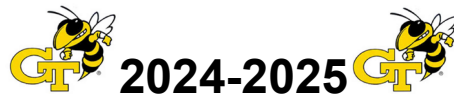




# Georgia Institute of Technology

## HANDBOOK FOR BIOLOGY MAJORS

SCHOOL OF BIOLOGICAL SCIENCES



LAST REVISION: JUNE 13, 2024

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## PREAMBLE

Welcome to the Biology BS degree at Georgia Tech. This handbook contains the rules and regulations for BS Biology degree for the specific catalog year shown on the cover page. The information contained in this document is supplemental to Degreeworks, the Georgia Tech catalog, and Georgia Tech's Academic rules.

Full details about how to navigate the Biology degree, the benefits of the degree, and access to other program, academic, and student resources can be found on our program website:  
<https://biosciences.gatech.edu/undergrad/>

For questions and concerns about any academic policy, please consult with your academic advisor: <https://biosciences.gatech.edu/undergrad/biology-advising>

## INSTITUTE POLICIES, RULES, AND REGULATIONS

### TRANSFER CREDIT AND THE 36 HOUR RULE

Transfer credit confirmation is a two-step process to determine whether: 1) Georgia Tech has an equivalent approved course and 2) the transfer credit was taken before the student's last 36 hours at Georgia Tech.

First, confirm that a course will transfer using the transfer equivalency table on OSCAR ([oscar.gatech.edu/pls/bprod/wwsktrna.P\\_find\\_location](https://oscar.gatech.edu/pls/bprod/wwsktrna.P_find_location)). If the course is not listed, upload a course description and syllabus to [transfercredit.gatech.edu](https://transfercredit.gatech.edu) for evaluation by the appropriate department. We suggest that you seek transfer credit approval *before* you take the course. In general, transfer Biological Sciences courses will be allowed as Biology electives if the course is a 3XXX or 4XXX level course from an accredited institution.

Second, be aware that students must complete the last 36 credit hours of their degree program in residence at Georgia Tech, a policy known as the "36-hour rule." Note that Georgia Tech ARCHE (Atlanta Regional Council for Higher Education) cross-enrollment, exchange credit, and GT faculty-led study abroad programs are considered "in residence" for the 36-hour rule. Exceptions to the 36-hour rule may be granted by approval of a petition to the Institute Undergraduate Curriculum Committee; *however, approval of this type of petition is rare*. It is recommended to petition for an exception BEFORE violating the rule. Additionally, some medical schools only accept prerequisite courses taken at four-year institutions. While students cannot receive transfer credit from a course taken at another institution when concurrently enrolled (e.g. in the same semester) at Georgia Tech, students are allowed to *cross-enroll* at other area schools through the ARCHE program. For additional information, refer to the ARCHE website at <https://registrar.gatech.edu/registration/cross-registration> and consult with the ARCHE advisor at [crossregistration@registrar.gatech.edu](mailto:crossregistration@registrar.gatech.edu).

### 39-HOUR RULE

A minimum of 39 hours of upper division coursework (3000-level or higher) is required for all Georgia Tech undergraduate degrees. The 39 hours of upper division coursework can fulfill any category of degree requirements, including free electives and "fall-through" courses. DegreeWorks has a credit counter that indicates the number of hours remaining to complete the 39-hour rule. The BS-Biology degree has 34 upper division credits included in the degree, leaving 5 additional credits for the student to identify and obtain as they select their courses.

### GRADE SUBSTITUTION

All students are eligible to repeat two courses for grade substitution by following the instructions at <https://catalog.gatech.edu/policies/grading-gpa/grade-substitution/>. The original grade of D or F remains visible on the student transcript and is likely to be used in scholarship calculations and by medical schools and other professional schools to calculate student GPA.

The benefit to grade substitution is that grade substitution allows GT to calculate a GPA without the original grade to determine GT academic standing of good standing, warning, or probation. These standings determine whether a student is allowed to remain at Georgia Tech as a college student. However, the credits and grades issued for both the original and retaken course are used to calculate eligibility for the HOPE and Zell scholarships.

As an alternative to earning a low grade and retaking the course if you are in a situation where an enrolled course load is unmanageable, consult an academic advisor before the withdrawal

deadline to discuss your options, which can include a strategic course withdrawal. A withdrawal will leave a W on your transcript and be neutral in your GPA. In most circumstances, a course withdrawal does not affect how many hours you attempted, so you'll still be considered a full-time student for financial aid / scholarship, GT Housing, and insurance purposes.

If you should decide to use grade substitution, follow all the guidelines, and set a calendar reminder to complete the grade substitution form after your retaken course grade is released, and before the withdrawal deadline of your next enrolled semester.

### **PROBLEMS WITH A PROFESSOR**

There may come a time when you get upset with a professor. When this happens, you should understand two things: 1) conflicts may occur when people work closely together, and 2) there is usually a satisfactory way to resolve the conflict.

As a student you will develop a working relationship with the faculty of Georgia Tech. This relationship is not symmetrical because faculty members evaluate your performance and decide about your grades. That system is not likely to change, probably for very good reasons. After all, professors have already demonstrated their advanced academic qualifications, and you came to Tech to learn some of the things that they know.

