

Princeton University

Quantitative and Computational Biology (QCB)

Graduate Student Handbook

2022-2023 Edition

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QCB Graduate Student Handbook

2021-2022 Edition

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QCB Program 5 Year Timeline

Year 1			Year 2		Year 3		Year 4		Year 5					
Fall	Spring		Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring				
Take three core courses (QCB 515, QCB 535 and COS/QCB 551)			Take one elective course*		Prep for generals		General Exam (January)		Take one elective course*		Teach**		Dissertation Defense (aka "Final Public Oral" or "FPO") <i>(FPO happens by the end of year 5, give or take)</i>	
Lab Rotation #1	Lab Rotation #2	Lab Rotation #3	Work in thesis lab (work should start the summer before year 2 begins)			Continue work in thesis lab and have annual thesis committee meetings, suggested time is October								

Summers between each year are spent working in your thesis lab; there are no mandatory summer courses with the exception of QCB 501, the responsible conduct of research half-course, offered by the department and a requirement of the graduate school. This is usually offered every other year and taken in your first or second year.

*Your two elective courses can be taken anytime during your **regular** enrollment (years 1 – 5), this is just a suggested timeline.

**Students typically teach in year 4, although exceptions can be made with approval from advisor and department.

Ph.D. Requirements

Core Courses:

- [QCB 515](#): Method and Logic in Quantitative Biology
- [QCB 535](#): Biological networks across scales : Open problems and research methods of systems biology
- [COS/QCB 551](#): Introduction to Genomics and Computational Molecular Biology
- [QCB 501](#): Topics in Ethics in Science
- Two elective courses from the lists below, including at least one from the Quantitative course list (substitutions possible with permission from the DGS)

[QCB Graduate Colloquium](#) (spring term)

Regular attendance of QCB seminar series (fall and spring terms)

[Research rotations](#) (completed during your first year, and three are required)

[General Examination](#) (taken in January of your second year)

[Teaching](#) (usually completed in fourth year)

[Thesis Committee Meetings](#) (annually in October after successful general exam)

[Dissertation defense](#) (end of year five)

Program length is five years. Please see [QCB Program Timeline](#) for program summary.

Course Requirements

Completion of course requirements is necessary to attain the Ph.D. degree. A minimum of a B average in program courses is necessary for successful completion of the program requirement. Courses must be graduate 500 level (exceptions are CHM403 and QCB490) and **not** taken as P/D/F in order to satisfy the course requirement, unless DGS approves otherwise ahead of time. **Course substitutions for electives are possible with approval from the DGS; send email to Ned Wingreen and Jennifer Giraldi with any substitution requests *before* you enroll.**

Courses must be taken during regular enrollment (years 1 – 5). You will not be able to enroll in courses at Princeton after your regular enrollment ends.

Note: if you take an approved course that is **half-term**, by itself, it will only count for half of one of your required courses. To complete the requirement, you would have to take another approved half course, or something equivalent with the approval of the DGS (i.e. maybe an additional project as part of the course, with the instructor and DGS approval).

Core Courses

- [QCB 515](#) Method and Logic in Quantitative Biology
- [QCB 535](#) Biological networks across scales: Open problems and research methods of systems biology
- [COS/QCB 551](#) Introduction to Genomics and Computational Molecular Biology
- [QCB 501](#) Topics in Ethics in Science (Responsible Conduct of Research, or RCR, course); please note that you may take an RCR course offered by another department with approval from home and affiliated departments.

Quantitative Elective Course List (*must take at least one*)

