Carnegie Mellon University

Academic Year 2024-2025

School of Computer Science

Computational Biology Department

Master's Student Handbook

Degree Programs Covered by This Handbook:

Integrated MS in Computational Biology

Table of Contents

SECTION 1: Welcome & Introduction....2
SECTION 2: Department Information....2
2.1 Program Contacts....2
2.2 Department Resources....3
SECTION 3: Master's Degree Requirements....3
3.1: Residency Requirements....3
3.2: Registration Process....4
3.3: Required Units for Degree Attainment....4
3.4: Core Courses....4
3.5: Electives....5
3.6: Department Policy on Double Counting Courses....5
3.7: Department Policy for Courses Outside the Department/College....5
3.8: Course Exemptions....6
3.9: Protocol for Evaluation of Transfer Credit....6
3.10: Teaching Opportunities....6
3.11: Research Opportunities....6
3.12: Internship Opportunities....6
3.13: Thesis Procedure....7
3.14: Early Consideration for Entry into the PhD Program....9
3.15: Example Course Schedules....10
SECTION 4: Department Policies & Protocols....11
4.1: Petition Procedures....11
4.2: Department Policy for Withdrawing from a Course....11
4.3: Requirements for Applying to the Program....11
4.4: New Policies After Program Start....12
4.5: Time Away from Academic Responsibilities....12
SECTION 5: Grading & Evaluation....13
5.1: Department Policy on Grades for Retaking a Course....13
5.2: Department Policy on Pass/Fail, Satisfactory/Unsatisfactory....13
5.3: GPA Requirements and QPA Requirements for Graduation....14
5.4: Satisfactory Academic Standing and Student Reviews....14

SECTION 1: Welcome & Introduction

Welcome to the Integrated Master of Science in Computational Biology program, especially for those just joining the Computational Biology Department (CBD). We're excited that you decided to continue your studies here at CMU in CBD. You have already completed a very rigorous undergraduate education, which included many courses within the field and we really hope this program will be a vital piece of your background after you depart from campus. This document is intended to put into writing all of the policies we will use to manage the next two semesters. We tried to be diligent in thinking through most questions that will come up in the program; that said, this is a living document, and while we don't intend there to be significant changes you will be notified of any changes that impact you.

This handbook is specific to your academic experience in the program, but it is just one element of the Graduate Student Handbook Suite. There are several other resources within the suite, that you should consult when needed:

- Your Program Handbook
- The SCS Student Handbook
- University-Wide Graduate Student Handbook (Office of Graduate & Postdoctoral Affairs)
- The Word Student Handbook

SECTION 2: Department Information

2.1 Program Contacts

Program Director: Dan DeBlasio, PhD
- Gates-Hillman Center 7707
- deblasio@cs.cmu.edu
- Contact for: Advising, Thesis, Capstone, Academic Issues

Program Coordinator: Tara Seman, MS
- Gates-Hillman Center 7721
- ts2t@andrew.cmu.edu
- Contact for: Course Scheduling, Logistic Issues

Department Chair: Russell Schwartz, PhD
- Gates-Hillman Center 7723
- russells@cs.cmu.edu

SCS Dean for Masters Studies: David Garlin, PhD
- Wean Hall 4218
- garlan@cs.cmu.edu

Graduate Student Ombudsperson: Suzanne Laurich-McIntyre, Ph.D
- ombudsperson@andrew.cmu.edu
- Students may confer with the university graduate student ombudsman on issues of process or other concerns as they navigate conflicts

Student Affairs Liaison: John Hannon, Ph.D.
- Warner Hall 300
- jfhannon@andrew.cmu.edu
- Supporting students to manage mental and physical health and other personal issues including finding appropriate resources and help managing impact on coursework and life outside of classes.

Program Faculty

All CBD faculty are participants in the program, full list can be found at http://www.cbd.cmu.edu/directory/faculty/voting-faculty/

2.2 Department Resources

There are student support and administrative staff members available Monday through Friday in person on the 7th floor of the Gates Hillman Center (rooms 7721 and 7725).

The Computational Biology Department provides a study space for all Master students of CBD in room GHC 7412. There is no assigned desk. You may use any unoccupied desk. This room is always to remain unlocked. Do not leave personal or items of value in the room.

A copier/printer is located in GHC 7604.

The department directory is located in the lobby of the Computation Biology Department.

The department maintains several bulletin Boards throughout the department containing information of upcoming events and recent research and student spotlights.