Any relationship that is emotionally and intellectually close, especially an asymmetrical one, may generate stresses. Therefore, we need to anticipate those stresses and find a way to deal with them. The solution you find will almost certainly be imperfect, but there is no reason that it need be unsatisfactory. The more unrealistic your initial expectations are, the more imperfect the solution will be to you. So, start out with this dose of reality; *most problems can be solved, but you may have to compromise*. Talk to your professor about the problem. If you are not satisfied with the result, talk to your advisor and if you still need help, consult the Associate Chair for Undergraduate Affairs. All of these points of contact can be found here: <https://www.biosci.gatech.edu/undergrad/biology-undergraduate-program-points-contact>

If you wish to pursue a formal grievance procedure, you should consult the Georgia Tech Registrar's website at <https://catalog.gatech.edu/rules/19/>

## B.S. DEGREE REQUIREMENTS: 2024-2025 CATALOG YEAR

A Bachelor of Science in Biology requires a minimum of 122 credit hours; 39 of these must be at the 3000-level or higher. All courses must be taken for a letter grade, except for Free Electives which can include pass/fail courses. All letter grades of D and higher are accepted in the Biology degree.

### **Required Biology Core Courses**

BIOS 1207	Majors Biological Principles (credit also accepted for BIOS 1107)
BIOS 1207L	Biological Principles Project Lab (credit also accepted for BIOS 1107L)
BIOS 1208	Majors Organismal Biology (credit also accepted for BIOS 1108)
BIOS 1208L	Organismal Biology Project Lab (credit also accepted for BIOS 1108L)
BIOS 2300 or 2310	Ecology or Problem-Based Ecology
BIOS 2600 or 2610	Genetics or Integrative Genetics
BIOS 3450	Cell and Molecular Biology
BIOS 3600	Evolutionary Biology
BIOS 4460	Communicating Biological Research

Two of these three labs: Ecology or Problem-Based Ecology Lab (BIOS 2301 or 2311); Genetics or Integrative Genetics Lab (BIOS 2601 or 2611); or Cell and Molecular Biology Lab (BIOS 3451). Each lab should be taken concurrently with the associated lecture course when possible.

### **Required Quantitative Biology Course**

One of the following:

BIOS 3400	Mathematical Models in Biology
BIOS 4150	Genomics & Applied Bioinformatics
BIOS 4401	Experimental Design & Statistical Methods

Other advanced quantitative courses may be appropriate depending on your interests and strengths. If you wish to enroll in a course other than BIOS 3400, BIOS 4401, or BIOS 4150 to fulfill your quantitative requirement, you must discuss with your advisor to petition for approval from the School of Biological Sciences Undergraduate Committee.

### **Required Senior Research Experience**

One of the following:

BIOS 4590	Research Project Lab
BIOS 4690	Independent Research Project

### **Required Non-Biology Science Courses**

CHEM 1211K	Chemical Principles I
CHEM 1212K	Chemical Principles II
CHEM 2311	Organic Chem I, Principles (sections P and higher)
CHEM 2312	Organic Chem II
CHEM 2380	Synthesis Lab
MATH 1551	Differential Calculus
MATH 1552	Integral Calculus
MATH 1553	Linear Algebra
PHYS 2211	Intro Physics I (Life Sciences section LS or C recommended)
PHYS 2212	Intro Physics II (Life Sciences section LS or C recommended)

**Biology Electives:** Students are required to complete 21 credits of Biology electives defined as follows: 12 "depth" credit hours must be courses with a "BIOS" prefix, excluding BIOS 4694-BIOS 4699. Biology Elective courses that are cross-listed with other departments are included in these 12 depth credit hours. The remaining 9 "breadth" credit hours can be selected from: other BIOS 3000-level and higher courses, BIOS 4695, BIOS 4697, BIOS 4699, VIP courses with a Biological

Sciences instructor, and the list of approved courses offered in the other departments (See Appendix.)

**Core IMPACTS Requirements:** Every student in the University System of Georgia engages in a General Education curriculum designed to provide a foundation of knowledge, skills and competencies to promote academic success and lifelong learning. This curriculum, “Core IMPACTS”, introduces the different ways of knowing the world and connects students to the big questions that will drive their future and provide the essential skills needed to succeed. Core IMPACTS is structured across seven areas: Institutional Priority; Mathematics and Quantitative Skills; Political Science and U.S. History; Arts, Humanities and Ethics; Communicating in Writing; Technology, Mathematics and Sciences; Social Sciences. Each of these seven areas of the general education core curriculum is structured around an “orienting question” and includes learning outcomes and career-ready competencies

For more information, see “Core Curriculum,” Information for Undergraduate Students on the Registrar’s website (<http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/>)

**Institutional Priority (Computing Requirement):** Fulfilled for Biology majors by completing CS 1301, CS 1315, CS 1371, or CS 13X1 (transfer course).

**Mathematics & Quantitative Skills:** Fulfilled for Biology majors by MATH 1552\* (Specified above in the list of Required Non-Biology Science Courses).

**Political Science & US History:** Students must select one of the following courses: HIST 2111, HIST 2112, INTA 1200, POL 1101, PUB 3000. See details below under “**Georgia Legislative Requirements (GLRs)**”

**Arts, Humanities & Ethics (Humanities):** Students must select 6 credits of coursework from the list of approved Humanities courses (see link for course and caveats): <https://catalog.gatech.edu/academics/undergraduate/core-curriculum/humanities/> Biology majors are encouraged to select 3000- or 4000-level Humanities courses to help fulfill the **39 hour rule**. Biology majors are not required to take a course carrying the Ethics attribute.

