

BIOLOGY, MS

The Master of Sciences (MS) in Biological Sciences is a research-intensive degree designed to prepare students for careers in the life sciences or further training in preparation for pursuing a PhD in the biological sciences. Students are required to conduct their own independent research while participating in either the Plan I (with thesis) or Plan II (without thesis) degree tracks leading to the MS in Biological Sciences. Plan I is the traditional track in which students are required to perform independent research and submit a formal thesis formatted to university guidelines and give a public defense of the thesis. Plan II (without thesis) also requires independent research and the completion of a Capstone Experience Research Report, as well as a formal defense of the research.

Admissions

Most successful applicants will contact potential faculty mentors during the application process. The departmental website lists faculty and provides a link to individual pages that describe their research interests.

Before entering graduate study in the Biological Sciences, the applicant is expected to have a substantial knowledge of chemistry, mathematics, and physics, and to have completed basic courses in the biological sciences with high standards of scholarship. In general, a curriculum equivalent to that required of undergraduate majors in the Department of Biological Sciences is expected. Students admitted without this background may be required to make up course deficiencies without receiving graduate credit.

See the Admission Criteria section of this catalog for more information.

Curricular Requirements

Plan I and Plan II both are available for the MS degree. A student pursuing an MS degree under either plan is expected to submit a formal research proposal by his or her second semester in residence, and to take final written and oral examinations before the degree is granted. Plan I requires 24 hours of coursework and a formal thesis; Plan II requires 30 hours of coursework and a written research report approved by the student's graduate committee. A "B" average must be maintained in all coursework.

Thesis - Plan I

Code and Title	Hours
Required Courses	
BSC 505 Intro to Grad Studies	2
BSC 601 Biological Sciences Seminar	1
Thesis Course	
BSC 599 Thesis Research	6
Biology Elective Courses 21	
BSC 507 Research Tech In By	
BSC 511 Phage Discovery Laboratory	
BSC 512 Limnology	
BSC 515 Wetland Ecology	
BSC 516 Disease Ecology	
BSC 517 Environmental Modeling	
BSC 519 Evolutionary Genomics	
BSC 520 Principles Of Systematics	
BSC 521 Pers Gen Med	
BSC 522 Biology of Cancer	

BSC 524	Human Physiology
BSC 525	Human Physiology Lab
BSC 526	Computational Biology Lab
BSC 528	Biology Of Fishes
BSC 530	Introduction to Pharmacology
BSC 531	Pathogenic Microbiology
BSC 534	Plant Systematics
BSC 535	Immunology
BSC 539	Bch/Molecular Biology Lab
BSC 541	Developmental Biology
BSC 542	Integrated Genomics
BSC 544	General Virology
BSC 548	Animal Behavior
BSC 549	Endocrinology
BSC 550	Fundamentals of Biochemistry
BSC 551	Bch/Molecular Biology II
BSC 553	Biochemistry Lab
BSC 555	Chemical Ecology
BSC 556	Microbial Ecology
BSC 558	Drug Discovery Laboratory
BSC 564	Biology Of Algae
BSC 565	Principles Of Toxicology
BSC 569	Histology Of Vertebrates
BSC 570	Prin Pop Genetics
BSC 571	Plant Physiology
BSC 573	Bioinformatics
BSC 575	General Entomology
BSC 576	Aquatic Insects
BSC 580	Plant Ecology
BSC 581	Foundations in Advanced Biostatistics with Applications to R
BSC 582	Conservation Biology
BSC 583	Evolution
BSC 585	Found Forest Res and Conserv
BSC 587	Biogeography
BSC 590	Stream Ecology
BSC 594	Signal Transduction Neuroby
BSC 598	Non-Thesis Research
BSC 607	Adv Research Tech In By
BSC 656	Microscopical Techniques
BSC 666	Disease Models and Mechanisms
BSC 675	Global Change Biology
BSC 695	Spec Topics Biolog Sci

Total Hours **30**

Additional Requirements:

24 credit hours other than BSC 599 Thesis Research, including:

- At least 19 credit hours with a letter grade (i.e., not Pass/Fail)
- A maximum of 6 credit hours with a letter grade may be taken from BSC 507 Research Tech In By and/or BSC 607 Adv Research Tech In By
- Up to 5 hours of Pass/Fail credit can be applied toward fulfillment of degree requirements. Pass/Fail hours can include up to a total of 4 credit hours of BSC 601 (Biological Sciences Seminar)
- Of the 30 required credit hours, 18 must carry the BSC or MS designation.
- There are no preconditions to enrolling in BSC 599, and there are no limits to the number of hours of BSC 599 taken – However, only 6 hours can be applied toward degree requirements. BSC 598 Non-Thesis Research may not be applied toward this degree.

Non-Thesis - Plan II

Code and Title	Hours
Required Courses	
BSC 505 Intro to Grad Studies	2
BSC 601 Biological Sciences Seminar	1
Biology Elective Courses	27
BSC 507 Research Tech In By	
BSC 511 Phage Discovery Laboratory	
BSC 512 Limnology	
BSC 515 Wetland Ecology	
BSC 516 Disease Ecology	
BSC 517 Environmental Modeling	
BSC 519 Evolutionary Genomics	
BSC 520 Principles Of Systematics	
BSC 521 Pers Gen Med	
BSC 522 Biology of Cancer	
BSC 524 Human Physiology	
BSC 525 Human Physiology Lab	
BSC 526 Computational Biology Lab	
BSC 528 Biology Of Fishes	
BSC 530 Introduction to Pharmacology	
BSC 531 Pathogenic Microbiology	
BSC 534 Plant Systematics	
BSC 535 Immunology	
BSC 539 Bch/Molecular Biology Lab	
BSC 541 Developmental Biology	
BSC 542 Integrated Genomics	
BSC 544 General Virology	
BSC 548 Animal Behavior	
BSC 549 Endocrinology	
BSC 550 Fundamentals of Biochemistry	
BSC 551 Bch/Molecular Biology II	
BSC 553 Biochemistry Lab	
BSC 555 Chemical Ecology	
BSC 556 Microbial Ecology	
BSC 558 Drug Discovery Laboratory	
BSC 564 Biology Of Algae	
BSC 565 Principles Of Toxicology	
BSC 569 Histology Of Vertebrates	
BSC 570 Prin Pop Genetics	

BSC 571 Plant Physiology	
BSC 573 Bioinformatics	
BSC 575 General Entomology	
BSC 576 Aquatic Insects	
BSC 580 Plant Ecology	
BSC 581 Foundations in Advanced Biostatistics with Applications to R	
BSC 582 Conservation Biology	
BSC 583 Evolution	
BSC 585 Found Forest Res and Conserv	
BSC 587 Biogeography	
BSC 590 Stream Ecology	
BSC 594 Signal Transduction Neuroby	
BSC 598 Non-Thesis Research	
BSC 607 Adv Research Tech In By	
BSC 656 Microscopical Techniques	
BSC 666 Disease Models and Mechanisms	
BSC 675 Global Change Biology	
BSC 695 Spec Topics Biolog Sci	
Total Hours	30

Additional Requirements:

- At least 25 credit hours with a letter grade (i.e., not Pass/Fail)
- A maximum of 6 credit hours with a letter grade may be taken from BSC 507 Research Tech In By and/or BSC 607 Adv Research Tech In By
- Up to 5 hours of Pass/Fail credit can be applied toward fulfillment of degree requirements. Pass/Fail hours can include up to a total of 4 credit hours of BSC 601 Biological Sciences Seminar
- Of the 30 required credit hours, 18 must carry the BSC or MS designation.
- BSC 599 Thesis Research may not apply toward this degree

All graduate students are **required** to register for and attend the weekly departmental seminar, enrolling in BSC 601 Biological Sciences Seminar **each semester** they are in residence at the Tuscaloosa campus.