The Department website https://cbd.cmu.edu/ contains a department calendar of events.

SECTION 3: Master's Degree Requirements

3.1: Residency Requirements

All courses in this program include an in-person expectation. It is expected that all students enrolled in the Integrated MS in Computational Biology program will be in the Pittsburgh area through the course of the two semesters of the program.

Students must be registered for at least 36 units during each semester to be considered full-time. Any questions about registration should be directed to the Program Directors or Enrollment Services (the HUB).

Students who need to withdraw from the program (leave the university with no intention of returning) for personal, medical or academic reasons must contact the Program Director to discuss their plans and fill out the appropriate Withdrawal form. For more information refer to www.cmu.edu/policies/documents/StLeave.html.

3.2: Registration Process

Students are responsible for their own registration, which should be completed in SIO. Given that all students in the program completed undergraduate degrees at CMU specific instructions are excluded from this document.

All students should consult their academic advisor (the Program Director) each semester to ensure they are on track for graduation. Permissions for coursework beyond the prescribed curriculum below or any courses that need specific waivers should be addressed in email to both the Program Director and Program Coordinator.

3.3: Required Units for Degree Attainment

The Integrated Master of Science in Computational Biology requires students to complete **102** units of coursework (up to 12 of which may be waived, see Section 3.6). The curriculum requires an Industry Capstone consisting of 12 hours in one semester and/or the completion of a Thesis (and a required 24 hours of thesis research units) across two semesters. In addition, a set of core courses and other requirements are enumerated below. Section 3.15 shows a recommended path to completion of the degree, with alternate timelines provided for those with undergraduate degrees both inside and outside the Computational Biology Department.

3.4: Core Courses

All students are required to complete the following 5 courses to attain the degree.

- Computational Methods for Biological Modeling and Simulation (02-712)
- Computational Genomics (02-710)
- Machine Learning for Scientists (02-620)
- Professional skills for computational biologists (02-602; 3 units)
- Computational biology seminar (02-702; 3 units)

Students must also complete one of the following:

- Industry capstone (02-798; 12 units); or
- M.S. thesis (02-700; 24 units total, 12 of which would count toward electives)

Note that as of AY 2024-2025, 02-602 and 02-702 are only offered in the Fall and Spring respectively, and so students must complete them in the prescribed semesters.

3.5: Electives

Students are required to complete at least 48 units of elective coursework, at least two courses of which (24 units) must be computational biology electives (an 02- listed course at the 600 level or higher). One of these courses may be the second semester of M.S. Thesis Research. Note that the number of required elective units may be higher for students with undergraduate majors or additional majors in Computational Biology (see next section).

3.6: Department Policy on Double Counting Courses

Because the Middle States Commission requires every master's degree to have at least 90 units, a student who has already taken a course from the first three core requirements listed above at the undergraduate level can count ***at most one*** such course toward their master's degree. If a student has taken more than one such course, then they will receive a waiver and must replace each such course with a computational biology elective (an 02- listed course at the 600 level or higher).

Note on CBD undergraduate majors completing the Integrated Program

Undergraduate majors in computational biology will, by virtue of the core courses in their degree, complete 02-712, 02-710, and 02-620. These students will replace these courses with computational biology electives. As such, these students' number of required elective units will be 72 rather than the standard 48.

3.7: Department Policy for Courses Outside the Department/College

While all elective units ***can*** be completed within CBD, at most two can be from outside the department:

- Up to one breadth elective may be taken from any SCS department at the 600-level or higher (course prefixes 05- [HCII], 07- [SCS Other], 10- [MLD], 11- [LTI], 15- [CSD], 16- [RI], 17- [S3D]).
- Up to one other breadth elective may be taken from any Mellon College of Science department at the 600-level or above, ***or*** from Biomedical Engineering (BME) department:
    - Neural Data Analysis (42-631)
    - Neural Signal Processing (42-632)
    - Image Based Computational Modeling and Analysis (42-640)
    - Brain-Computer Interface: Principles and Applications (42-665)
    - Other courses that overlap the interests of the program from BME with approval of the Program Director

3.8: Course Exemptions

02-620 (Machine Learning for Scientists) can be waived if either 10-315 or 10-701 has already been taken at the undergraduate level; students will be required to replace the course with an additional computational biology elective.

3.9: Protocol for Evaluation of Transfer Credit

Transfer credit is not accepted for use in this program.

