MICROBIOLOGY AND CELL SCIENCE | CLAS

The Bachelor of Science in Microbiology and Cell Science offers students flexibility in a curriculum that develops an excellent knowledge base and an understanding of concepts in microbiology, cell biology, and the biomolecular sciences. Emphasizes application of the scientific method to gain an understanding of the biological world at the cellular and molecular levels. Students learn to evaluate hypotheses, to interpret experimental data, and to communicate results effectively.

About this Program

- **College:** Liberal Arts and Sciences (https://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/)
- **Degree:** Bachelor of Science
- **Credits for Degree:** 120

To graduate with this major, students must complete all university, college, and major requirements.

Department Information

The Department of Microbiology & Cell Science is committed to excellence in education, research and service to the community. The curriculum provides an excellent preparation for students who wish to enter the workforce or continue their education in professional programs such as medical, dental, pharmacy, veterinary programs, graduate school, or public health degrees. BS degrees are offered through both the College of Agricultural and Life Sciences and the College of Liberal Arts and Sciences and the MS and PhD degrees are offered through the College of Agricultural and Life Sciences. Combination degrees are available.
Website (http://microcell.ufl.edu/)

CONTACT

Email (zinaahn@ufl.edu) | 352.392.1906 (tel) | 352.846.0950 (fax)

P.O. Box 110700
1355 Museum Drive
MICROBIOLOGY AND CELL SCIENCE BUILDING (MCSB)
GAINESVILLE FL 32611-0700
Map (http://campusmap.ufl.edu/#/index/0981)

Curriculum

- Bioinformatics Minor UF Online
- Combination Degrees
- Microbiology and Cell Science UF Online
- Microbiology and Cell Science | CALS
- Microbiology and Cell Science | CLAS
- Pathogenesis Minor
- Pathogenesis Minor UF Online

This major prepares students for entry into professional programs in medicine, dentistry, and veterinary medicine and provides a strong foundation for graduate studies in microbiology, cell biology, and related cellular and biomedical sciences. The major also provides a background for entry into government, industrial research, and diagnostic laboratories.

The curriculum develops fundamental knowledge of prokaryotic and eukaryotic cells and viruses. Courses include the physiology and genetics of microorganisms, mechanisms of pathogenesis and innate immunity systems, astrobiology, bacterial and genome sequencing and bioinformatics.

requirements for the Major

All Microbiology and Cell Science majors must complete 28 credits: 18 credits of core requirements, at least 6 credits of department electives, at least 1 credit in an advanced laboratory, and 3 credits for the quantitative requirement. In addition, students must complete 36-38 credits of required foundation coursework.

Minimum grades of C within two attempts, including withdrawals, are required in all critical-tracking courses, major courses, department core requirements, department electives, and the quantitative requirement. Second attempts must be completed the next semester of enrollment. A cumulative 2.0 GPA is also required.

Required Foundation Coursework

Code	Title	Credits
BSC 2010	Integrated Principles of Biology 1	4
& 2010L	and Integrated Principles of Biology Laboratory	

BSC 2011	Integrated Principles of Biology 2	4
& 2011L	and Integrated Principles of Biology Laboratory 2	
CHM 2045	General Chemistry 1	4
& 2045L	and General Chemistry Laboratory	
CHM 2046	General Chemistry 2	4
& 2046L	and General Chemistry 2 Laboratory	
MAC 2311	Analytic Geometry and Calculus 1	4
CHM 2210	Organic Chemistry 1	3
CHM 2211	Organic Chemistry 2	5
& 2211L	and Organic Chemistry Laboratory	
Select one:		8-10
Option One		
PHY 2053	Physics 1	
& 2053L	and Laboratory for PHY 2053	
PHY 2054	Physics 2	
& 2054L	and Laboratory for PHY 2054	
Option Two		
PHY 2048	Physics with Calculus 1	
& 2048L	and Laboratory for PHY 2048	
PHY 2049	Physics with Calculus 2	
& 2049L	and Laboratory for PHY 2049	
Total Credits		**36-38**

All majors must complete the biology and general chemistry sequences and calculus by the end of the sophomore year. Organic Chemistry, CHM 2210, must be completed by the end of tracking term five. To continue in the major, students must attain a cumulative GPA in these graded courses of no less than 2.5 and with no grade lower than a C.