Transfer Credit

See information on transfer credit.

Accelerated Master's Program

See information on the Accelerated Master's Program.

Comprehensive Exams

Plan I: All students must pass a final oral examination (defense) related to their thesis. Final oral examination questions may also include other subjects beyond the student's research that the M.S. Advisory Committee or other faculty consider relevant. Final oral examinations for the M.S. Plan I must be taken **not less than six weeks prior** to the proposed graduation date (Note: This deadline does not include time required for revision of the thesis after the defense). The outside member of the student's committee must attend and participate in the final defense; this may be a virtual presence if the member can see and hear the presentation and actively participate in questioning of the candidate.

All departmental faculty members have the right to attend the final oral defense, and have the right to ask questions of the student that are relevant to the goals of the examination. Only faculty on the student's

committee may vote on whether the student has passed or failed the examination.

Plan II: All M.S. Plan II students must pass a final oral examination related to their research or literature survey topic. Final oral examination questions may also include other subjects beyond the student's research that the M.S. Plan II Advisory Committee or other faculty members consider to be relevant. Final oral examinations must be taken not less than two weeks prior to the proposed graduation date. All committee members must attend and participate in the oral examination, either in-person or by electronic means (e.g., Skype). All students are required to notify the departmental office of their final oral examination 14 days prior to the exam.

All departmental faculty have the right to attend the oral examination, and have the right to ask questions of the student that are relevant to the goals of the examination. Only faculty on the student's committee may vote on whether the student has passed or failed the examination.

Plan I

M.S. Plan I Advisory Committee: A student must form a M.S. Advisory Committee prior to their first annual review meeting. The first committee meeting is to be held after completion of the first semester of studies (by January 31st for students entering in the fall semester and by June 30th for students entering in the spring semester) to evaluate progress toward a degree. In subsequent years of study, the committee will meet prior to December 15th to review progress during the previous academic year. It will also meet as needed to administer all final examinations, and to examine and approve the thesis.

M.S. Research Proposal: A formal research proposal is required and should be completed by the end of the student's second semester in the program. This proposal should include:

1. A full but concise statement of the specific goals of the research.
2. A review of the relevant literature to place the proposed work in a solid theoretical context.
3. A discussion of the significance of the proposed research and how it addresses a novel question.
4. A description of the experimental design, including experimental methods, procedures, and methods used in analysis and interpretation of results.
5. Literature citations.

The M.S. Advisory Committee can establish additional requirements such as page length and format. The proposal should be submitted to and approved by the student's

M.S. Advisory Committee no later than the end of the student's second semester enrolled in the Graduate Program. A new proposal will be required if the thesis research changes significantly.

Research Expectations: A formal thesis, prepared in accordance with university regulations, is required. The thesis shall be based upon research approved by the student's M.S. Advisory Committee and conducted under the supervision of the major professor. See <https://services.graduate.ua.edu/etd/> for formatting and submission guidelines.

Formal Departmental Seminar and Final Oral Defense: In addition to participation in the departmental research symposiums, a publicly announced final formal departmental seminar concerning the student's research is required. The seminar is scheduled immediately preceding the final oral examination. All students are required to notify departmental office personnel of the date, time and room location of their formal seminar a minimum of **14 days prior to the seminar**. A title and an

abstract must be submitted to the departmental office at the time of seminar notification so that a public announcement can be made. In addition, a copy of the final draft of your thesis must be made available in the departmental office for those wishing to review it.

All students must pass a final oral examination (defense) related to their thesis. Final oral examination questions may also include other subjects beyond the student's research that the M.S. Advisory Committee or other faculty consider relevant. Final oral examinations for the M.S. Plan I must be taken **not less than six weeks prior** to the proposed graduation date (Note: This deadline does not include time required for revision of the thesis after the defense). The outside member of the student's committee must attend and participate in the final defense; this may be a virtual presence if the member can see and hear the presentation and actively participate in questioning of the candidate.

