

# MICROBIOLOGY & CELL SCIENCE

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Not all courses are offered every semester. Refer to the schedule of courses for each term's specific offerings.

More Info (<https://one.ufl.edu/soc/>)

*Unless otherwise indicated in the course description, all courses at the University of Florida are taught in English, with the exception of specific foreign language courses.*

## 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

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MICROBIOLOGY AND CELL SCIENCE BUILDING (MCSB)

GAINESVILLE FL 32611-0700

Map (<http://campusmap.ufl.edu/#/index/0981>)

## Curriculum

- Bioinformatics Minor
- 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

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## Courses

### ALS 3200C AI in Agricultural and Life Sciences 3 Credits

**Grading Scheme:** Letter Grade

Artificial intelligence (AI) is used to solve problems in research and industry. This course provides students with understanding of and practical hands-on experience building and using AI systems. Students will obtain the skills and knowledge they need to use AI to solve real-world problems in agricultural and life sciences.

**Prerequisite:** (BSC 2891 or STA 2023 or STA 3032 or EEL 3872) with minimum grades of C.

### BSC 2891 Python Programming for Biology 3 Credits

**Grading Scheme:** Letter Grade

Discoveries in biology are driven as much by computer analysis as by laboratory work. Learn the theory and practice of computer programming with emphasis on the practical techniques and problem solving skills required to use computer programming in biological research. Taught completely online.

### BSC 4434C Introduction to Bioinformatics 3 Credits

**Grading Scheme:** Letter Grade

Lecture and hands-on computer laboratories emphasize data-mining tools freely available in web-based resources that predict gene function from DNA, RNA, and protein sequences.

**Prerequisite:** MCB 3020 or MCB 3023 or BCH 4024 or CHM 3218 with a minimum grade of C.

**BSC 4467 Applications and Technologies of Synthetic Biology 3 Credits**

**Grading Scheme:** Letter Grade

Synthetic biology is the construction and reconstruction of biological systems and its practical applications in research and industry. Examines advanced molecular biology tools for DNA assembly, the construction of biological pathways and circuits, genome editing, and strategies for transcriptional control.

**Prerequisite:** MCB 3020 or MCB 3023.

**BSC 4913 Independent Research in Bioinformatics 3 Credits**

**Grading Scheme:** Letter Grade

Mentored research experience at the interface between computational and biological sciences; preparation for competitive graduate-school and industry positions in bioinformatics.

**Prerequisite:** BSC 2891 or MCB 4320C or BSC 4434C or BSC 4434C with a minimum grade of C.

**BSC 4914 Advanced Independent Research in Bioinformatics 3 Credits**

**Grading Scheme:** Letter Grade

Mentored bioinformatics research experience that challenges students to develop a deeper understanding of bioinformatics methodologies, to frame biological questions, to evaluate primary scientific literature and to present their research in formal written and oral presentations.

**Prerequisite:** BSC 4913 with a minimum grade of C.

**MCB 2000 Microbiology 3 Credits**

**Grading Scheme:** Letter Grade

Role of microorganisms in chemical transformations, disease, public health, and agriculture. Fundamental concepts are discussed, followed by beneficial and harmful actions of microorganisms as they affect our lives. Not acceptable for admission to advanced microbiology courses nor for the preprofessional curricula required for the medical/veterinary sciences.

**Attributes:** General Education - Biological Science

**MCB 2000L Microbiology Laboratory 1 Credit**

**Grading Scheme:** Letter Grade

Laboratory exercises demonstrate biochemical transformations and present methods for studying microbial properties. Not acceptable for admission to advanced microbiology courses nor for the preprofessional curricula required for the medical/veterinary sciences.

**Corequisite:** MCB 2000.

**MCB 2006 Microbes without Borders 3 Credits**

**Grading Scheme:** Letter Grade

Introduces the amazing world of microbiology; microbes play a significance role for individuals, for our communities, and for the whole planet. Readings, discussions, and activities provide a mind-opening, global journey to acknowledge the great things microbes do for us.

**MCB 3015C Lab Skills Bootcamp 1 Credit**

**Grading Scheme:** Letter Grade

Provides a foundation and advanced skills all biological science students should master. Emphasizes analytical, computational, communication and other lab skills above and beyond bench work.

**Prerequisite:** (BSC 2010 or equivalent) and (Agricultural and Life Sciences major or Microbiology and Cell Science major).

**Corequisite:** CHM 2045 or equivalent.

**MCB 3020 Basic Biology of Microorganisms 3 Credits**

**Grading Scheme:** Letter Grade

Introduces the principles and techniques of microbiology, genetics, taxonomy, biochemistry and ecology and microorganisms. Also studies virology, immunology, and the pathogenicity of microorganisms. (B)

**Prerequisite:** BSC 2010 and BSC 2010L, or ISC 2400L, or ISC 2401L, or equivalent, with minimum grades of C; BSC 2011 and BSC 2011L, or equivalent, or AGR 3303, with minimum grades of C; non-microbiology majors only.

