792 and CM 793 must be taken every academic year.

³ At least 8 credits in regular graduate-level courses relevant to Cell & Molecular Biology, with approval of the graduate advisory committee.

Plan B Effective Fall 2024

Code	Title	Credits
Required Courses:		
CM 510	Introduction to Cell and Molecular Biology	1
CM 544/MIP 544	Reproducible Biomedical Research Methods	3
CM 595	Independent Study	1-18
CM 792	Cell and Molecular Biology Seminar ²	1-2
CM 793	Seminar ²	1-2
Select one course from the following:		4
BC 563	Molecular Genetics	
BC 565	Molecular Regulation of Cell Function	
Ethics Elective (see list below)		1
Electives ³		4-12
Program Total Credits:		30

A minimum of 30 credits are required to complete this program.

Ethics Electives

Code	Title	Credits
Select at least one course from the following:		
BC 601	Responsible Conduct in Biochemistry	1
GRAD 544	Ethical Conduct of Research	1
MIP 554	Research Policies and Regulations	1
NSCI 575/GRAD 575	Ethical Issues in Big Data Research	1

Cell and Molecular Biology Electives

A minimum of 8 credits of electives related to the student's research area are required. Some possible options are listed, but this list is not exhaustive.

Code	Title	Credits
AB 511	Microbiome of Plant Systems	3
ANEQ 505	Microbiome of Animal Systems	3
ANEQ 545	Molecular Methods in Animal Genetics	3
ANEQ 575	Computational Biology in Animal Breeding	3
BC 511	Structural Biology I	4
BC 563	Molecular Genetics	4
BC 565	Molecular Regulation of Cell Function	4
BC 571	Quantitative Biochemistry	1
BC 611	Structural Biology II	2
BC 663	Gene Expression	2
BC 665A	Advanced Topics in Cell Regulation: Microscopic Methods	2
BIOM 525/MECH 525	Cell and Tissue Engineering	3
BIOM 533/CIVE 533	Biomolecular Tools for Engineers	3
BMS 500	Mammalian Physiology I	4
BMS 501	Mammalian Physiology II	4
BZ 565/MIP 565	Next Generation Sequencing Platform/ Libraries	1
BZ 570	Molecular Aspects of Plant Development	3
BZ 576/BZ 476	Genetics of Model Organisms	4
CBE 560	Engineering of Protein Expression Systems	3
DSCI 511	Genomics Data Analysis in Python	2
DSCI 512	RNA-Sequencing Data Analysis	1
MIP 530	Advanced Molecular Virology	4
MIP 543	RNA Biology	3
MIP 545	Microbial Metagenomics/Genomics Data Analysis	2
MIP 670	Molecular Immunology and Immunogenetics	3
MIP 730/ERHS 730	Principles of Flow Cytometry & Cell Sorting	2
NB 501	Cellular and Molecular Neurophysiology	2
NB 503/BMS 503	Developmental Neurobiology	3

¹ Minimum 1 credit for CM 595, with additional credits as needed to bring degree total to 30 credits, with approval of the graduate advisory committee.

² CM 792 and CM 793 must be taken every year.

³ At least 8 credits in regular graduate level courses relevant to Cell & Molecular Biology, with approval of the graduate advisory committee.

Requirements for All Graduate Degrees

For more information, please visit Requirements for All Graduate Degrees (<https://catalog.colostate.edu/general-catalog/graduate-bulletin/graduate-study/procedures-requirements-all-degrees/>) in the Graduate and Professional Bulletin (<https://catalog.colostate.edu/general-catalog/graduate-bulletin/>).

Summary of Procedures for the Master's and Doctoral Degrees

NOTE: Each semester the Graduate School publishes a schedule of deadlines. Deadlines are available on the Graduate School website (<https://graduateschool.colostate.edu/deadline-dates/>). Students should consult this schedule whenever they approach important steps in their careers.

Forms (<https://graduateschool.colostate.edu/forms/>) are available online.

Step	Due Date
1. Application for admission (online)	Six months before first registration
2. Diagnostic examination when required	Before first registration
3. Appointment of advisor	Before first registration
4. Selection of graduate committee	Before the time of fourth regular semester registration
5. Filing of program of study (GS Form 6)	Before the time of fourth regular semester registration
6. Preliminary examination (Ph.D. and PD)	Two terms prior to final examination
7. Report of preliminary examination (GS Form 16) - (Ph.D. and PD)	Within two working days after results are known
8. Changes in committee (GS Form 9A)	When change is made
9. Application for Graduation (GS Form 25)	Refer to published deadlines from the Graduate School Website
9a. Reapplication for Graduation (online)	Failure to graduate requires Reapplication for Graduation (online) for the next time term for which you are applying
10. Submit thesis or dissertation to committee	At least two weeks prior to the examination or at the discretion of the graduate committee
11. Final examination	Refer to published deadlines from the Graduate School Website
12. Report of final examination (GS Form 24)	Within two working days after results are known; refer to published deadlines from the Graduate School website
13. Submit a signed Thesis/ Dissertation Submission Form (GS Form 30) to the Graduate School and Submit the Survey of Earned Doctorates (Ph.D. only) prior to submitting the electronic thesis/ dissertation	Refer to published deadlines from the Graduate School website.
14. Submit the thesis/dissertation electronically	Refer to published deadlines from the Graduate School website
15. Graduation	Ceremony information is available from the Graduate School website