Required Major Coursework

Code	Title	Credits
Microbiology Major Core Coursework		
BCH 4024	Introduction to Biochemistry and Molecular Biology [1]	4
or CHM 3218	Organic Chemistry/Biochemistry 2	
MCB 3023	Principles of Microbiology	5
& 3023L	and Principles of Microbiology Laboratory	
MCB 4203	Bacterial Pathogens [1]	3
or PCB 4233	Immunology	
MCB 4304	Genetics of Microorganisms [1]	3
or PCB 4522	Molecular Genetics	
MCB 4403	Prokaryotic Cell Structure and Function [1]	3
or PCB 3134	Eukaryotic Cell Structure and Function	
Microbiology Major Department Electives		**6**
Advanced Laboratory course		**1**
Quantitative Requirement – Programming or Biostatistics		**3**
Select one:		
BSC 2891	Python Programming for Biology	
MCB 4325C	R for Functional Genomics	
Similar Programming or Biostatistics course (approved by department)		
Total Credits		**28**

[1] If students take both "or" courses, one will count as a core course and the other will roll over into the department elective requirement.

Major Electives

A total of 6 credits of approved department electives, and additionally one credit in an advanced lab, are required. The list of approved department electives is available on the department website (https://microcell.ufl.edu/undergraduate/on-campus/#:~:text=Undergraduate%20Course%20Listing).

Programming or Biostatistics Courses

A total of 3 credits of approved courses meets this requirement. Select from BSC 2891, MCB 4325C, or an equivalent biostatistics programming class. Several of these courses are also department electives and cannot be used to fulfill both the quantitative and the department elective requirements. No overlap is allowed. STA 2023 will not fulfill this requirement.

Course Details

MCB 4911 may be taken for a maximum of three credits per semester and six credits total. This policy also applies to microbiology and cell science majors registered for undergraduate research in other departments' undergraduate research courses, such as BCH 4905, BMS 4905, ZOO 4911, etc.

MCB 4934 is often used for TA positions as “Supervised Teaching.” TA positions may be repeated for a total of two semesters.

Enrollment in MCB 4911, MCB 4905 and MCB 4934 (Supervised Teaching) will not fulfill any credits toward the microbiology major requirements; they will count only as general elective credit toward the 120 credits for the BS degree.

Relevant Minors and Certificates

The Microbiology and Cell Science Department also offers an undergraduate minor in bioinformatics to students majoring in any biology-related subject, including and not limited to microbiology, biology, or biochemistry.

So integrated is bioinformatics with biology that it is difficult to find an active research program that does not rely on bioinformatic analysis to achieve results. Unfortunately, the integration of bioinformatic and traditional methods is not stressed in many undergraduate programs, leaving the next generation of biologists without the skills they need to succeed in tomorrow’s research environment. The undergraduate minor in bioinformatics provides this critical training to future professionals in the biological disciplines.

Research

A majority of majors are actively involved in undergraduate research for credit with mentors throughout the university. Preprofessional and graduate school-bound majors are encouraged to do a minimum of two semesters of undergraduate research. The department has a comprehensive list of mentors across campus who allow undergraduate students to do valuable research under their guidance. Please refer to the department website for more information on undergraduate research, finding a mentor and a contact list of UF faculty who have worked with microbiology and cell science majors.

Enrollment in MCB 4911 will not fulfill any credits toward the microbiology major requirements; they will count only as general elective credit toward the 120 credits for the BS degree.

Critical Tracking

Critical Tracking records each student’s progress in courses that are required for entry to each major. Please note the critical-tracking requirements below on a per-semester basis.

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites (https://cpm.flvc.org/advance-search/) may be used for transfer students.