**Communication in Writing (English):** Students must take ENGL 1101\* and 1102\*.

**Technology, Mathematics, & Science:** Fulfilled for Biology majors by MATH 1551\*, MATH 1553\*, PHYS 2211, and PHYS 2212 (Specified above in the list of Required Non-Biology Science Courses).

**Social Sciences:** Students must select 9 credits of coursework from the list of approved Social Science courses (see link for course and caveats): <https://catalog.gatech.edu/academics/undergraduate/core-curriculum/social-sciences/> Biology majors are encouraged to select 3000- or 4000-level Social Sciences courses to help fulfill the **39 hour rule**.

\*Timing: Students must complete a MATH course<sup>†</sup> and ENGL 1101 and 1102 courses within their first 30 credit hours as part of the state’s required Communication and Quantitative Outcomes. After reaching 30 credit hours, a student must enroll in the next course necessary to make progress toward completing this requirement in every semester in which they take classes.

<sup>†</sup>Consult the registrar’s website and your academic advisor for the exact MATH sequence required by the 30 credit hour mark.

**Wellness Requirement:** Georgia Tech requires students to complete APPH 1040 or APPH 1050 or APPH 1060.

**Free Electives:** The remaining 11 credits beyond those listed above are free electives, which may be taken for letter grade or pass/fail.

**Georgia Legislative Requirements (GLRs)/US and Georgia Constitution and History Requirements:** See “[Core IMPACTS Curriculum](#),” and the [Catalog](#) for and more information. For students who first entered GT in May 2023 or later, all students must satisfy four legislative requirements to graduate. Requirements must be fulfilled before completing 90 or more credit hours:

1. United States history: fulfilled by HIST 2111, HIST 2112, equivalent transfer/AP/IB credit (see the transfer equivalency catalog to confirm), or passing the [United States History Module Examination](#). Note that the examination does not carry any academic credit.
2. Georgia history: fulfilled by HIST 2111, HIST 2112, equivalent transfer/AP/IB credit (see the transfer equivalency catalog to confirm), or passing the [Georgia History Module Examination](#). Note that the examination does not carry any academic credit.
3. United States Constitution: fulfilled by INTA 1200, POL 1101, PUBP 3000, equivalent transfer/AP/IB credit, equivalent transfer/AP/IB credit (see the transfer equivalency catalog to confirm), or passing the [United States Constitution Module Examination](#). Note that the examination does not carry any academic credit.
4. Constitution of Georgia: fulfilled by INTA 1200, POL 1101, PUBP 3000, equivalent transfer/AP/IB credit, equivalent transfer/AP/IB credit (see the transfer equivalency catalog to confirm), or passing the [Constitution of Georgia Module Examination](#). Note that the examination does not carry any academic credit.

***All students must complete one of these five courses (HIST 2111, HIST 2112, INTA 1200, POL 1101, or PUBP 3000) to fulfill [Political Science & US History requirements](#); courses may be completed at GT or via AP/IB/Transfer credit.***

Students may *not* fulfill all four of the requirements through the Canvas Module Examinations.



## BACHELOR OF SCIENCE IN BIOLOGY 2024-2025 DEGREE REQUIREMENTS

FIRST YEAR-FALL	HOURS
GT 1000 FRESHMAN SEMINAR*	1
ENGL 1101 ENGLISH COMPOSITION I	3
MATH 1551 DIFFERENTIAL CALCULUS	2
BIOS 1207 AND 1207L MAJORS BIOLOGICAL PRINCIPLES <sup>1</sup>	4
CHEM 1211K CHEMICAL PRINCIPLES I	4
<b>TOTAL SEMESTER HOURS</b>	<b>14</b>

SECOND YEAR-FALL	HOURS
BIOS 2300 ECOLOGY, BIOS 2600 GENETICS, OR BIOS 2610 INTEGRATIVE GENETICS <sup>3</sup>	3
BIOS 2301 ECOL LAB, BIOS 2601 GEN LAB, OR BIOS 2611 INTEGRATIVE GEN LAB <sup>3</sup>	1
CHEM 2311 ORGANIC CHEMISTRY I	3
MATH 1553 LINEAR ALGEBRA	2
COMPUTING REQUIREMENT OR HUM OR SOC SCI ELECTIVE	3
HUM OR SOC SCI OR POL/HIST (GLR <sup>4</sup> ) ELECTIVE	3
<b>TOTAL SEMESTER HOURS</b>	<b>14 or 15</b>

THIRD YEAR-FALL	HOURS
PHYS 2211 INTRODUCTORY PHYSICS I FOR LIFE SCIENCES	4
BIOS 3450 CELL & MOLECULAR BIOLOGY OR BIOS 3600 EVOLUTION <sup>6</sup>	3
BIOS 3451 CELL & MOLECULAR BIOS LAB <sup>3</sup>	1
BIOLOGY ELECTIVE	3
QUANTITATIVE BIOLOGY REQUIREMENT <sup>5</sup> OR HUM OR SOC SCI ELECTIVE	3
WELLNESS	2
<b>TOTAL SEMESTER HOURS</b>	<b>15 or 16</b>

FOURTH YEAR-FALL	HOURS
BIOLOGY ELECTIVES	6
FREE ELECTIVE	3
HUM OR SOC SCI ELECTIVE	3
SENIOR RESEARCH EXPERIENCE <sup>7</sup>	3
BIOS 4460 COMMUNICATING BIOLOGICAL RESEARCH	1
<b>TOTAL SEMESTER HOURS</b>	<b>16</b>