3.10: Teaching Opportunities

Students in the Integrated MS in Computational Biology program are not ***required*** to complete any teaching, but are encouraged to participate in the opportunities provided by the department. Requests for Teaching Assistants (TAs) are typically mid-semester for the semester following. Students interested in being a TA should contact the Program Director to ensure contact is made in a timely manner to get students assigned courses.

3.11: Research Opportunities

Research is not required unless a student is on the thesis track. Students may participate in research activities outside of the thesis by contacting any willing department faculty. For assistance finding a suitable research advisor, students may contact the Program Director.

3.12: Internship Opportunities

Due to the expedited nature of the program and the inclusion of the capstone, internships are not required by the program and cannot receive credit.

Students are allowed, and encouraged, to pursue internship opportunities in the summer before the program begins, but this is not required. As students don't officially start in the program until the Fall semester no course credit can be awarded.

3.13: Thesis Procedure

Students have the option of completing a Thesis project. The procedure and timeline are detailed below, but includes completing 2 semesters of 02-700 (MS Thesis Research). The key time-points below are to be considered as "no later than", and students are encouraged to complete these milestones earlier if possible.

The Summer before program starts

- Find a research lab and discuss your plan to complete a thesis with the lab's PI.
    - Students who want to have help finding a research lab should contact the program academic advisor.

Start of first semester

- Complete an 02-700 contract (provided by Program Coordinator) in coordination with the thesis advisor. (Note thesis advisor will coordinate with the Program Director to submit a grade for this course by the end of the semester.)

Start of second semester

- Complete a thesis proposal in conjunction with your advisor (see details below).
- Set thesis committee.
    - The thesis advisor will serve as the chair of the thesis committee.
    - The student and advisor should identify at least two (2) other faculty committee members.
    - At least two members of the thesis committee must be full-time faculty at Carnegie Mellon University (at least one of which must hold the rank of Tenure-Track Assistant Professor or higher in the Computational Biology Department)
    - If the thesis advisor is not a Tenure-Track professor, then at least one other member of the committee must be.
- Submit proposal for review.
    - The completed proposal (which must have already been reviewed by the thesis advisor) should be e-mailed to the Program Director(s), plus the full thesis committee, with the advisor CC'd.

    - Within 2 weeks, the committee members need to acknowledge the proposal and submit comments to the student.
    - A revised proposal is due to the committee and academic advisor 2 weeks later and is subject to final approval by the thesis committee and the Program Director.
- Start writing the thesis (see formatting below).

2 Month before graduation

- Schedule and plan thesis defense.
    - The thesis defense must be completed at least 2 weeks prior to graduation.
        - Planning and scheduling should begin well in advance.
    - All members of the thesis committee must be present for the defense.
    - The defense will last between 1-2 hours.
    - Once a date and time are selected the student should work with the Program Coordinator to reserve a suitable room that can seat at least 10 people (or more if the student expects more).
    - Once date, time, and venue are selected the defense should be advertised to the CBD community (defenses are open to the public with extreme exceptions in the cases of sensitive data).

2 Weeks before Defense

- Students submit a completed thesis document to the thesis committee and the academic advisor.
- It is recommended that the student practice the thesis defense presentation with the lab members and/or advisor.

On Defense Day

- Students should bring a copy of the MS Thesis Defense Form (can be obtained from Program Coordinator) with name, committee members, & thesis title filled out to the defense.
    - This document will be signed and surrendered to the committee chair until revisions are completed.
- After a public defense and public questions, the student will remain for private questions with the committee and then the committee will confer privately without the student.

After Defense Day

- Any requested revisions need to be submitted to the thesis committee and the academic advisor. (Must be completed before graduation.)
- After a 3 year embargo, completed thesis documents will be publicly available in ProQuest and/or the program website.

Thesis Proposal Format

The Thesis Proposal should have the following sections:

- Specific Aims (1-2 aims, approximately 0.5 page).
    - State concisely and realistically what your research is intended to accomplish and what hypotheses are to be tested.
- Background & Significance (approximately 1 page).
    - Briefly sketch the background to the proposal, critically evaluate existing knowledge and specifically identify the gaps that the project is intended to fill, i.e., summarize the general knowledge of the field, and identify where your questions fit in. This important section displays your knowledge and understanding of the field and its current shortcomings. What are the major unanswered questions? Include previous work done by yourself, your lab, and other labs.
- Experimental Design and Methodologies (approximately 1 page).
    - Discuss the experimental design and the procedures to be used to accomplish the specific aims of the project. Include potential difficulties and limitations of the proposed procedures, and alternative approaches to achieving the aims.
- Literature Cited.
    - References should be cited within the text in a consistent format.