- [APC 524 /MAE506/AST506](#) Software Engineering for Scientific Computing
- [CBE 517](#) Soft Matter Mechanics: Fundamentals & Applications
- [CHM 503/CBE 524/MSE 514](#) Introduction to Statistical Mechanics
- [CHM 515](#) Biophysical Chemistry I
- [CHM 516](#) Biophysical Chemistry II
- [CHM 542](#) Principles of Macromolecular Structure: Protein Folding, Structure, and Design
- [COS 511](#) Theoretical Machine Learning
- [COS 524/COS 424](#) Fundamentals of Machine Learning
- [COS 557](#) Analysis and Visualization of Large-Scale Genomic Data Sets
- [COS 597D](#) Advanced Topics in Computer Science: Advanced Computational Genomics
- [COS 597F](#) Advanced Topics in Computer Sci: Computational Biology of Single Cells
- [ELE 535](#) Machine Learning and Pattern Recognition
- [MAE 550/MSE 560](#) Lessons from Biology to Engineer Tiny Devices
- [MAE 567/CBE 568](#) Crowd Control: Understanding and Manipulating Collective Behaviors and Swarm Dynamics
- [MAT 586/APC 511/MOL 511/QCB 513](#) Computational Methods in Cryo-Electron Microscopy
- [MOL 518](#) Quantitative Methods in Cell and Molecular Biology
- [MSE 504/CHM 560/PHY 512/CBE 520](#) Monte Carlo and Molecular Dynamics Simulation in Statistical Physics & Materials Science
- [NEU 437/537](#) Computational Neuroscience
- [NEU 501](#) Cellular and Circuits Neuroscience
- [NEU 560](#) Statistical Modeling and Analysis of Neural Data
- [ORF 524](#) Statistical Theory and Methods
- [PHY 561/2](#) Biophysics
- [QCB 505/PHY555](#) Topics in Biophysics and Quantitative Biology
- [QCB 508](#) Foundations of Statistical Genomics

Biological Elective Course List

- **CHM 403** Advanced Organic Chemistry
- **CHM/QCB 541** Chemical Biology II
- **EEB 504** Fundamental Concepts in Ecology, Evolution, and Behavior II
- **EEB 507** Recent Research in Population Biology
- **MAE 566** Biomechanics and Biomaterials: From Cells to Organisms
- **MAE 567/CBE 568** Crowd Control: Understanding and Manipulating Collective Behaviors and Swarm Dynamics
- **MOL 504** Cellular Biochemistry
- **MOL 506** Cell Biology and Development
- **MOL 518** Quantitative Methods in Cell and Molecular Biology
- **MOL 521** Systems Microbiology and Immunology
- **MOL 523** Molecular Basis of Cancer
- **MOL 559** Viruses: Strategy & Tactics
- **QCB 490** Molecular Mechanisms of Longevity
- **QCB 535** Biological networks across scales: Open problems and research methods of systems biology

Selected undergraduate courses of interest

(Note: these do not count toward course requirements)

- **APC 350** Introduction in Differential Equations
- **CBE 448** Introduction to Nonlinear Dynamics
- **COS 226** Algorithms and Data Structures
- **EEB 324** Theoretical Ecology
- **MOL/QCB 485** Mathematical Models in Biology
- **ORF/MAT 309/380** Probability and Stochastic Systems
- **ORF 406** Statistical Design of Experiments
- **QCB 302** Research Topics in QCB

Please visit the registrar's course offerings page at <http://registrar.princeton.edu/course-offerings> to see what is be offered this academic year and for detailed course information.

Responsible Conduct of Research (RCR)

Students are required to take [QCB501 Topics in Ethics in Science](#), the QCB course in responsible conduct of research (RCR). This course is offered every other year and students will be notified when an enrollment year is upcoming. Students are also permitted to enroll in an RCR course hosted by an affiliated department, provided both home and host departments give approval. The QCB Executive Committee is also available to field and answer questions about issues in the arena of "Responsible Conduct of Research."

As QCB501 is only offered every other year, we require all incoming students to complete the **CITI Training Module**, an online RCR course, by November of their first year. Instructions are sent directly to new students.

Students must complete all RCR training by their **third year of study, preferably earlier** (this is a requirement set by the Graduate School).

QCB Graduate Colloquium

QCB students are required to attend our **QCB Graduate Colloquium** during the spring term, and all students will give a short research presentation to their peers. The series will end with first-years giving short talks on the research conducted during one of their rotations. Schedule will be made during the fall term.

Lab Rotations & Choosing a Thesis Advisor

QCB students are required to complete three lab rotations. Rotations, approximately 10 weeks in length, will take place during the fall, winter, and spring of the first year. Students can choose rotations at their discretion. **All lab rotations must be discussed with and approved by the Director of Graduate Studies in advance.**

Lab rotation expectations: Students are required to meet with the faculty member they are rotating with at the beginning of the rotation to form a working plan. Students are expected to show up routinely in lab to work on their project and to attend all lab meetings, and it is recommended that the student meet with the faculty member periodically. Satisfactory rotation performance is one condition of [reenrollment](#). Students will be expected to present the work done during their lab rotations to their QCB peers during the spring term of the [QCB Graduate Colloquium](#). At the end of each rotation, the department will obtain feedback from both students and faculty.