FIRST YEAR-SPRING	HOURS
ENGL 1102 ENGLISH COMPOSITION II	3
MATH 1552 INTEGRAL CALCULUS	4
BIOS 1208 AND 1208L MAJORS ORGANISMAL BIOLOGY <sup>1,2</sup>	4
CHEM 1212K CHEMICAL PRINCIPLES II	4
<b>TOTAL SEMESTER HOURS</b>	<b>15</b>

SECOND YEAR-SPRING	HOURS
BIOS 2600 GENETICS, BIOS 2300 ECOLOGY OR BIOS 2310 PROBLEM-BASED ECOLOGY <sup>3</sup>	3
BIOS 2601 GENETICS LAB, BIOS 2301 ECOL LAB, OR BIOS 2311 PROB-BASED ECOL LAB <sup>3</sup>	1
CHEM 2312 ORGANIC CHEMISTRY II	3
CHEM 2380 SYNTHESIS LAB	2
QUANTITATIVE BIOLOGY REQUIREMENT <sup>5</sup> or COMPUTING REQUIREMENT	3
HUM OR SOC SCI OR POL/HIST (GLR <sup>4</sup> ) ELECTIVE	3
<b>TOTAL SEMESTER HOURS</b>	<b>14 or 15</b>

THIRD YEAR-SPRING	HOURS
PHYS 2212 INTRODUCTORY PHYSICS II FOR LIFE SCIENCES	4
BIOS 3450 CELL & MOLECULAR BIOLOGY OR BIOS 3600 EVOLUTION <sup>6</sup>	3
BIOLOGY ELECTIVE	3
HUM or SOC SCI ELECTIVE	3
FREE ELECTIVE	3
<b>TOTAL SEMESTER HOURS</b>	<b>16</b>

FOURTH YEAR-SPRING	HOURS
BIOLOGY ELECTIVES	9
FREE ELECTIVE	5
HUM OR SOC SCI ELECTIVES	3
<b>TOTAL SEMESTER HOURS</b>	<b>17</b>

**TOTAL DEGREE REQUIREMENT HOURS** **122<sup>8</sup>**

See important notes on next page

\*Not required for graduation, another free elective may be substituted

## Important notes regarding degree requirements

Pass-fail allowed for Free Electives only. Refer to Institute rules for maximum pass-fail credits allowed.

<sup>1</sup>BIOS 1107 and 1107L may be substituted for BIOS 1207 and 1207L; BIOS 1108 and 1108L may be substituted for BIOS 1208 and 1208L.

<sup>2</sup>Four credit hours of Biology elective may be substituted for BIOS 1208 and 1208L if a score of 5 was achieved on the AP Biology test. A maximum of 1 of these credits may be BIOS 4697 or BIOS 4699. Please discuss this option with your advisor. It is important to note that substituting for BIOS 1208 and 1208L often results in a student needing to take more than a single Biology elective class, because most Biology electives are only 3 credit hours.

<sup>3</sup>Biology lab courses: Students are required to complete two of these three lab categories: Ecology or Problem-Based Ecology Lab (BIOS 2301 or 2311); Genetics or Integrative Genetics Lab (BIOS 2601 or 2611); Cell and Molecular Biology Lab (BIOS 3451).

<sup>4</sup>The four Georgia Legislative Requirements (GLRs) must be completed before 90 credit hours and may be completed as follows: US HISTORY fulfilled by HIST 2111, HIST 2112, equivalent transfer/AP/IB credit, or passing the United States History Module Examination\*; GA HISTORY fulfilled by HIST 2111, HIST 2112, equivalent transfer/AP/IB credit, or passing the Georgia History Module Examination; US CONSTITUTION fulfilled by INTA 1200, POL 1101, PUBP 3000, equivalent transfer/AP/IB credit, equivalent transfer/AP/IB credit, or passing the United States Constitution Module Examination\*; GA CONSTITUTION fulfilled by INTA 1200, POL 1101, PUBP 3000, equivalent transfer/AP/IB credit, equivalent transfer/AP/IB credit, or passing the Georgia Constitution Module Examination\*. Note that all students must complete one of these five courses (HIST 2111, HIST 2112, INTA 1200, POL 1101, or PUBP 3000) to fulfill the Political Science & US History requirement; courses may be completed at GT or via AP/IB/Transfer credit. \*Note that the Module Examinations do not carry any academic credit.

<sup>5</sup>The following courses meet the Quantitative Biology Course requirement (Note that MATH 1551 and MATH 1553 are pre-requisites for most of the Quantitative Requirement courses): BIOS 3400 Mathematical Models in Biology, BIOS 4150 Genomics & Applied Bioinformatics, BIOS 4401 Experimental Design & Statistics (meets MCAT statistics requirement).

<sup>6</sup>The prerequisite for BIOS 3600 is either BIOS 2300, BIOS 2310, BIOS 2600, or BIOS 2610.

<sup>7</sup>The Senior Research Experience can be met with any of the following during the fourth year fall or spring semesters: BIOS 4590 Research Project Lab, BIOS 4690 Independent Research Project (requires at least one previous semester of BIOS 4699/2699).

<sup>8</sup>A minimum of 39 hours of upper division coursework (3000-level or higher) is required for all Georgia Tech undergraduate degrees. The 39 hours of upper division coursework can fulfill any category of degree requirements, including free electives and "fall-through" courses.