Thesis Format

The Thesis should have the following sections:

- Title page & Dedication/Acknowledgements
- Abstract (1 page)
- Introduction chapter (4 or more pages).
    - Separate from introduction sections in other chapters, this is a place for the student to put the entire thesis in context.
- 1 or more additional chapters (20 or more pages each).
    - Chapter format should be consistent and may match the format of any journal article in the field of study.
- Literature Cited.
    - References should be cited within the text in a consistent format.

Submitted or Published manuscripts can be included as appendices and cited within the main document to reduce repetition. Students are encouraged to expand on results and methodological details not included in the submitted manuscript.

3.14: Early Consideration for Entry into the PhD Program

Students in any degree program within the Computational Biology Department are permitted to apply early to the Joint Carnegie Mellon-University of Pittsburgh Ph.D. Program in Computational Biology.

Application process

Early admission applications will consist of the same materials as a normal application and must be submitted by the due date (early September). Decision about the early application will be made by October 1st. Decisions will be a) to offer early admission, b) not to offer early admission but to consider the applicant again during the regular admissions cycle, or c) to reject the application. If a student is rejected, they cannot apply again during the regular admission cycle.

Students admitted early would need to decide whether to accept the offer by November 1st. Students admitted early who do not accept the offer by November 1st will not be considered for regular admission. Students who accept the early offer would not be allowed to apply to other PhD programs at CMU or elsewhere.

Limited Number of early admissions offers

The Computational Biology Ph.D. expects to offer early admission to a maximum of 2 students per year combined from MSAS, MSCB, and the Integrated MS in Computational Biology programs.

Adjusted Curriculum

The curriculum for students who accept an early admission offer may be adjusted for the spring semester to allow inclusion of one or more courses that are required by the Ph.D. program. Such courses would be counted as part of required units for the M.S. program and not for the Ph.D. program, although the requirement for those courses would be waived by the Ph.D. program if a satisfactory grade is received.

Minimum unit requirements for the Ph.D. program would still need to be met.

3.15: Example Course Schedules

For CB majors

Fall	Units	Spring	Units
02-602: Professional Issues for Computational Biologists	3	02-702: Computational Biology Seminar	3
02-XXX: Free computational biology elective or M.S. Thesis	12	02-XXX: M.S. Thesis or Industry Capstone	12
02-XXX: Free computational biology elective	12	02-XXX: Free computational biology elective	12
02-XXX: Free computational biology elective	12	SCS-XXX: Free SCS elective	12
MCS-XXX: Mellon college elective	12	XX-XXX: Free elective (waived)	12
Total	**51**	**Total**	**51**

For other majors

Fall	Units	Spring	Units
02-602: Professional Issues for Computational Biologists	3	02-702: Computational Biology Seminar	3
02-712: Computational Methods for Biological Modeling and Simulation	12	02-620: Machine Learning for Scientists	12
02-XXX: Free computational biology elective	12	02-710: Computational Genomics	12
02-XXX: Free computational biology elective or M.S. Thesis	12	02-XXX: M.S. Thesis or Industry Capstone	12
MCS-XXX: Mellon college elective	12	SCS-XXX: Free SCS elective	12
Total	**51**	**Total**	**51**

SECTION 4: Department Policies & Protocols

4.1: Petition Procedures

Petitions for adaptation from the prescribed program must be provided in written form by at least the end of the student's first semester (i.e. the end of the semester preceding their final semester). Given the flexibility of the program, course substitutions are highly unlikely and will be permitted only in extreme circumstances.

4.2: Department Policy for Withdrawing from a Course

Students may withdraw from a course online. The university has a Drop deadline toward the end of the semester, after which the course appears on the student's transcript as withdrawn (W). The last day to withdraw from a class is the final day of classes.

That said, students should consult with their academic advisor on the impact of withdrawing on their progress to completion. Given that the program is only two semesters, any withdrawal from required courses can have serious consequences on students' completion of their degree.

4.3: Requirements for Applying to the Program

All students entering the program must complete the following courses; with a 3.0 QPA in these courses. Note that all students completing a B.S. in Computational Biology (or the additional major in Computational Biology) meet these requirements as part of their major requirements. Students completing a minor or a concentration in Computational Biology will likely have completed a significant subset of these courses, depending on their primary major.