Please see following page for rotation dates. ***Students should have a thesis advisor by the end of their third rotation. If a student foresees any problem with this, they should meet with the DGS as soon as possible to discuss a course of action.***

Rotation schedule for 2022-2023 academic year*

ROTATION	BEGINS	ENDS
FIRST	September 7, 2022	November 22, 2022
SECOND	November 28, 2022	February 17, 2023
THIRD	February 20, 2023	May 5, 2023

- Fall break is October 15 – 23, 2022 and spring break is March 11 – 19, 2023
- Summer months are June and July. **If you anticipate that you will not have a thesis advisor by June 1, 2023, please reach out to DGS as soon as possible.**

*We understand your rotation dates might not follow this schedule exactly for a variety of reasons, and that is okay. There is enough leeway to still ensure you can do three 10-week rotations. We have tried to account for semester breaks and holidays when estimating rotation start and end dates. *Work in thesis lab should begin no later than June 1, 2023.*

QCB General Exam Requirements (taken in January of your second year)

The general exam consists of a 7 page written thesis proposal, in the format and style of an NIH predoctoral NRSA application, and a two-hour oral exam.

The overall goal of the general exam is to be sure that you have developed a novel and feasible research plan of appropriate scope for a thesis project, and that you have the knowledge and the skills required to carry it out. Students are highly encouraged to develop successfully defended thesis proposals into F31 applications, if eligible.

1. **Forming your committee: the department will work with the student's advisor in forming an appropriate exam committee.** Once a committee is formed, the student will be responsible for coordinating a date and time, and reserving a room for the exam. The general exam committee will consist of three faculty, and the student's advisor will not serve on the examining committee and is not present at the exam. At least 1 of the 3 committee members must be QCB faculty.
2. **When it happens:** General Exams are held in January of your second year; any exceptions must first be approved by the Director of Graduate Studies and then by the Graduate School, if it falls outside of their pre-determined exam windows (see the registrar's [Academic Calendar](#)).
3. **How to prepare:** The **written portion** of the general exam is a report describing the thesis proposal and is written by the student in consultation with their thesis advisor. Proposals should be in the style of an NIH fellowship, as follows:
 - a. **Your proposal must have a title**
 - b. **Specific Aims (1 page)***
 - c. **Research Strategy, which is broken down into: (a) Significance and (b) Approach (6 pages)****
 - d. **References (mandatory) and figures (if applicable) – no page limit**

It is recommended that the thesis advisor review the student's thesis proposal and offer feedback to the student before the general exam, but advisors are asked not to rewrite any part of the proposal.

4. **Submit your final thesis proposal** to your committee members and the graduate administrator (Jennifer Giraldi) at least one week in advance of your exam.
5. **The second part of the generals is a two-hour oral presentation**, which should cover the content in the written proposal.
 - a. **The format: Chalk talk. If you'd like to add anything, such as a video, you must consult with your exam committee for approval beforehand.** During the presentation, anticipate being interrupted early and often with comments and

questions throughout your presentation. They will ask questions to get a sense of your breadth and depth of knowledge in your area of focus, as well as general molecular and biological and quantitative knowledge. It is normal and acceptable for you to not know the answers to all of their questions, so do not panic if you have to say “I don’t know”. It is a good idea to make sure your room is equipped with supplies you need before you begin (chalk, water, etc.).

- b. Have a minimum of two practice exams with your lab**, one of which should include your thesis advisor. It is often helpful to ask more senior students from the labs of your committee members to come to your practice exams and try to ask the kinds of questions their advisors might.

The general exam results: your committee will confer immediately after your exam and submit a written recommendation to the QCB graduate committee, who will then decide the final result. The student will then receive an official document from the department and the graduate school, stating the pass or fail. If the result is a fail, the student must retake the exam within a year of the fail date. Students who fail a second time will have their Ph.D. candidacy and enrollment terminated.