**STUDENT/ADVISOR WORK SHEET  
2024-2025**

**Student Name:** \_\_\_\_\_

**ID number:** \_\_\_\_\_

<b>General Biology (Required)</b>	<b>Credits</b>	<b>✓</b>	<b>Other Required Courses</b>	<b>Credits</b>	<b>✓</b>
BIOS 1107 and 1107L or BIOS 1207 and 1207L Biol Principles	4		CHEM 1211K Chem Principles I	4	
BIOS 1108 and 1108L or BIOS 1208 and 1208L Organismal Bio	4		CHEM 1212K Chem Principles II	4	
BIOS 2300 or 2310 Ecology	3		MATH 1551 Differential Calculus	2	
BIOS 2600 or 2610 Genetics	3		MATH 1552 Integral Calc	4	
BIOS 3600 Evolution	3		MATH 1553 Linear Algebra	2	
BIOS 3450 Cell & Molecular Bio	3		CHEM 2311 Organic Chem I	3	
BIOS 4460 Comm Biol Research	1		CHEM 2312 Organic Chem II	3	
<b>Core lab requirement Choose 2 from:</b>			CHEM 2380 Synthesis Lab	2	
BIOS 2301 or 2311 Ecology Lab	1		PHYS 2211 Physics I	4	
BIOS 2601 or 2611 Genetics Lab	1		PHYS 2212 Physics II	4	
BIOS 3451 Cell & Molec Bio Lab	1		CS 1301 or 1315 or 1371	3	
<b>Quantitative requirement Choose 1 from:</b>			APPH 1040 or 1050 Wellness	2	
BIOS 3400 Math Models Bio	3		<b>Total</b>	<b>37</b>	
BIOS 4150 Genomics & App Binf	3		<b>English &amp; Humanities</b>	<b>Credits</b>	<b>✓</b>
BIOS 4401 Exp Des and Stat	3		ENGL 1101	3	
<b>Senior Research requirement Choose 1 from:</b>			ENGL 1102	3	
BIOS 4590 Research Project Lab	3		Humanities	3	
BIOS 4690 Ind. Research Project	3		Humanities	3	
<b>Total</b>	<b>29</b>		<b>Total</b>	<b>12</b>	
<b>Biology Electives (21 hrs req)</b>	<b>Credits</b>	<b>✓</b>	<b>Social Sciences/Constitution &amp; History Requirements</b>	<b>Credits</b>	<b>✓</b>
<b>Depth Electives (min 12 cr)<sup>1</sup></b>			Political Science & US History (includes 1-2 GLR <sup>3</sup> requirements)	3	
			Social Science	3	
			Social Science	3	
			Social Science	3	
			GLR: US History <sup>3</sup>	(0-3)	
			GLR: US Constitution <sup>3</sup>	(0-3)	
			GLR: GA History <sup>3</sup>	(0-3)	
<b>Breadth Electives (max 9 cr)<sup>2</sup></b>			GLR: GA Constitution <sup>3</sup>	(0-3)	
			<b>Total</b>	<b>12</b>	
			<b>Free Electives</b>	<b>Credits</b>	<b>✓</b>
			GT1000 (recommended)	1	
<b>Total</b>	<b>21</b>				
			<b>Total</b>	<b>11</b>	
			<b>Total for Graduation</b>	<b>122</b>	

**SEE IMPORTANT NOTES ON FOLLOWING PAGE**

## NOTES

Pass-fail allowed for Free Electives only. Refer to Institute rules for maximum pass-fail credits allowed.

<sup>1</sup>Depth electives can be fulfilled with BIOS 3000 and higher courses excluding 4595, 4697, or 4699.

<sup>2</sup>Breadth electives can be fulfilled with any BIOS 3000 and higher courses or with approved non-BIOS courses; see the Biology Major Handbook for an approved list of non-BIOS courses.

<sup>3</sup>The four Georgia Legislative Requirements (GLRs) must be completed before 90 credit hours and may be completed as follows: US HISTORY fulfilled by HIST 2111, HIST 2112, equivalent transfer/AP/IB credit, or passing the United States History Module Examination\*; GA HISTORY fulfilled by HIST 2111, HIST 2112, equivalent transfer/AP/IB credit, or passing the Georgia History Module Examination; US CONSTITUTION fulfilled by INTA 1200, POL 1101, PUBP 3000, equivalent transfer/AP/IB credit, equivalent transfer/AP/IB credit, or passing the United States Constitution Module Examination\*; GA CONSTITUTION fulfilled by INTA 1200, POL 1101, PUBP 3000, equivalent transfer/AP/IB credit, equivalent transfer/AP/IB credit, or passing the Georgia Constitution Module Examination\*. Note that all students must complete one of these five courses (HIST 2111, HIST 2112, INTA 1200, POL 1101, or PUBP 3000) to fulfill the Political Science & US History requirement; courses may be completed at GT or via AP/IB/Transfer credit. \*Note that the Module Examinations do not carry any academic credit.

## B.S. DEGREE ENHANCEMENTS

**Bachelor of Science in Biology – Research Option:** The Research Option enables students to conduct 9 credit hours of supervised research with a Biological Sciences faculty member over multiple semesters. With faculty guidance, students write a brief proposal, perform independent, original research, and write a thesis about their work. The thesis is evaluated by two Biological Sciences faculty members. The first 6 credit hours of the research option are taken as BIOS 4699 (research for credit) or BIOS 4698 (research for pay). Students then take BIOS 4690 (Independent Research Project; 3 hr) and two one-credit-hour writing courses, LMC 4701 and 4702. These writing courses can be counted as Biology electives for students completing the Research Option. Note that LMC 4701 should be taken in the semester PRIOR to enrolling in BIOS 4690. The student's research is presented in BIOS 4460 Communicating Biological Research. Completing this program gives students a "Research Option" designation on their transcripts. Students can consult the School of Biological Sciences (<http://biosci.gatech.edu/undergrad/bachelor-science-biology-research>) and the Undergraduate Research Opportunities Program (<http://uop.gatech.edu/research-option>) for more details.