Semester 1

- Complete CHM 1025 or CHM 2045/CHM 2045L
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 2

- Complete CHM 2045/CHM 2045L and MAC 2311
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 3

- Complete CHM 2046/CHM 2046L and BSC 2010/BSC 2010L
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 4

- Complete BSC 2011/BSC 2011L
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 5

- Complete CHM 2210
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 6

- Complete MCB 3023
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 7

- Complete MCB 4203 (Fall) or PCB 4233 (Spring) or PCB 3134 (Fall/Spring) or MCB 4403 (Fall)
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 8

- Complete MCB 4034L
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Model Semester Plan

Students are expected to complete the Writing, Civic Literacy, summer enrollment, and Quest requirements while in the process of taking the courses below. Students are also expected to complete the general education international (GE-N) requirements concurrently with another general education requirement (typically, GE-C, H, or S) as part of the CLAS Basic Distribution requirements. One of the two general education mathematics courses must be a pure math course.

College of Liberal Arts and Sciences allows students additional flexibility in its Distribution Requirements. Students may count a maximum of 6 credits TOTAL from the CLAS Distribution course lists towards Humanities, Social and Behavioral Sciences, or Biological and Physical Sciences, with no more than 3 credits of Humanities, 3 credits of Social and Behavioral Sciences, or 6 credits of Biological or Physical Sciences.

The full list of major-specific requirements for this major can be found on the Overview tab. College of Liberal Arts and Sciences degree requirements can be found on the College's degree requirements page (https://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/#degreerequirementstext).

Microbiology electives outside of the department may not count towards the 3000 level or above electives outside of the major requirement.
CHM 2211, CHM 2211L, BCH 4024, PHY 2054, PHY 2054L, PHY 2049, and PHY 2049L may count towards 3000 level or above electives outside of the major.

For degree requirements outside of the major, refer to CLAS Degree Requirements: Structure of a CLAS Degree (https://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/#degreerequirementstext).

Degree Comparison between the Colleges

CALS | MCB	CLAS | MCY
Effective Oral Communication (AEC 3030C or SPC 2608)	College-level Foreign Language Sequence (8-10 credits)
Technical Writing (ENC 2210 or ENC 3254 or AEC 3033C)	1 additional Humanities course
Economics (ECO 2013 or ECO 2023 or AEB 2014)	1 additional Social and Behavioral Sciences course

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.

Course	Title	Credits
Semester One		
Quest 1		3
CHM 2045	General Chemistry 1	4
& 2045L	and General Chemistry Laboratory (**Critical Tracking**; State Core Gen Ed Physical Sciences) [1]	
MAC 2311	Analytic Geometry and Calculus 1 (**Critical Tracking**; State Core Gen Ed Mathematics)	4
State Core Gen Ed Composition; Writing Requirement		3
	Credits	**14**