Students who pass the general exam will receive an email from the graduate school inviting them to apply for their incidental Master of Arts degree, which is done through TigerHub.

*** SPECIFIC AIMS (1 PAGE)**

State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will have on the research field(s) involved.

List succinctly the specific objectives of the research proposed (e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop a new technology).

****RESEARCH STRATEGY (6 PAGES)**

Start each section of the Research Strategy with an appropriate section heading – **Significance** and **Approach**. Cite published experimental details in the Research Strategy section and provide the full reference in a References Cited section at the end. While there is no page limitation for bibliography, it is important to be concise and to select only those literature references pertinent to the proposed research.

(a) Significance

- Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.
- Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.
- Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

(b) Approach

- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project.
- Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.

Above guidelines taken from NIH website:

<https://researchtraining.nih.gov/programs/fellowships/F31>

In summary, your proposal should present a research project that you intend to carry out over the duration of your time in the QCB program. The proposal should include a cited background in literature, how your project fits into this background, the significance of your proposal, the approach you will use and what the rationale is behind your approach. You should also discuss potential problems and what alternative strategies may be used to lead to possible solutions. And please keep in mind that this is a proposal, and it is understood that it is in the preliminary stages of research.

Teaching

<http://gradschool.princeton.edu/costs-funding/sources-funding/assistantships/assistantships-instruction>

To complete the teaching requirement, a student must teach a minimum of one full-time assignment (6 AI hours), or teach two part-time assignments of 2 or more AI hours each. Students typically teach in their fourth year of study. No student is permitted to teach until after a successful general exam.

Please note that this is the minimum to complete the program's teaching requirement. You may need to teach additional hours/terms at your advisor's request, for funding and/or educational purposes. If you do not teach full-time, and are not on fellowship, your advisor will be expected to fund the remaining stipend and tuition that term(s).

Every March, the department will send out a *Teaching Request* form, and this would be a good time for you to have a discussion with your advisor about expectations for the upcoming academic year. If you will be teaching in the upcoming year, you will indicate which courses would be a good fit for you (see end of this document for a sample). Students G4+ who need to complete the program requirement are considered first for available teaching slots.

The graduate administrator will make all teaching assignments in the summer for fall term courses and around October for all spring term courses. Department courses include ISC231-234, ISC326, QCB302, QCB408, QCB515, and COS551/QCB455. If a student would like to teach one of these courses in particular, or a course from another department, they should inform the graduate administrator as soon as possible, so the request can be taken into consideration. Students have also taught in courses for CBE, COS, EEB, ENV, MAT, MOL, SML. These are usually secured with assistance from the student's advisor. If you do plan to teach in a course outside of QCB, you must notify us immediately with your teaching plan, as we handle your funding.

First-time Assistants-in-Instruction (AI's) are required by the Graduate School to attend a training & orientation course given by the McGraw Center for Teaching and Learning. Trainings are offered twice a year, once in early September for fall term AI's and once in late January for spring term AI's. The graduate administrator must register all students so they are given credit for completing the training.

If you are on a fellowship, you can usually still teach, but it must be a 3 hour (50%) assignment or less. This is graduate school policy. You also need to check with your fellowship officer on if they have any specific rules regarding teaching to make sure it is allowable (every fellowship is different!)

Thesis Advisory Committee and Thesis Committee Meetings

After the student has chosen a thesis advisor and passed the general exam, they must form a thesis committee, which consists of the thesis advisor and two additional faculty members. If you are co-advised by two faculty, you will need two non-advisor committee members; if you are co-advised by three faculty, one additional committee member is sufficient. At least one member of your committee must be QCB faculty. If you need assistance in forming your committee, please work with your advisor and/or DGS. The thesis committee must ultimately be approved by the DGS.

Thesis committee meetings are mandatory and held once a year in October. The student or any of the committee members may hold additional meetings as needed. It is recommended that at least two meetings are held each year, but it is not required.

To prepare for the thesis committee meeting, the student should write 1-2 pages about their research progress and goals and then present this and any future plans to the thesis committee for feedback. Meetings typically last one hour. Graduate students are responsible for organizing the meeting.

Please keep the graduate administrator informed of any upcoming meetings, as a progress form is sent to the committees ahead of time.