**Bachelor of Science in Biology – Business Option:** The B.S. in Biology with a Business Option is a good fit for students interested in the business of biology, who intend to manage their own clinic or practice after professional school, or who may want to pursue an M.B.A. upon graduation. Students in the biology business option must complete 15 credits of approved coursework covering the principles of accounting, economics, and management. Two electives allow students to take advanced coursework in these areas, or to explore the legal, international, entrepreneurial, technological, or financial aspects of the business world. Six of the credit hours from the list of management (MGT) courses will fulfill requirements for Biology electives, and another 3 credit hours of management courses count as free electives. Additional courses within the Business Option may satisfy Social Science electives. Biology majors in this option must still fulfill the other requirements for the Biology undergraduate degree and should note that the MGT courses used as Biology electives reduce the approved Biology electives from outside Biology. Students interested in the Business Option should visit [biosci.gatech.edu/undergrad/business-option](http://biosci.gatech.edu/undergrad/business-option) for specific details on the courses available.

**Bachelor of Science in Biology – International Plan:** Georgia Tech offers an International Plan through the Office of International Education (<https://ip.oie.gatech.edu/home>). Successful completion of this plan earns students an International Plan designation on their Georgia Tech degree. The primary purpose of the plan is to offer a challenging and coherent academic program for students to develop global competence within the context of a Biology degree. The specific requirements of the International Plan can be found at the OIE website. For more details, contact Dr. Emily Weigel ([emily.weigel@biosci.gatech.edu](mailto:emily.weigel@biosci.gatech.edu)), advisor for Biology majors in the International Program. Georgia Tech Biological Sciences courses are taught in Australia/New Zealand [pacific.gatech.edu](http://pacific.gatech.edu) as part of the Study Abroad program. Other study abroad programs which offer courses relevant to Biology majors are described on the School of Biological Sciences website ([biosci.gatech.edu/undergrad/international-opportunities](http://biosci.gatech.edu/undergrad/international-opportunities)). In addition, many Biological Sciences courses are available through Georgia Tech partner universities abroad. Some of these universities teach Biological Sciences courses in English. To learn more, consult the Office of International Education (<https://ea.oie.gatech.edu/>).

## COURSEWORK ALLOWED TO COUNT TOWARD A MINOR

Biology majors are eligible for discipline-focused or multi-discipline minors to broaden the scope of your undergraduate degree. For Biology majors, the following categories of coursework may be allowed to also count toward a minor: Biology Depth electives, Biology Breadth electives, Free electives, and "Fall-through" courses. No other category of courses is allowed to count toward a minor. We encourage you to work with your Undergraduate Advisor to integrate your minor into your undergraduate studies. Minors which may be of particular interest to Biology majors are listed on the Biological Sciences website:

<https://biosciences.gatech.edu/undergrad/other-programs-interest>

### BIOLOGICAL SCIENCES CERTIFICATES

Certificate programs in Biological Sciences are available to Biology majors as an option to focus your elective coursework around a specific biological subdiscipline. Certificates are awarded by the School of Biological Sciences and do not appear on the transcript or diploma. Each certificate requires 12 credit hours of approved courses from that certificate's list, at least 9 of which must be at the 3000 level or higher. All courses counting toward the certificate must be taken on a letter-grade basis. Major electives can be counted toward certificates, but courses required by name and number in a student's major program of study will not be counted toward certificates. While students may complete more than one certificate, they may not double-count courses towards more than one certificate or minor.

Further information is available here [biosci.gatech.edu/undergrad/biology-certificates](https://biosci.gatech.edu/undergrad/biology-certificates) and from School of Biological Sciences advisors.

### 5-YR BS/MS programs:

#### 5-YEAR BS/MS PROGRAM (BSBIO/MSBIO)

Biology majors can add a 5-year combined BS/MS program in Biology (BSBIO/MSBIO). Students who wish to participate in the BSBIO/MSBIO will complete their undergraduate BS degree in Biology and then spend one year completing their MS in Biology. Details and points of contact are available at: <http://biosci.gatech.edu/undergrad/5-year-bsms-program-bsbiomsbio-0>

The following is a list of application requirements and how to apply:

- You must be a Biology undergraduate student
- Identify a research advisor that you have already performed undergraduate research with or with whom you have discussed completing a Master's thesis.
- Apply after completion of 30 semester credit hours but before completion of 90 semester credit hours, including transfer and advanced placement credits. Students with more than 90 credits will be considered for the program on a case-by-case basis.
- Have a GPA of 3.3 or higher in courses required for the BS in Biology. Students with a GPA less than 3.3 will be considered for the program on a case-by-case basis.
- The BSBIO/MSBIO is aimed at students who have a strong interest in biological research. In particular, students on a path to take Independent Research Project (BIOS 4690) as their capstone research experience in Biology may have an interest in the program. Students will be in a particularly strong position to complete the BSBIO/MSBIO if they have taken several semesters of undergraduate research (BIOS 4698, 4699, 4690) which consist of a cohesive scientific research project.
- It is recommended that students with an interest in the BSBIO/MSBIO seek the advice of their research advisor, academic advisor, or the graduate office before applying.
- To apply, submit a standard graduate application at <http://www.grad.gatech.edu/apply-now>.

