

# PROFESSIONAL SCIENCE MASTER'S IN BIOMANUFACTURING AND BIOTECHNOLOGY

The Professional Science Master's (PSM) in Biomanufacturing and Biotechnology is ideal for students who want to prepare for careers in a variety of industries that use bioprocesses, biomanufacturing, and biotechnology. The program is also designed to provide opportunities for professionals working in these industries to get the training they may need to advance in their careers. The program includes a balanced combination of bioscience, engineering, and business courses, appropriate for students with either a science or engineering background. The program culminates with an internship experience at a partnering organization, company, government entity, or non-profit, where the student puts into practice their bioscience, engineering, and business training.

The PSM in Biomanufacturing and Biotechnology is an affiliated Professional Science Master's (PSM) degree. Affiliation is administered by the Commission on Affiliation of PSM Programs (<https://www.professionalsciencemasters.org/>) (formerly named PSM National Office) to ensure a strong and distinctive PSM brand. The PSM is designed for students who are seeking a graduate degree in science or mathematics and understand the need for developing workplace skills valued by top employers.

Students interested in graduate work should refer to the Graduate and Professional Bulletin (<http://catalog.colostate.edu/general-catalog/graduate-bulletin/>).

## Learning Objectives

Graduates will demonstrate:

1. A working knowledge of the core areas of biochemistry, including genetics, structural biology, cell biology, and molecular biology.
2. Ability to apply engineering problem solving and design skills to analyze, design, and optimize continuous and batch bioprocesses for production and purification of value-added products.
3. Professional leadership, communication, and strategic decision making skills.
4. Ability to integrate current bioscience, engineering, and business theory and techniques into their knowledge base and professional pursuits.
5. Ability to identify ethical issues in business and biotechnology, and understand the ethical implications of practicing their profession in society.



## Requirements Effective Fall 2025

Code	Title	Credits
<b>Core Course Requirements</b>		
BUS 500	Foundations for Business Impact <sup>1</sup>	2
BUS 601	Quantitative Business Analysis	2
BUS 614	Accounting Concepts	2
BUS 620	Leadership and Teams	2
CBE 504/BIOM 504	Fundamentals of Biochemical Engineering	3
CBE 505	Biochemical Engineering Laboratory	1
CBE 522/BIOM 522	Bioseparation Processes	3
CBE 687	Internship	7
MIP 300	General Microbiology <sup>2</sup>	3
<b>Biological Engineering Courses</b>		
Select a minimum of 6 credits from the following:		6
BIOM 422	Quantitative Systems and Synthetic Biology	
BIOM 525/ MECH 525	Cell and Tissue Engineering <sup>3</sup>	
BIOM 526/ ECE 526	Biological Physics <sup>4</sup>	
BIOM 533/ CIVE 533	Biomolecular Tools for Engineers	
CBE 560	Engineering of Protein Expression Systems	
CBE 570	Biomolecular Engineering/Synthetic Biology	
CBE 540/CIVE 540	Advanced Biological Wastewater Processing	
<b>Business Electives</b>		
Select a minimum of 2 credits from the following:		2
BUS 626	Managing Human Capital	
BUS 640	Financial Principles and Practice <sup>5</sup>	
BUS 655	Marketing Management	
<b>Bioscience Courses</b>		
Select a minimum of 6 credits from the following:		6
BC 411	Physical Biochemistry	
BC 463	Molecular Genetics	
BC 465	Molecular Regulation of Cell Function	
BC 512	Principles of Macromolecular Structure	
BC 563	Molecular Genetics <sup>6</sup>	

BC 565	Molecular Regulation of Cell Function <sup>7</sup>
BC 571	Quantitative Biochemistry
BSPM 740/ SOCR 740	Plant Molecular Genetics
CHEM 521/BC 521	Principles of Chemical Biology
CHEM 522	Methods of Chemical Biology
CM 515	Computational Cell and Molecular Biology
DSCI 336	Data Graphics and Visualization
DSCI 510	Linux as a Computational Platform
DSCI 511	Genomics Data Analysis in Python
FTEC 350	Fermentation Microbiology
FTEC 375	Introduction to Fermentation Unit Operations
FTEC 572	Food Biotechnology <sup>4</sup>
MIP 450	Microbial Genetics
MIP 545	Microbial Metagenomics/Genomics Data Analysis
MIP 550	Microbial and Molecular Genetics Laboratory <sup>8</sup>
MIP 565/BZ 565	Next Generation Sequencing Platform/ Libraries
MIP 570	Functional Genomics
MIP 611	Advanced Microbiological Research Methods
MIP 613	Applied Microbiology and Virology
MIP 616	Modern Molecular Biology for Microbiologists
SOCR 455	Microbiomes of Soil Systems
STAR 511	Design and Data Analysis for Researchers I

**Program Total Credits:** **39**

A minimum of 39 credits are required to complete this program.

<sup>1</sup> BUS 500 is a prerequisite (or concurrent) for the other BUS courses.

<sup>2</sup> Students who have taken MIP 300 or who otherwise have a strong microbiology background should substitute a more advanced microbiology course.

<sup>3</sup> May be offered every other year (even).

<sup>4</sup> May be offered every other year (odd).

<sup>5</sup> BUS 640 has BUS 601 and BUS 614 as prerequisites.

<sup>6</sup> Students cannot receive credit for both BC 463 and BC 563.

<sup>7</sup> Students cannot receive credit for both BC 465 and BC 565.

<sup>8</sup> MIP 550 has multiple prerequisites. Students must take MIP 300, then MIP 450, then meet with the MIP 550 instructor to discuss whether the course is a good fit and thereby potentially obtain an override.

## Requirements for All Graduate Degrees

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