Dissertation

<http://gradschool.princeton.edu/academics/degree-requirements/phd-requirements/dissertation-and-fpo>

After the student has chosen a thesis advisor, completed all coursework, and passed the general exam, the remainder of the program is devoted to independent research leading to the writing of a dissertation.

The dissertation must show that the candidate has technical mastery of the field and is capable of doing independent research. This study must enlarge or modify current knowledge in a field or present a significant new interpretation of the known materials.

The dissertation is reviewed and approved by at least two principal readers before being submitted for acceptance to the Graduate School. **The Graduate School requires that all reader's reports and other documentation be received in their office, via the advanced degree application in TigerHub, at least three to four weeks before your defense (FPO) examination date.**

Thesis format and procedures for its deposition with the University archives can be found on the Mudd Library website: <https://rbsc.princeton.edu/policies/masters-theses-and-phd-dissertations-submission-guidelines>.

Final Public Oral Examination (your dissertation defense)

The final public oral (FPO) examination is a final exam in the student's field of study and a defense of the dissertation, and is the last formal requirement for the Ph.D. The advisory committee serves as the final thesis committee and conducts the FPO. Additional faculty may need to be included as at least two of your FPO committee members may not also be principal readers of your dissertation.

The FPO consists of a public lecture on the thesis research, usually of about one hour in length. During this presentation, the public and the thesis committee may question the student about the research.

Students who successfully defend by early May are invited to participate in the June Commencement. Degree deadline dates can be found on the Graduate School website: <https://gradschool.princeton.edu/academics/degree-deadlines>.

If the student does not pass the final public oral examination, he or she may request to retake the examination within one year. If unsuccessful a second time, the candidate is not permitted another opportunity to retake the examination, and Ph.D. candidacy is terminated.

Students may wish to consult [Benefits and Status after the FPO](#) for information about benefits you may receive between FPO and degree conferral.

Timeline to your Dissertation Defense (aka FPO, Final Public Oral)

To start: Click [here](#) for degree deadlines

Please refer to the graduate school website for their "Preparing for the FPO" timeline as any updates will be posted there: <https://gradschool.princeton.edu/academics/degree-requirements/phd-advising-and-requirements/dissertation-and-fpo/advanced-degree>

QCB specific information for your **principal readers** and **examining committee**:

- a. *Dissertation readers*: You must have two faculty dissertation readers. One should be your advisor.
- b. *FPO exam committee*: A minimum of 3 faculty members are required, and one is your advisor(s). Two faculty on your committee must **not** have read your dissertation. At least one member of your committee must be QCB faculty.
- c. Coordinate your FPO date and time with your exam committee, and book a room.

Reenrollment (happens every April)

<http://gradschool.princeton.edu/academics/degree-requirements/standard-requirements/reenrollment>

Students are evaluated on an on-going basis by their research advisor, thesis committee and the Director of Graduate Studies. Readmission to a subsequent academic year is conditional on the progress and conduct during the previous year.

Students will be notified by the Graduate School via email, with instructions, when it is time to submit the reenrollment application. This is an annual process. Reenrollment applications typically open to students in mid-March, with a deadline in April. On the reenrollment application, students describe their academic progress of the current year and their goals for summer and the next academic year. **Students are expected to be as detailed as possible in the applications**, or their reenrollment application may get an initial rejection by their advisor, which causes a delay in process. (e.g. do not only write “work in lab” as your summer goals).

Once the student submits the application, the advisor then provides feedback (if there is an advisor at this point). In turn, the department receives the application, provides feedback, and submits the application to the Graduate School for approval. The student will then receive a renewal contract from the Graduate School for the upcoming academic year.

Student Status

<http://gradschool.princeton.edu/academics/enrollment-statuses>

Please visit the Graduate School website for information regarding the following student statuses: In Absentia, Leave of Absence, Withdrawal, Degree Completion Enrollment (DCE), Enrollment Terminated, Degree Candidacy Continued (ETDCC) and Termination.

Funding Information

Students in the QCB Graduate Program are provided funding for a five year enrollment period. For the first year of study, the Graduate School provides fellowship and tuition payment; in subsequent years, students are funded via department funds, training grants, teaching positions, research grants, internal or external fellowships, or a combination thereof.