Mathematics

- Concepts of mathematics (21-127 or 15-151)
- Matrix algebra (21-241 or equivalent)
- An introductory probability/statistics course (36-218 or 15-259 or 36-225/36-226)

Computer science

- Fundamentals of Programming (15-112)
- Principles of Imperative Computation (15-122)
- Algorithms and Data Structures (15-351 or 15-451)

Computational biology

- An introduction to computational biology (02-251 or 02-250)
- A 300+ level course in the computational biology department of at least 9 units

Biology

- Modern biology (03-121 or 03-151)
- Genetics (03-221 or 03-220, with 03-221 preferred)

4.4: New Policies After Program Start

The handbook that is in effect at the time a student ***starts the program*** is the definitive document on the policies for degree completion. If changes are made to policies they will not be retroactive except in extreme circumstances, which will be communicated to all affected students in advance, and they will have the opportunity to to be involved in the decision making policy.

Because the program involves a set of prerequisite classes, changes to these requirements will be made very clear in advance to everyone who has shown interest in the program (via the to be established mailing list), and any admissions decisions impacted by these changes will be considered on a case-by-case basis.

4.5: Time Away from Academic Responsibilities

Due to the course-based nature of this program, time not spent in classes is uncontrolled by the department. The only exception to this may be for students completing a thesis, in these cases students should consult their thesis advisor on policies for university holidays (Fall, Winter, Spring breaks, etc).

Students who need to delay their studies for personal, medical or academic reasons may do so with a Leave Of Absence (LOA; leaving the university temporarily with a commitment to return). Students must contact the Program Director to discuss their plans and fill out the appropriate Leave Of Absence form. Final approval of LOA is pending approval of the Director and Coordinator under advisement of the Department Head. The student's place in the program will be held until a mutually determined time. For more information refer to http://www.cmu.edu/policies.

SECTION 5: Grading & Evaluation

5.1: Department Policy on Grades for Retaking a Course

Retaking a course that was not passed initially does not remove the previous grade from inclusion in the students overall GPA.

5.2: Department Policy on Pass/Fail, Satisfactory/Unsatisfactory

Pass/Fail courses are strongly discouraged unless it is a course that is not counted toward the student's program of study or if there is a medical hardship in completing a course. Taking a course for credit indicates an intellectual commitment to the material and may be viewed more positively by other professors and potential employers than a Pass. Potential employers gain more information about a student's ability from seeing a letter grade on a transcript than from a P. Except for 02-602 Professional Issues in Computational Biology and 02-702 Computational Biology Seminar, Pass/Fail courses cannot be used to satisfy any program requirements or to satisfy any prerequisites.

With petition to and ***approval*** from the Program Director, students may elect to take a course Pass/Fail. Such a petition must give a compelling reason for taking a course Pass/Fail and must argue why that will not impact the student's program of study. Within the registration ADD period during the first two weeks of each semester, the student must fill out the Pass/Fail Approval Form and receive permission from the Assistant Director and the Department Head. Switching a course to Pass/Fail mid-semester will generally only be approved under special circumstances.

- Prerequisites may not be taken Pass/Fail.
- Classes taken Pass/Fail may not be used to fulfill graduation requirements, except for seminar courses and 02-602 and 02-702.
- Pass/Fail status is irrevocable.

5.3: GPA Requirements and QPA Requirements for Graduation

To be in good academic standing, a student is expected to maintain a B average (GPA = 3.0) in the coursework that will be counted towards the degree. No grade lower than C shall be used for completion of degree requirements.

5.4: Satisfactory Academic Standing and Student Reviews

After each semester the Program Director will examine each student's progress in the program.

If a student is making inadequate progress (i.e. is not satisfying any of the conditions above and/or is not on track to complete the program in 2 semesters), the Program Director will notify the student in writing of the deficiencies and the consequences of failing to correct those deficiencies. Any student whose cumulative QPA is at or below 3.0 after one term or who is otherwise not making satisfactory progress toward their degree will receive a letter from the program placing them on academic probation. Under most circumstances, the student will be given one semester to earn a B average in the courses to be counted towards the degree.

Additionally, those who don't earn minimum required grades in any classes (C or higher in any classes counting toward the degree) will also be placed on academic probation. Academic probation will end only when the student returns to a B average and fulfills the other requirements laid out in the terms of their probation. Failure to return to good academic standing after one semester dismissal from the program or other actions as decided upon by the administration of the program.

Any decision of this procedure can be appealed using the established CMU policies as noted in the Summary of Graduate Student Appeal and Grievance Procedures.