See additional information on Plan I Advisory Committee.

Plan II

M.S. Plan II Advisory Committee: A student must form a M.S. Advisory Committee prior to their first annual review meeting. The first committee meeting is to be held after completion of the first semester of studies (by January 31st for students entering in the fall semester and by June 30th for students entering in the spring semester) to evaluate progress toward a degree. In subsequent years of study, the committee will meet prior to December 15th to review progress during the previous academic year. It will also meet as needed to administer all final examinations, and to examine and approve the culmination Capstone Experience.

Culminating "Capstone" Experience: In addition to earning a minimum of 30 semester hours of credit, candidates for the M.S. Plan II degree are required to complete one or more of the following:

A. Non-thesis research project. This requirement is met by completing a research project under the supervision and to the satisfaction of the student's M.S. Plan II Advisory Committee. The M.S. Plan II Advisory Committee determines the nature and extent of the research project. The student must prepare a report, present a public seminar, and pass an oral examination on this research. The oral exam will take place immediately following the public seminar. The research report must be submitted to the M.S. Plan II Advisory Committee for review at least 14 days prior to the public seminar and oral exam. In addition, a copy of the research report must be submitted to the department office and the public defense announced at least 14 days prior to the seminar and exam date. Students selecting this option may apply up to 6 hours of BSC 507/BSC 607 and up to 5 hours of BSC 598 Non-Thesis Research toward fulfillment of requirements for the degree.

B. Research practicum. This requirement is met by earning 6 credit hours of BSC 507 Research Tech In By under the supervision and to the satisfaction of the student's M.S. Plan II Advisory Committee. The M.S. Plan II Advisory Committee determines the nature and extent of the BSC 507 research project. Examples of research practicum experiences include, but are not limited to, conducting research in the M.S. Plan II Advisor's laboratory, at a regional research center (e.g., HudsonAlpha Institute for Biotechnology, Joseph W. Jones Ecological Research Center), or at a national lab (e.g., National Institutes of Health). The student must prepare a report, present a formal public seminar, and pass an oral exam on the research experience. The oral exam will take place immediately following the public seminar. The research report must be submitted to the M.S. Plan II Advisory Committee for review at least 14 days prior to the oral exam. In addition, a copy of the

research report must be submitted to the Department office and the public seminar and exam announced at least 14 days prior to the date. Students selecting this option may apply up to 6 hours of BSC 507/BSC 607 toward fulfillment of requirements for the M.S. Plan II degree. BSC 598 may not be applied toward fulfillment of requirements for the degree under this option.

C. In-depth topical literature survey. Students selecting this option must prepare a formal paper and pass an oral exam on a research topic approved by the M.S. Plan II Advisory Committee. Students selecting this option may not apply BSC 507, BSC 598, BSC 607, or BSC 698 toward fulfillment of requirements for the degree.

Culminating “Capstone” Experience Proposal: A formal Capstone Experience proposal is required and should be completed by the end of the student’s second semester in the program. This proposal should include a full but concise statement of the specific goals of the Capstone Experience. M.S. Plan II option A candidates must also include in their proposals the following:

1. A full but concise statement of the specific goals of the research.
2. A review of the relevant literature to place the proposed work in a solid theoretical context.
3. A discussion of the significance of the proposed research and how it addresses a novel question.
4. A description of the experimental design, including experimental methods, procedures, and methods used in analysis and interpretation of results.
5. Literature citations.

The M.S. Advisory Committee can establish additional requirements such as page length and format. The proposal should be submitted to and approved by the student’s M.S. Advisory Committee not later than the end of the second semester. A new proposal will be required if the thesis research changes significantly.

Formal Departmental Seminar (M.S. Plan II Options A and B only): In addition to participation in the departmental research symposiums, a publicly announced final formal departmental seminar of the student’s research is required for students selecting M.S. Plan II Options A and B. The seminar is scheduled immediately preceding the final oral examination. All students are required to notify departmental office personnel of the date, time and room location of their formal seminar and exam a minimum of **14 days prior to the date**. A title and an abstract must be submitted to the departmental office at the time of defense notification so that a public announcement can be made. In addition, a copy of the final draft of your written report must be made available in the departmental office for those wishing to review it.