**Corequisite:** CHM 2200 or CHM 2210.

**Attributes:** General Education - Biological Science

**MCB 3020L Laboratory for Basic Biology of Microorganisms 1 Credit**

**Grading Scheme:** Letter Grade

Laboratory exercises on the structure, nutrition, and growth of prokaryotic and eukaryotic cells. Includes isolation and classification of representative microorganisms.

**Prerequisite:** non-Microbiology and Cell Science major.

**Corequisite:** MCB 3020.

**MCB 3023 Principles of Microbiology 3 Credits**

**Grading Scheme:** Letter Grade

Introduces the principles and techniques of microbiology, genetics, taxonomy, biochemistry, and ecology of microorganisms. Required of all majors and students who will enroll in more advanced courses in the Department of Microbiology and Cell Science.

**Prerequisite:** BSC 2010 and BSC 2010L, or ISC 2400L, or ISC 2401L, or equivalent, with minimum grades of C; BSC 2011 and BSC 2011L, or equivalent, or AGR 3303, with minimum grades of C; microbiology majors only.

**MCB 3023L Principles of Microbiology Laboratory 2 Credits****Grading Scheme:** Letter Grade

Laboratory techniques on the structure, nutrition, biochemistry, genetics, and growth of microorganisms. Required of all majors and students who will enroll in more advanced courses in the Department of Microbiology and Cell Science.

**Prerequisite:** Microbiology and Cell Sciences major.**Corequisite:** MCB 3023.**MCB 3703 Astrobiology 3 Credits****Grading Scheme:** Letter Grade

Examines the origin, evolution, and future of life in our solar system. Include planetary habitability, astrobiogeochemistry, microbial life, and human spaceflight.

**Prerequisite:** introductory course in microbiology, astronomy, chemistry, physics or geology.**Attributes:** Satisfies 4000 Words of Writing Requirement**MCB 3933 Professional Development in Microbiology and Cell Science 1-2 Credits****Grading Scheme:** Letter Grade

Assistance in making career decisions and organizing supporting academic credentials. Emphasizes the wide variety of career opportunities and professional development tools applicable to careers in professional schools, academia, industry, and alternative professions.

**Prerequisite:** BSC 2011 and CHM 2045 or equivalent and Agricultural and Life Sciences Microbiology and Cell Science major.**MCB 4034L Advanced Microbiology Laboratory 1 Credit****Grading Scheme:** Letter Grade

Application of immunological, molecular biological and microbial techniques to the isolation, identification, and characterization of bacteria and viruses.

**Prerequisite:** (MCB 3020 or MCB 3023) and (MCB 3020L or MCB 3023L) with minimum grades of C.**MCB 4090 Careers for Impact in Microbiology and Cell Science 1 Credit****Grading Scheme:** Letter Grade

Provides connections into a variety of microbiology and cell science careers, and hones essential networking and communication skills through practical application exercises. A portfolio will be created to identify and obtain suitable experiential learning and career opportunities.

**Prerequisite:** completed Career Readiness check-ins through the UF Career Connections Center.**MCB 4091 Innovation Project Management for Life Sciences 1 Credit****Grading Scheme:** Letter Grade

Provides practical tools to manage innovation projects typical of life science research and development. Discusses challenges and methodologies associated with developing objectives, preparing project plans, establishing metrics, defining responsibilities, as well as mitigating risks and dealing with uncertainties. Also strengthens skills for strategic prioritization, time management, meeting facilitation, and communication to promote an innovative culture.

**Prerequisite:** BCS 2010.**MCB 4150 Prokaryotic Diversity 3 Credits****Grading Scheme:** Letter Grade

Introduces the diversity of bacteria and archaea. Discussions provide a conceptual and historical framework for understanding their origin and evolution; morphological, metabolic, and molecular characteristics; genetic and physiological diversity; importance in human, animal, and plant health; and roles in elemental cycling.

**Prerequisite:** MCB 3020 or MCB 3023 with a minimum grade of C.**MCB 4203 Bacterial Pathogens 3 Credits****Grading Scheme:** Letter Grade

Host-microbe relationships in the diseases of humans and animals, including the virulence characteristics of bacterial pathogens, the techniques used in their isolation/identification, and molecular approaches to the study of their virulence.

**Prerequisite:** MCB 3020 or MCB 3023 with minimum grade of C.**MCB 4271 Antimicrobial Resistance 3 Credits****Grading Scheme:** Letter Grade

Covers content related to antimicrobial resistance: the origins of antimicrobial resistance, dissemination, mechanisms, therapeutics, and impact on healthcare, agriculture, and the environment. Mainly concentrates on resistance in bacteria, but will also discuss other organisms, including viruses, parasites, fungi, and cancer.