Semester Two		
BSC 2010 & 2010L	Integrated Principles of Biology 1 and Integrated Principles of Biology Laboratory (**Critical Tracking**; Gen Ed Biological Sciences)	4
CHM 2046 & 2046L	General Chemistry 2 and General Chemistry 2 Laboratory (**Critical Tracking**; Gen Ed Physical Sciences)	4
BSC 2891	Python Programming for Biology (or similar quantitative elective)	3
Gen Ed Composition; Writing Requirement		3
	Credits	**14**
Semester Three		
BSC 2011 & 2011L	Integrated Principles of Biology 2 and Integrated Principles of Biology Laboratory 2 (**Critical Tracking**; Gen Ed Biological Sciences)	4
CHM 2210	Organic Chemistry 1 (**Critical Tracking**)	3
Departmental elective		3
Quest 2		3
CLAS Foreign Language Proficiency Requirement [1]		4-5
	Credits	**17-18**
Semester Four		
CHM 2211 & 2211L	Organic Chemistry 2 and Organic Chemistry Laboratory	5
MCB 3023 & 3023L	Principles of Microbiology and Principles of Microbiology Laboratory (**Critical Tracking**)	5
State Core Gen Ed Humanities (https://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext)		3
CLAS Foreign Language Proficiency Requirement [1]		3-5
	Credits	**16-18**
Semester Five		
A 2.5 GPA with minimum grades of C in the Critical Tracking science and math courses listed above is required to continue in the major after Semester Four.		
MCB 4203 or PCB 4233	Bacterial Pathogens (**Critical Tracking**) [2] or Immunology	3
MCB 4403 or PCB 3134	Prokaryotic Cell Structure and Function (**Critical Tracking**) or Eukaryotic Cell Structure and Function	3
Gen Ed Humanities		3
Electives (3000 level or higher; not in major)		3
Elective (or CLAS Foreign Language Proficiency Requirement if 4-3-3 language option) [1]		3
	Credits	**15**
Semester Six		
MCB 4304 or PCB 4522	Genetics of Microorganisms (**Critical Tracking**) or Molecular Genetics	3
BCH 4024 or CHM 3218	Introduction to Biochemistry and Molecular Biology or Organic Chemistry/Biochemistry 2	4
MCB 4034L	Advanced Microbiology Laboratory (**Critical Tracking**)	1
Gen Ed Mathematics		3
Ged Ed Social and Behavioral Sciences		3
	Credits	**14**
Semester Seven		
Select one:		4-5
PHY 2048 & 2048L	Physics with Calculus 1 and Laboratory for PHY 2048	
PHY 2053 & 2053L	Physics 1 and Laboratory for PHY 2053	
State Core Gen Ed Social and Behavioral Sciences (https://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext)		3
Gen Ed Humanities		3
Electives (3000 level or higher; not in major)		4
	Credits	**14-15**
Semester Eight		
Select one:		4-5
PHY 2049 & 2049L	Physics with Calculus 2 and Laboratory for PHY 2049	

PHY 2054 & 2054L	Physics 2 and Laboratory for PHY 2054	
Department elective		3
Gen Ed Social and Behavioral Sciences		3
Electives		6
	Credits	**16-17**
	Total Credits	**120**

1 https://catalog.ufl.edu/UGRD/colleges-schools/UGLAS/#degreerequirementstext
2 MCB 4203 is taught in Fall and Spring. PCB 4233 is taught only in Spring.

Academic Learning Compact

The Bachelor of Science in Microbiology and Cell science, offered by both the College of Agricultural and Life Sciences and the College of Liberal Arts and Sciences, offers students flexibility in a curriculum that develops an excellent knowledge base and an understanding of concepts in microbiology, cell biology and the biomolecular sciences. Emphasis will be placed on application of the scientific method to gain an understanding of the biological world at the cellular and molecular levels. Students will learn to evaluate hypotheses, to interpret experimental data and to communicate results effectively.

Before Graduating Students Must

Complete requirements for the baccalaureate degree, as determined by faculty.

Students in the Major Will Learn to

Student Learning Outcomes | SLOs

Content

1. Describe fundamental concepts, skills and processes in microbiology, molecular biology and in host/pathogen interactions.
2. Apply fundamental concepts, skills and protocols used to conduct research in fields of microbiology, molecular biology and in host/pathogen.

Critical Thinking

3. Evaluate information and data in the general areas of microbiology and the cellular and molecular biological sciences.
4. Solve typical problems that are encountered in general areas of microbiology and cellular and molecular biological sciences.

Communication

5. Communicate effectively in written form in a manner appropriate in microbiology and the cellular and molecular biological sciences.
6. Communicate orally (including visual aids) in an effective manner appropriate in microbiology and the cellular and molecular biological sciences.

Curriculum Map

I = Introduced; R = Reinforced; A = Assessed

Courses	SLO 1	SLO 2	SLO 3	SLO 4	SLO 5	SLO 6
AEC 3030C						I, R, A
AEC 3033C					I, R, A	
MCB 3023	I, A		I	I		
MCB 3023L	I, R	I, R	R	I, R, A		R
MCB 4034L	I, R	I, R, A	I, R, A	I, R	R	I, R
MCB 4203 or PCB 4233	I, R, A	I, R	I, R	I, R	I, R	I, R
MCB 4304 or PCB 4522	I, R, A	I, R	R, A	R	R	R

Assessment Types

- Genome and lab projects
- Presentations
- Exams
- Final grades