For M.S. Plan II as a transitional degree (pre-Ph.D.): In order to qualify for the M.S. degree, Ph.D. students must fulfill all requirements of the M.S. Plan II culminating “Capstone” experience option A, namely (i) submit a written report detailing the research experience, (ii) present a formal departmental dissertation and (iii) pass a final oral examination). Research applied toward fulfillment of the M.S. Plan II degree requirements may not be applied toward fulfillment of requirements for the Ph.D. degree.

Time Limits for Degree Completion

See information on time limits for degree completion.

Student Progress Requirement

Annual Progress Review: First year students must meet with their committee after completing the first semester of studies (by January

31st for students entering in the fall semester and by June 30th for students entering in the spring semester). Subsequently, each graduate student will meet annually prior to December 15th with her/his M.S. Advisory Committee for the purpose of reviewing the student’s progress toward a degree during the previous academic year.

This evaluation will result in a “Pass”, “Probationary pass”, or “Fail”. Guidelines for these rankings are given below.

- **Pass:** The graduate student is making satisfactory research progress commensurate with their time in the program, has maintained at least a 3.0 cumulative GPA, and has met other requirements of the program (e.g., formed a committee, presented a research proposal, etc.) in a timely manner.
- **Probationary Pass:** The graduate student has fallen behind schedule with respect to such requirements as formation of a committee, literature search and submission of a research proposal, scheduling and taking required examinations (for PhD students only), writing of the thesis or dissertation etc. (see degree timeline), or little or no research progress has been made since the last annual review. It may apply to a student receiving a grade lower than a B in a course during the previous year even though the (overall cumulative) GPA is 3.0 or higher. Committees awarding a Probationary Pass for students who have fallen behind schedule must provide a written rationale to the Graduate Committee and the Department Chair in the annual committee report, including clearly defined milestones or benchmarks the student must reach in order to bring their performance up to standard. The student must submit a remediation plan to their committee members addressing the concerns of the committee, including procedures for how milestones and benchmarks will be met, as well as a timeline, within two weeks of notification of their Probationary Pass. This plan must be signed by the major advisor and two other members of the student’s advisory committee, and presented for approval to the Graduate Program Director. Once approved, the remediation plan document will be placed in the student’s file, and a copy given to the student. Furthermore, the graduate student must have a follow-up committee meeting within six months of the annual review to evaluate their progress on the remediation plan. At the conclusion of the six-month follow-up meeting, the student will be awarded either a Pass or a Fail.
- **Fail:** The graduate student’s progress is unacceptable for reasons such as a cumulative GPA of less than 3.0 in all (both graduate and undergraduate) courses attempted, insufficient research progress, or not completing the degree within time limits without an acceptable/approved reason.

Graduate students receiving a ranking of Fail for any annual review, or two rankings of Conditional Pass for any two annual reviews, will be dismissed from the Biological Sciences Graduate Program.

Appeal of a dismissal decision. If a decision was made to dismiss the student from the program, the student may make a formal appeal. This should be done according to the University of Alabama’s University-wide Academic Grievance Procedures, described in the faculty handbook and available online at <http://facultyhandbook.ua.edu/>.

Additional Academic Requirements

All graduate students are required to register for and attend the weekly departmental seminar, enrolling in BSC 601 Biological Sciences Seminar each semester they are in residence at the Tuscaloosa campus.

Academic Misconduct Information

See information on academic misconduct.

Withdrawals and Leave of Absence Information

See information on withdrawals and leave of absence in the handbook.

Academic Grievances Information

See information on academic grievances.

Scholastic Requirements

See scholastic requirements in the handbook.

Graduate School Deadlines Information

See information on Graduate School deadlines.

Application for Graduation Information

See information on application for graduation.