**Prerequisite:** MCB 2000 or MCB 3020 or MCB 3023.**MCB 4271L Antimicrobial Resistance Lab 1 Credit****Grading Scheme:** Letter Grade

This laboratory course covers content related to antimicrobial resistance: the origins of antimicrobial resistance, surveillance, dissemination, mechanisms, therapeutics, and impact on healthcare, agriculture, and the environment.

**Prerequisite:** (MCB2000 or MCB3020 or MCB3023) and (MCB3020L or MCB3023L);**Corequisite:** MCB 4271.

**MCB 4304 Genetics of Microorganisms 3 Credits**

**Grading Scheme:** Letter Grade

Molecular biology of bacterial gene expression, including DNA replication, mutation, genetic mapping using plasmids and phages, and recombinant DNA mechanisms.

**Prerequisite:** (MCB 3020 or MCB 3023) and (MCB 3020L or MCB 3023L) with minimum grades of C.

**MCB 4320C The Microbiome 3 Credits**

**Grading Scheme:** Letter Grade

Increase knowledge, appreciation, and use of genomics pertaining to the breadth of microbial diversity across a wide variety of organisms and habitats using methods that do not require culturing of the myriad of inhabitants. Use tools, practice analysis, and interpretation of genomic data sets to analyze different microbiomes.

**Prerequisite:** MCB 3020 or MCB 3023 with minimum grades of C.

**MCB 4324 Computational Genomics and Epigenomics 3 Credits**

**Grading Scheme:** Letter Grade

Genomics and epigenomics utilize high-throughput sequencing technologies in understanding biology questions. The primary goal is to introduce history, theory, latest advances, and computational approaches in (epi)genomics for conducting large-scale genomic analyses. Topics include sequence alignment, genome assembly and annotation, variant identification, transcriptomics, small RNAs, DNA methylation, histone modification, open chromatin region, and 3D chromatin interaction.

**Prerequisite:** BSC 2891 or STA 2023 or MCB 3020 or MCB 3023 or PCB 3063 or BSC 4434C or MCB 4325C.

**MCB 4325C R for Functional Genomics 3 Credits**

**Grading Scheme:** Letter Grade

Introduces the Basics of the R Language and to state of the art methods for functional genomics data analysis. Learn how to write R scripts, choose appropriate statistical tools, and how to use Linux environments to analyze high-throughput genomics data.

**Prerequisite:** STA 2023 and (BSC 2010 or BSC 2011 or MCB 3020 or MCB 3023 or BCH 4024 or CHM 3218).

**MCB 4403 Prokaryotic Cell Structure and Function 3 Credits**

**Grading Scheme:** Letter Grade

Analyzes the cell structure and physiology of bacterial cells. Extensive discussion of cell division and cell growth is provided along with descriptions of important bacterial cell structures (e.g. cell walls, membranes, flagella, etc.)

**Prerequisite:** CHM 2211 and (MCB 3020 or MCB 3023) and (MCB 3020L or MCB 3023L) with minimum grades of C. BCH 4024 should be taken before MCB 4403.

**MCB 4422 Probiotics 3 Credits**

**Grading Scheme:** Letter Grade

Covers the use of microorganisms to promote a health status in the host and provides a conceptual background in microbiology and immunology for the use of microorganisms for the prevention or treatment of animal and human diseases.

**MCB 4503 General Virology 3 Credits**

**Grading Scheme:** Letter Grade

Nature of viruses and mechanisms of infection and replication, including bacterial, animal, and plant viruses.

**Prerequisite:** MCB 3020 or MCB 3023 or MCB 4203 or PCB 3023 or BCH 3023 or PCB 3134 or BCH 4024 or CHM 3218.

**MCB 4503L Virology Laboratory 1 Credit**

**Grading Scheme:** Letter Grade

Laboratory course covering basic virology assays used to generate, propagate and enumerate viruses using cell culture and molecular methods.

**Prerequisite:** MCB 3020L or MCB 3023L.

**MCB 4652 Environmental Microbiology 3 Credits**

**Grading Scheme:** Letter Grade

Overview of microorganisms in the environment including occurrence, abundance and distribution; processes of microbial interaction with the environment; and practices of applied environmental microbiology.

**Prerequisite:** MCB 3020 or MCB 3023 or equivalent introductory microbiology course with minimum grade of C.

**MCB 4782 Extremophiles 3 Credits**

**Grading Scheme:** Letter Grade

The evolution, physiology, biochemistry, and molecular biology of extremophiles with emphasis on archaea and their viruses. Discuss principles of energy metabolism at the limits of life. Highlights research that incorporates cutting-edge techniques and biotechnology applications for using extremophiles to solve real world problems.