Graduate students are paid once a month. Direct deposit can be set up through TigerHub.* If direct deposit is not set up, paychecks are held onto by the Institute’s HR Assistant, and students are emailed when they are ready for pick up.

Paycheck amounts will vary year-to-year depending on funding source. If a student is paid via **fellowship**, no taxes are directly deducted from paychecks, and students are expected to report those taxes. First year of pay from the graduate school is considered a fellowship. Other potential fellowships include the LSI’s NIH training grant, and external

awards such as the NSF, NJCCR, etc. If a student is **not on a fellowship (i.e. research or teaching)**, then taxes are taken out of paychecks like any other salaried position. The graduate school does not offer tax assistance, but a guideline summary can be found on their website.**

*Direct deposit instructions:

<https://finance.princeton.edu/announcements/2020/sign-direct-deposit>

**Tax information: <https://gradschool.princeton.edu/costs-funding/tax-information>

Outside Funding

<http://gradschool.princeton.edu/costs-funding/sources-funding/external-funding/external-fellowships>

Students are encouraged to apply for outside sources of funding. Please discuss with your advisor about appropriate fellowship opportunities and visit Princeton's Pivot site at https://pivot.proquest.com/funding_main. A spreadsheet of upcoming fellowship opportunities will also be sent out once a year to all students and advisors.

Students who do obtain external awards must fill out the Graduate School's **External Fellowship Form**, so the graduate school and the department have all of the necessary award information. <https://gsapps.princeton.edu/externalfellowship/>

Safety Training

All students must complete **laboratory safety** and **biosafety training** offered by Princeton's office of Environmental and Health Services (EHS). Students who do not take this course will not be permitted to work in a lab. Students will typically complete training during September orientation, before the start of their first lab rotation.

Students should visit the EHS website, <http://www.princeton.edu/ehs>, for further information on safety issues, hazardous material and more.

Student Vacation Policy <http://gradschool.princeton.edu/policies/student-vacation-time>

Graduate study is understood to be a full-time commitment. The specific periods taken as vacation must not conflict with the student's academic responsibilities, coursework, research or teaching.

Students must discuss vacation time with their advisor(s). If a student is teaching, approval must also be given by the course instructor. AI's will typically not be allowed to take vacation when class is in session or during reading period and exam times.

International Travel <http://www.princeton.edu/travel/graduate-students>

The Graduate School requires that all graduate students on University sponsored travel register their trips in the University's Travel Registration database, Concur. This is travel that is funded, entirely or in part, by PU funds or funds processed through University accounts.

Affiliated Seminar Series

Please note that attendance is mandatory for the QCB Seminar Series only. All other seminars are optional and listed here for informational purposes only. Seminars are held during the academic year.

QCB Seminar Series (Lewis-Sigler Institute)

<http://lsi.princeton.edu/archives/seminars>

CUNY-Princeton Biophysics Seminar Series

<http://lsi.princeton.edu/archives/seminars>

Chemical and Biological Engineering

<http://www.princeton.edu/cbe/events>

Chemistry

<http://chemistry.princeton.edu/seminars-events/type/seminar>

Computer Science

<http://www.cs.princeton.edu/general/newsevents/events>

Ecology & Evolutionary Biology Seminar Series

<http://www.princeton.edu/eeb/events>

Molecular Biology Seminar Series

<http://molbio.princeton.edu/events/all>

Neuroscience Seminar Series

<http://www.princeton.edu/neuroscience/events/index.xml?category=Neuroscience%20Seminar%20Series>

PACM Seminar Series (Program in Applied and Computational Mathematics)

<https://www.math.princeton.edu/events>

Information Links and Contacts

QCB Faculty <http://lsi.princeton.edu/qcbgraduate/faculty-research>

QCB Staff <http://lsi.princeton.edu/people/staff>

QCB Graduate Program <http://lsi.princeton.edu/qcbgraduate>

TigerHub Login Page

(where students register for courses, reenroll and manage payroll information, including setting up direct deposit and W-2 information): <https://registrar.princeton.edu/tigerhub/>

Graduate School

Location: Clio Hall; Phone: 609-258-3034; <http://gradschool.princeton.edu>

Pivot: Princeton's external fellowship funding opportunity search engine

https://pivot.proquest.com/funding_main

CPS (Counseling and Psychological Services)