## Requirements for BSBIO/MSBIO

	REQUIREMENT	CLASSES	TYPICAL TIMELINE	FULFILLED
<b>COMPLETE BEFORE APPLYING TO BS/MS</b>				
1	GPA > 3.3	Minimum GPA for Application	Apply after completion of 30 credit hours but before completion of 90 credit hours	Y
<b>COMPLETE BEFORE FINISHING BSBIO</b>				
1	Graduate Biology Course	3 hour graduate-level course (6000 and above) *	4 <sup>th</sup> year - Fall	Y
2	Graduate Biology Course	3 hour graduate-level course (6000 and above) *	4 <sup>th</sup> year - Spring	Y
3	Capstone research	BIOL 4690	4 <sup>th</sup> year - Spring	Y
4	Thesis committee	Identify and contact faculty to serve on your thesis committee for your MS degree	4 <sup>th</sup> year -Spring	Y
5	GPA > 3.0	Minimum GPA for graduation with BSBIO to continue into MSBIO		Y
<b>COMPLETE DURING MSBIO</b>				
1	Committee meeting	Discuss plans for MS research	5 <sup>th</sup> year – Fall (beginning of semester)	Y
2	Masters Research	8 hours (BIOL 8901 + BIOL 7000)	5 <sup>th</sup> year - Fall	Y
3	Graduate Biology courses	BIOL 6000 and above (6 hours)	5 <sup>th</sup> year – Fall	Y
4	Biology Seminar	1 hour	5 <sup>th</sup> year – Fall	Y
5	Committee meeting	Update committee on research progress and expected results	5 <sup>th</sup> year – Spring (beginning of semester)	Y
6	Masters Research	8 hours (BIOL 8901 + BIOL 7000)	5 <sup>th</sup> year – Spring	Y
7	Graduate Biology courses	BIOL 6000 and above (6 hours)	5 <sup>th</sup> year – Spring	Y
8	Biology Seminar	BIOL 8003 (1 hour)	5 <sup>th</sup> year – Spring	Y
9	Thesis defense	Defend MS thesis	5 <sup>th</sup> year – Spring (end of semester)	
10	GPA > 2.70	Minimum GPA for graduation with MSBIO		Y

\* Requires a level permit from the Registrar's Office. This will be granted with senior standing or a petition to the faculty.

### **5-YEAR BS/MS PROGRAM (BSBIO/MSBINF)**

Biology majors can add a 5-year combined BS/MS program in Biology/Bioinformatics (BSBIO/MSBINF) aimed at students who have a strong interest in computational biology and genomics. Students who wish to participate in the BSBIO/MSBINF will complete their undergraduate BS degree in Biology and then spend one year completing their MS in Bioinformatics. Details and points of contact are available here <http://biosci.gatech.edu/undergrad/5-year-bsms-program-bsbiolmsbinf-0>.

The following is a list of application requirements and how to apply:

- You must be a Biology undergraduate student.
- Apply after completion of 30 semester credit hours but before completion of 90 semester credit hours, including transfer and advanced placement credits. Students with more than 90 credits will be considered for the program on a case-by-case basis.
- Have a GPA of 3.3 or higher in courses required for the BS in Biology. Students with a GPA less than 3.3 will be considered for the program on a case-by-case basis.
- At the time of application, students must have completed CS1301 or CS1371, and either completed or registered for Multivariable Calculus (Math 2550, 2551, 2561, or 2605).
- Continuation into the MS degree requires the student complete the BS requirements with an overall GPA of 3.0 or higher and complete the MS requirements (37 credits) with an overall GPA of 2.7 or higher.
- It is recommended that students with an interest in the BSBIO/MSBINF seek the advice of their research advisor, academic advisor, or the graduate office before submitting an application.
- To apply, submit a standard graduate application at <http://www.grad.gatech.edu/apply-now>. Students applying will need to write a short essay explaining their purpose in obtaining an MS degree.
- Several courses (BIOL 6150 and BIOL 6000+) required for the 5-year degree can be used as Biology and Free Electives toward the BSBIO.