**Prerequisite:** CHM 2211 and ((MCB 3020 and MCB 3020L) or (MCB 3023 and MCB 3023L)).

**MCB 4794 Analysis, Interpretation, and Visualization of Microbiological Data 3 Credits**

**Grading Scheme:** Letter Grade

Focuses on the analysis and interpretation of microbiological data using R language and other command line tools with a series of examples that range in complexity. Analyze various microbiological data, including RNA-Seq, 16SrRNA gene sequencing, direct and indirect measurements of microbial growth, and measurements of microbial bioproducts, among others. Finally, teaches good practices for data reproducibility.

**Prerequisite:** MCB 3020 or MCB 3023.

**MCB 4905 Independent Study 0-4 Credits****Grading Scheme:** S/U

Individual laboratory research under the guidance of a faculty member. Required of, but not limited to, candidates for high and highest honors. Not acceptable toward 25 credits of required department and elective credits.

**Prerequisite:** undergraduate advisor permission; microbiology majors only.**MCB 4911 Supervised Research in Microbiology and Cell Science 0-3 Credits****Grading Scheme:** Letter Grade

Provides firsthand, supervised research. Projects may involve inquiry, design, investigation, scholarship, discovery, or application..

**Prerequisite:** Instructor permission.**MCB 4915 Honors Thesis Research in Microbiology and Cell Science 0-3 Credits****Grading Scheme:** Letter Grade

Independent research in microbiology and cell science leading to an honors thesis. Student will be mentored by a faculty member. Projects may involve inquiry, design, investigation, scholarship, discovery or application.

**Prerequisite:** junior standing, upper division GPA of 3.75 or higher and completed honors thesis proposal on file.**MCB 4934 Special Topics in Microbiology and Cell Science 1-4 Credits****Grading Scheme:** Letter Grade

Supervised literature or historical study on current topics in microbiology and cell science. Not acceptable toward 25 credits of required department and elective credits.

**Prerequisite:** undergraduate coordinator permission.**MCB 4941 Microbiology and Cell Science Internship 1-4 Credits****Grading Scheme:** Letter Grade

Internship in microbiology and cell science under supervision of the department.

**Prerequisite:** Instructor permission.**NUR 3197 Genetics and Genomics in Health Care 2 Credits****Grading Scheme:** Letter Grade

Genetics and genomics are advancing quickly and will play a greater role in health care as personal genome sequencing becomes available.

Reinforces basic genetics and genomics concepts and exploring how genomics may affect health care.

**Prerequisite:** Nursing major.**PCB 1051 Exploring Your Genome 3 Credits****Grading Scheme:** Letter Grade

How the genome sequence is analyzed and its implications on human health. Promotes genetic literacy (see syllabus for specific topics).

**PCB 3134 Eukaryotic Cell Structure and Function 3 Credits****Grading Scheme:** Letter Grade

Lecture and discussions in the field of cell biology with emphasis on the interrelation of structure and function, the regulation of metabolism and the specialized activities of plant and animal cells.

**Prerequisite:** (BSC 2010 and BSC 2010L or equivalent with minimum grades of C) and ((BSC 2011 and BSC 2011L or equivalent) or (AGR 3303 and CHM 2210) with minimum grades of C) and (CHM 2200 or CHM 2210 with minimum grade of C).**Corequisite:** CHM 2211 and CHM 2211L.**PCB 4233 Immunology 3 Credits****Grading Scheme:** Letter Grade

Basic concepts in immunology, including specific components, development, and function.

**Prerequisite:** (MCB 3023 or MCB 3020 or BCH 4024 or CHM 3218 or PCB 3134) with minimum grade of C.**PCB 4522 Molecular Genetics 3 Credits****Grading Scheme:** Letter Grade

Molecular biology of prokaryotes and eukaryotes covering the fundamentals of genome organization and gene structure, regulation of transcription, DNA replication and repair, and RNA processing. Also includes discussion of strategies, vectors and applications of genetic engineering in higher plants and animals.

**Prerequisite:** BSC 2010 and BSC 2010L with minimum grades of C.**PCB 4666 Human Genomics 3 Credits****Grading Scheme:** Letter Grade

Discusses how human genome sequence data is obtained, analyzed, and interpreted with an emphasis on what can be learned from an individual's genome. Genome-based strategies are used for the detection, treatment, and prevention of many diseases.

**Prerequisite:** BSC 2010 and BSC 2011 and (PCB 3134 or PCB 4522 or BCH 4024 or BCH 3025).**ZOO 4232 Human Parasitology 3 Credits****Grading Scheme:** Letter Grade

Host-parasite relationships of helminth and protozoan diseases important in health sciences and veterinary medicine.

**Prerequisite:** BSC 2010 and BSC 2010L, or equivalent; and BSC 2011 and BSC 2011L, or equivalent, or AGR 3303 with minimum grades of C.