Location: McCosh Health Center (Third Floor); Phone: 609-258-3285

<http://www.princeton.edu/uhs/student-services/counseling-psychological>

University Health Services

Location: McCosh Health Center; Phone: 609-258-3129

<http://www.princeton.edu/uhs>

Payroll questions

Location: 701 Carnegie Center, Suite 154

Phone: 609-258-3082; Email: payroll@princeton.edu

<https://finance.princeton.edu/payroll-labor-accounting/payroll>

Tax questions

<http://gradschool.princeton.edu/costs-funding/tax-information>

For additional help, domestic students must visit the IRS website or consult a professional tax preparer for assistance; international students can visit the Davis International Center for assistance:

<https://davisic.princeton.edu/taxes-social-security>

Housing Office

Location: Macmillan Building

Phone: 609-258-3460; Email: gradhsg@Princeton.EDU

Weather Hotline: 609-258-SNOW

Public Safety: 609-258-1000

Core Course Descriptions

QCB 515 Method and Logic in Quantitative Biology [Offered in fall term]

Close reading of published papers illustrating the principles, achievements, and difficulties that lie at the interface of theory and experiment in biology. Two important papers, read in advance by all students, will be considered each week; the emphasis will be on discussion with students as opposed to formal lectures. Topics include: cooperativity, robust adaptation, kinetic proofreading, sequence analysis, clustering, phylogenetics, analysis of fluctuations, and maximum likelihood methods. A general tutorial on Matlab and specific tutorials for the four homework assignments will be available.

QCB 535 Biological networks across scales: Open problems and research methods of systems biology [Offered in fall term]

This Special Topics Quantitative and Computational Biology Course comprises five units, each presenting a different level of biological organization. Unit 1 focuses on the regulation of single genes and gene networks. Unit 2 discusses enzyme networks in metabolism and protein-protein interaction networks that control intracellular processes. Unit 3 focuses on cell-cell communication within adult and developing tissues. Unit 4 is on control systems that coordinate tissues in growing and aging organisms. Unit 5 is on networks of organisms, connecting with ideas from genetics, biochemistry, and physiology.

COS/QCB 551 Introduction to Genomics and Computational Molecular Biology [Offered in fall term]

This interdisciplinary course provides a broad overview of computational and experimental approaches to decipher genomes and characterize molecular systems. We focus on methods for analyzing "omics" data, such as genome and protein sequences, gene expression, proteomics and molecular interaction networks. We cover algorithms used in computational biology, key statistical concepts (e.g., basic probability distributions, significance testing, multiple hypothesis correction, data evaluation), and machine learning methods which have been applied to biological problems (e.g., hidden Markov models, clustering, classification techniques).

QCB 501 Topics in Ethics in Science [Offered every other year]

Discussion and evaluation of the role professional researchers play in dealing with the reporting of research, responsible authorship, human and animal studies, misconduct and fraud in science, intellectual property, and professional conduct in scientific relationships. Participants are expected to read the materials and cases prior to each meeting. Successful completion is based on regular attendance and active participation in discussion. This half-term course is designed to satisfy federal funding agencies' requirements for training in the ethical practice of scientists. Required for graduate students and post-docs.

QCB Graduate Student Checklist

If needed, this checklist is intended to help you keep track of your graduate career milestones.

Course Requirements

- QCB 515** (Method and Logic in Quantitative Biology)
- COS/QCB 551** (Introduction to Genomics and Computational Molecular Biology)
- QCB 535** (Biological networks across scales)
- QCB 501** (our RCR or Responsible Conduct of Research course) - offered approximately every other summer
- Elective #1** _____
- Elective #2** _____
- NOTE: At least one elective must be from our *Quantitative* course elective list (see <http://lsi.princeton.edu/qcbgraduate/education/phd-program-requirements>). All course substitutions must be approved by the DGS, email Ned Wingreen and Jennifer Giraldi before a course is taken. Courses cannot be taken P/D/F.

Research Rotations

Students must complete three lab rotations. All rotations are usually completed by end of the first year, and the student's thesis lab should be decided upon at the conclusion of the rotations and started the summer after their first year. If a student foresees any issues with this timetable, they should meet with the DGS to discuss a course of action.