## Requirements for BSBIO/MSBINF

	<b>REQUIREMENT</b>	<b>CLASSES</b>	<b>TYPICAL TIMELINE</b>	<b>FULFILLED</b>
<b>COMPLETE BEFORE APPLYING TO BS/MS</b>				
<b>1</b>	Computing	CS 1301 or CS 1371 (CS 1315 not allowed)	2 <sup>nd</sup> year - Fall	Y
<b>2</b>	Multivariable Calculus	MATH 2550, 2551, 2561, or 2605; must be completed or in-progress at time of application. MATH 2550 is approved only for students who completed MATH 1552 and not MATH 1555.	3 <sup>rd</sup> year - Fall	Y
<b>3</b>	GPA > 3.3	Minimum GPA for Application	Apply after completion of 30 credit hours but before completion of 90 credit hours	Y
<b>COMPLETE BEFORE FINISHING BSBIO</b>				
<b>1</b>	Bioinformatics	BIOL 6150 *	4 <sup>th</sup> year - Fall	Y
<b>2</b>	Statistics for Bioinformatics	BIOS 4401, MATH 3215, or ISYE 3770 (or comparable statistics course approved by advisor)	4 <sup>th</sup> year - Spring	Y
<b>3</b>	Graduate Biology Course	3 hour graduate-level course (6000 and above)*	4 <sup>th</sup> year - Spring	Y
<b>4</b>	GPA > 3.0	Minimum GPA for graduation with BSBIO to continue into MSBINF		Y
<b>COMPLETE DURING MSBINF</b>				
<b>1</b>	Programming for Bioinformatics	BIOL 7200	5 <sup>th</sup> year - Fall	Y
<b>2</b>	Bioinformatics Capstone Course	BIOL 8803F or alternate	5 <sup>th</sup> year – Fall	Y
<b>3</b>	Bioinformatics Research or other graduate elective	BIOL 8901	5 <sup>th</sup> year – Fall	Y
<b>4</b>	Approved Electives	13 hours - No more than 6 hours below 6000-level	5 <sup>th</sup> year – Fall; 5 <sup>th</sup> year – Spring	Y
<b>5</b>	Computational Genomics	BIOL 7210	5 <sup>th</sup> year – Spring	Y
<b>6</b>	Intro Databases	CS 4400	5 <sup>th</sup> year – Spring	Y
<b>7</b>	Machine Learning in Computational Biology	CX 4803 MLB	5 <sup>th</sup> year - Spring	Y
<b>8</b>	Bioinformatics Research or other graduate elective	BIOL 8902	5 <sup>th</sup> year – Spring	Y
<b>9</b>	GPA > 2.70	minimum GPA for graduation with MSBINF		Y

\* Requires a level permit from the Registrar's Office. This will be granted with senior standing or a petition to the faculty.

## UNDERGRADUATE RESEARCH IN THE SCHOOL OF BIOLOGICAL SCIENCES

All students will complete a senior research experience for credit. Students can additionally complete research for credit or for pay or audit. Details are on our program website.

### **Summary of Biology Research Courses:**

Course descriptions are available at <https://biosciences.gatech.edu/undergrad/courses>

BIOS 4460 – Communicating Biological Research: Senior students present seminars on recent research topics based on their own research experience and/or literature research. 1 credit hour. BIOS 4590 or 4690 is a prerequisite with concurrency—one of these courses must be taken before or in the same term as BIOS 4460. Grade assigned by faculty teaching the course.

BIOS 4590 – Research Project Lab: Experience in designing, implementing, and communicating a biology research project, and practical training in modern approaches for biological research. 3 credit hours. Prerequisites: BIOS 1107 or 1207 and 1107L or 1207L or equivalent. Grade assigned directly by faculty teaching the course.

BIOS 4690 – Independent Research Project: Independent research with proposal and manuscript writing, conducted with the guidance of a faculty member. 3 credit hours. Prerequisites: 1 credit hour of BIOS 2698 or 2699 or 4698 or 4699. Faculty may accept a student without the 1 credit hour prerequisite at their discretion by signing a prerequisite override form for the student. Students must obtain a permit to take BIOS 4690. To request a permit, complete the Senior Research Permit Request form at this link:

<https://www.biosci.gatech.edu/undergrad/undergraduate-research#Senior%20Research>.

Letter grade assigned by the faculty research mentor and sent to the instructor of record of BIOS 4690 for the semester in question.

BIOS 4698 – Research Assistantship: Independent research conducted under the guidance of a faculty member. 1-12 credit hours. Audit-only course.

BIOS 4699 – Undergraduate Research: Independent research conducted under the guidance of a faculty member. 1-12 credit hours. Grade assigned directly by research advisor.

## BIOLOGICAL SCIENCES COURSE LISTINGS

Refer to the catalog for current course listings and to our program website for select course descriptions. Special topics courses are typically offered each semester but are not listed in the catalog. All prerequisite courses require a D unless otherwise specified.

### **NON-BIOLOGICAL SCIENCES COURSES THAT ARE APPROVED FOR BIOLOGY BREADTH ELECTIVES (9 credits maximum)**

#### **LMC:**

LMC 4701 Undergraduate Research Proposal Writing (Research Option only)

LMC 4702 Undergraduate Research Thesis Writing (Research Option only)

**All BMED 3XXX and higher courses EXCEPT:**

BMED 4698	Research Assistantship
BMED 4699	Undergraduate Research
BMED 4900-4903	Special Problems

**All CHEM 3XXX and higher courses EXCEPT:**

CHEM 4601	Chemistry Seminar
CHEM 4698	Research Assistantship
CHEM 4699	Undergraduate Research
CHEM 4901- 4903	Special Problems in Chemistry

**All EAS 3XXX and higher courses EXCEPT:**

EAS 4651	Practical Internship
EAS 4698	Research Assistantship
EAS 4699	Undergraduate Research
EAS 4900	Special Problems

**All MATH 3XXX and higher courses EXCEPT:**

MATH 4080	Senior Project I
MATH 4090	Senior Project II
MATH 4698	Research Assistantship
MATH 4699	Undergraduate Research
MATH 4999	Special Problems

**All NEUR 3XXX and higher courses EXCEPT:**

NEUR 4698	Research Assistantship
NEUR 4699	Undergraduate Research
NEUR 4901	Special Problems

**All PHYS 3XXX and higher courses EXCEPT:**

PHYS 4601	Senior Seminar I
PHYS 4602	Senior Seminar II
PHYS 4698	Research Assistantship
PHYS 4699	Undergraduate Research

**All PSYC 3XXX and higher EXCEPT:**

PSYC 4600	Senior Thesis I
PSYC 4601	Senior Thesis II
PSYC 4698	Research Assistantship
PSYC 4699	Undergraduate Research
PSYC 4900-4910	Special Problems