- Rotation 1: Lab and Project

- Rotation 2: Lab and Project

- Rotation 3: Lab and Project

General Exam (held in January of your second year):

- By the fall of your second year, the department will work with advisors on creating exam committees, which will consist of three faculty. The exam committee cannot include your thesis advisor. Committees must have at least one QCB faculty member.
- Once you are notified of your exam committee, book the date/time/room with your committee as soon as possible.
- Prepare your written submission and practice giving your talk.
- Submit proposal to your committee and Jen Giraldi at least a week in advance of the exam.

Exam committee member #1 _____

Exam committee member #2 _____

Exam committee member #3 _____

Thesis Committee Meetings (held annually in October)*

- Form thesis committee by the fall term following your successful general exam (one member will be your advisor). At least one member must be QCB faculty. All committees must be approved by DGS.
- Completed meeting in October of third year.
- Completed meeting in October of fourth year.
- Completed meeting in October of fifth year.

Thesis committee member #1 _____

Thesis committee member #2 _____

Thesis committee member #3 _____

*To prepare for a meeting, write up 1-2 page summary of your research progress and goals. Present this and your future plans to the thesis committee for feedback.

Dissertation and FPO (Final Public Oral): You can find information and a complete checklist for Princeton's FPO process here:

<https://gradschool.princeton.edu/academics/degree-requirements/phd-advising-and-requirements/dissertation-and-fpo/advanced-degree>.

QCB TEACHING REQUEST FORM (sample - updated form will be emailed out annually)

Please discuss the upcoming year with your advisor(s) and find out if they expect you to teach. QCB students typically teach in year 4. Students in year 4, as well as older students that have not met their program teaching requirement, are given priority. Note also that many fellowships and our training grant limit the number of hours you are permitted to teach. I will work with instructors and your advisors on final placements.

- Your name:
- Date:
- Need to teach in fall term (yes, no)?
- Need to teach in spring term (yes, no)?

FALL TERM COURSES (Please number ALL the courses that you would be a fit for by ranking them, with a “1” being your top choice. Leave blank the courses that you would not be a fit for.)

[QCB 302, Research Topics in QCB](#)

Requirement: student must have background in molecular biology and/or genetics.

[QCB455, Intro to Genomics and Computational Molecular Biology](#)

Requirement: student must have a solid background in computational biology, statistics, genomics, and R programming.

[QCB515, Method and Logic in Quantitative Biology](#)

Requirement: student must have a background in programming and applied math.

[ISC 231/232, Integrated Science, precept AI's](#)

Requirement: solid background in mechanics, statistical physics, chemical kinetics, and chemical equilibria. Note: if you meet only part of requirement, that is okay, please check this off and add your details in the “additional comments” section on the next page.

[ISC 231/232, Integrated Science, lab AI's](#)

Requirement: Student must have an experimental background. A background in physics is preferred, but students with a background in biology will also be considered. Labs are physics and biology centric, and utilize MATLAB extensively.

SPRING TERM COURSES (Please number ALL the courses that you would be a fit for by ranking them, with a “1” being your top choice. Leave blank the courses that you would not be a fit for.)

[ISC233/234, Integrated Science, precept AI's](#)

Requirement: solid background in mechanics, electricity and magnetism, quantum mechanics, and physical chemistry. Note: if you meet only part of this requirement, that is okay, please check this off and add your details in the “additional comments” section below.

[ISC 233/234, Integrated Science lab AI's](#)

Requirement: Student must have an experimental background. A background in physics is preferred, but students with a background in biology will also be considered. Labs are physics and biology centric, and utilize MATLAB extensively.

[ISC 233/324, Integrated Science computer science AI's](#)

Requirement: knowledge of JAVA and basic data structures (arrays, trees etc). No knowledge of biology is needed.

[QCB 408, Foundations of Statistical Genomics](#)

Requirement: student must have a solid background in statistics, genetics/genomics, and R programming.

- If you are already planning to teach outside of QCB this AY, please indicate that here, and include the **term, course number, title, and how many AI hours it will be:**

- If you feel you are a fit for teaching in departments / courses outside of QCB, but have not officially identified anything, please list them here (e.g. you could say EEB dept, or SML courses, or course CBE 123, etc.):

Additional Comments: