Overview of PhD Programs
For New Students

School of Mathematics, Georgia Tech

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See our **Current Students Page** for a hyperlink version of this presentation:

www.math.gatech.edu/∼yu/GraduateProgram/Orientation.pdf

All Green Phrases in this presentation are hyperlinks to a page on the School of Math's or Institutte's website.

See **Current Students FAQ** for answers to some frequently asked questions.

Outline

Outline

Degrees offered

- **PhD**
  - Mathematics (Math)
  - Algorithms, Combinatorics, and Optimization (ACO)

    joint with: College of Computing, and the School of Industrial and Systems Engineering
  - Computational Sciences and Engineering (CSE)

    joint with: seven other schools
  - Bioinformatics (BINF)

    joint with: five other schools
  - Quantitative Biosciences (QBioS)

    joint with: six other schools
  - Machine Learning (ML)

    Joint with Colleges of Computing and Engineering
- **MS**
  - Mathematics (Math)
  - Computational Sciences and Engineering (CSE)
  - Quantitative and Computational Finance (QCF)
  - Statistics

Many PhD students pick up an MS degree along the way.

If you wish to do so, you may petition for that as you complete the required coursework for MS.

See the bottom of our MS Page for the procedures for collecting an MS degree.

Degree requirements

All PhD programs require the following elements:

- Responsible conduct of research (RCR) training
- Course work
- Written comprehensive exams
- Oral comprehensive exam
- Minor — 6 or 9 hours of course work outside area of specialization.
- Dissertation

But each item is interpreted a little differently depending on the program. QBioS and ML do not require written comprehensive exams.

Degree requirements: RCR

All PhD students at Georgia Tech must complete RCR training that consists of:

- **CITI module on-line training**
  - 4-6 hours to complete
  - Must be completed within 90 days (or hold on registration)
- **In person training**
  PhD students from the School of Math will complete this by taking MATH 6001, taught by Chris Jankowski.

  Must be completed within a year on campus, but we highly encourage you to sign up for this course in the Fall (or else you will need to take a course that is not geared towards math and spend a great deal of time talking about things not really relevant to math). For more info see

  Institute's RCR Page

Degree requirements: Coursework in **Math**

You must complete 36 hours of course work:

- At least 30 hours must be in math courses at the 6000-level or higher.
- At least 6 hours must form the doctoral minor field of study.
- The overall GPA for these courses must be at least 3.0.
- These courses must be taken for a letter grade and passed with a grade of at least C.
- See also the Breadth Requirements that must be satisfied.

Degree requirements: Coursework in **ACO**

- 7 Core Courses
  - CS 6515 -Introduction to Graduate Algorithms or CS 6520 Complexity
  - CS 6550 - Design and Analysis of Algorithms
  - ISyE 7661 - Theory of Linear Inequalities
  - ISyE 7686 - Advanced Combinatorial Optimization
  - Math 6014 - Graph Theory
  - Math 6121 - Algebra I
  - Math 7018 - Probabilistic Methods in Combinatorics
- 15 hours of additional coursework at the 6000 level or above including:
  - Math 6337 - Real Analysis I
  - Two of the following three:
    - Math 6112 - Advanced Linear Algebra
    - Math 6321 - Complex Analysis
    - A 6000 level or above topology/geometry course

  Math 6338 - Real Analysis II is not required but is strongly encouraged

Degree requirements: Coursework in **CSE**

- CSE 6001, Introduction to CSE (1 credit hour)
- 12 hours of courses chosen from
  - CSE/Math 6643 Numerical Linear Algebra
  - CSE 6140 Computational Science and Engineering Algorithms
  - CSE 6730 Modeling and Simulation: Fundamentals & Implementation
  - CSE/ISYE 6740 Computational Data Analysis
  - CSE 6220 High Performance Computing
- 9 hours of computation specialization: Courses that increase understanding of computational methods, approved by academic advisor.
- 9 hours of an application specialization: Courses that increase depth of understanding in an application field; these need not be computation focused courses.
- 9 hours (for CSE-MATH students) of MATH courses which are not cross-listed with another department.
- 9 credit hours of courses in an approved minor

Degree requirements: Coursework in **BINF**

- 9 credit hours of Bioinformatics and Computational Bioscience (e.g. BIOL 6150, BIOL 7200, BIOL 7210)
- 9 credit hours in Biology, Biochemistry or Biomedical Engineering (e.g. BIOL 7015, BMED 6517, BIOL 8803)
- 9 credit hours of Mathematics and Computer Science (e.g. CS 7641, CSE 6242, MATH 6702)
- 9 credit hours of courses in an approved minor
- 24 research credit hours

Degree requirements: Coursework in **QBioS**

- BIOL/PHYS 6750 – Foundations of Quantitative Biosciences (4 hours)
- BIOL 8801 – Seminars in Quantitative Biosciences (2 hours) and Professional Development in Quantitative Biosciences (1 hour)
- Three courses from Quantitative Modeling Core (e.g. APPH 6225, CHEM 6481, CSE 6140, MATH 6221)
- Two courses from Bioscience Disciplinary Electives
- One course from Quantitative Models in the Biosciences
- One additional elective must be taken as part of the “interface” minor requirement

Degree requirements: Coursework in **ML**

- 12 credit hours of core courses
  - Mathematical Foundations of Machine Learning (CS/CSE/ECE/ISYE 7750)
  - Probabilistic and Statistical Methods in Machine Learning (ISyE 6412, ECE/ISYE/CS/CSE 7751, MATH 7251, MATH 7252)
  - Machine Learning Theory and Methods (chosen from CS 7545, CS7616, CSE/ISyE 6740, ECE 6254, ECE 6273)
  - Optimization (chosen from ECE 6270, ISYE 6661, ISYE 6663, ISYE 7683)
- 15 credit hourse of five courses (electives from a large list of courses)
- 6 credit hours of courses in an approved minor

Degree Requirements: Comps in **Math**

Students must pass 2 of 7 exams offered in *Algebra, Analysis, Differential Equations, Discrete Math, Numerical Analysis, Probability, and Topology*.

- Must include Algebra or Analysis
- Must be completed within 2 years of starting program
- Administered during the first two weeks of Fall and Spring terms

You can take each exam up to 4 times during your 2 years. No penalty for doing badly so try them whenever you like.

Algebra and Analysis exams are offered each Fall and Spring, but others will be offered only if students register for them in the prior semester.

Degree Requirements: Comps in **Math**

For Fall 2024, the exams will be

- **Algebra** on Monday, August 12 (3pm–6pm)
- **Analysis** and **Discrete Mathematics** on Wednesday, August 14 (3pm–6pm)
- **Differential Equations**, **Probability**, and **Topology** on Friday, August 16 (3pm–6pm)

For syllabi of Math Comps, see our

Written Comprehensive Exams Page

An extensive library of past exams is also available at

Past Comprehensive Exams Page

Degree Requirements: Comps in **ACO**

- The exam contains questions based, more or less, on the material in the ACO core courses. The syllabi for the exams are at

  www.aco.gatech.edu/academics/examination-syllabi

- Must be passed by the end of the 4th academic semester (not including Summers), but encouraged to complete within 3 academic semesters.

You can pass the exam, or fail with a recommendation to retake the exam, or fail without being able to retake the exam.

Degree Requirements: Comps in **CSE**

- Select 2 exams from among 5 subjects: numerical methods, discrete algorithms, modeling and simulation, computational data analysis, and high performance computing.
- Should be completed within 2 years of starting program.

Degree Requirements: Oral Comp

For all programs must be completed by the 3rd year on campus.

- Math:
  - 1 to 3 page written proposal concerning area of research.
  - 40 minute oral presentation to committee plus questions and feedback from committee.
- ACO (also called Research Proposal):
  - Write 3-6 page proposal about research.
  - 20 minute oral presentation to a committee followed by questions from the committee.
- CSE:
  - Create a computational artifact.
  - Write 5 page proposal discussing work.
  - Oral presentation to committee.

Degree Requirements: Oral Comp

- BINF:
  - Write proposal.
  - Oral presentation to committee.
- QBioS:
  - Write a thesis proposal (10 pages + 2 additional pages for references).
  - 45 minute oral presentation to committee.
- ML:
  - Take a one-semester course and submit a summary report.
  - Closed oral exam with committee (with a short presentation).

Degree Requirements: Minor

According to GT Catalogue,

www.catalog.gatech.edu/academics/graduate/doctoral-degree-info/

all PhD programs at Georgia Tech should satisfy a minor requirement in their course work, which

- Consists of at least 6 hours, preferably outside the School,
- Be in a related group outside student's area of specializtion and selected in consultation with student's advisor or the DGS
- Should be at the 6000 level or above, but the use of certain 4000 level courses may also be approved
- Courses should be taken with a letter grade and with grade C or higher.
- PhD MATH program requires 6 hours of course work with grades A or B, see

www.math.gatech.edu/graduate/doctoral-programs

Degree Requirements: Dissertation

The writing of the Dissertation constitutes the final phase of your graduate studies.

You need to finish your thesis within 7 years of passing the oral comp. This also involves a Thesis defense, sometimes called the final oral exam.

For more details, see our **Dissertation and Graduation Page**

Outline

First year: Mentors and PhD advisors

All PhD students in the School of Math are assigned an initial mentor when they arrive

- The mentor is assigned based on students interests.
- Your mentor will help you select classes, navigate the seminars and colloquia, help with teaching issues, ...
- You can change your mentor at any time. Please inform the DGS when you do.
- Your mentor is not your PhD advisor. You will choose a PhD advisor sometime within your first 2 or 3 years on campus.

For more details, see **Expectations for Graduate Students and Faculty**

First year: Research Horizons Seminar

- Seminar run by graduate students.
- Faculty give talks aimed at first and second year graduate students.
- Ideal place to learn about what type of research is going on in the department and possibly find an advisor!
- Also, free pizza!

All students should go to this seminar.

Attendance for most seminars will be part of the requirements for MATH 6001.

First year: Grad Groups

All first year PhD students are encouraged to register for GT 6000, Grad Groups, which is a one credit hour course for the first eight weeks of Fall 2024.

- All of the activities are designed to provide guidance, support, development, and/or time for reflection.
- Set a foundation for your time as a graduate student at Georgia Tech.
- Detailed syllabus for a recent offering of Grad Groups at

Grad Group Syllabus

First year: Other student activities

In addition to the Research Horizon Seminars, Grad students and Grad Student Council organize several other activities, which you are encouraged to take part in or even lead.

These include activities related to the High School Math Competition, Peer Mentoring Program, and Student Chapters of AMS, SIAM and AWM. For more info and to contact the organizers see

Student Activities Page

There are also teas every afternoon, which you are encouraged to attend.

We will also organize monthly board game nights for you.

First year: Academics

- Take core courses and take other courses to explore your interests.
- Try written comprehensive exams (if you are in Math).
- Talk to the DGS or your mentor about your plan of study.
- Go to the Research Horizons Seminar.
- Attend other Seminars and Colloquia.
- Talk to other students and faculty members about their area of interest.
- Take part in student activities and attend the daily Tea.

Apart from your coursework and the comps the main thing you should be considering in your first year or two is who your PhD advisor will be. The best way to find your advisor is to talk to students and faculty!

Outline

Logistics

A. **e-mail:** All of you have a Georgia Tech email account (of the form @gatech.edu or @math.gatech.edu).

   You should check this account daily to keep up with important announcements and messages.

B. **Offices:** We have 20 small 2 person offices and 6 larger 12 person offices. Four small offices are located on the second floor of Skiles, and all others are located on the first level. You will start in a large shared office and may be able to move to a smaller one shared with only one other student (usually after completing your comprehensive exams).

Logistics

C. **TA duties:**

- Normally you will have “5 contact hours" a week: two 2-hour studio sections and 1 hour in the math lab. In addition, you will need time to prepare for your studio session and grade.
- In your first semester you get a lighter load, which allows time for you to take CETL 8000 and to get acclimated to Georgia Tech.
- In a normal semester we expect you to work about 1/3 time on your TA duties. That should be about 13 hours. Of course in some weeks it might be a bit more and some a bit less, but if you are consistently working over the 13 hours please let Klara Grodzinsky or the DGS know about it.
- After passing your comprehensive exams you will have the opportunity to teach your own class.

Outline

Registration Issues

A. To be a **full time student** you must register for at least **12 hours** per semester (but no more than 21).
   - **If you are a TA, RA or on a visa you must be full time; otherwise, you will jeopardize your funding and visa.**
   - At least 9 of those 12 must be taken Pass/Fail (P/F) or for a Letter Grade. The remaining 3 hours can be Audit.
   - In the summer you still must take 12 hours of courses, but 6 of those hours can be Audit.
   - If you drop a class you must make sure that you do not go below 12 hours.

B. Special Classes I:
   Each term you are a TA or RA you may take:
   - Math 8997 — the TA course, 3 hours for Audit only; or
   - Math 8998 — the RA course, 3 hours for Audit only

   Another course convenient for auditing is
   - Math 7999 — Prep-PHD Qual Exam, 3 hours for Audit only.

   These classes help you keep your full time status.

Registration Issues

C. Special Classes II:
   - Math 8900 — Special Problems/Directed Study.
   - Math 9000 — PhD Thesis Writing (only P/F)

   You can take as many hours as you like, subject to the approval of your mentor, advisor, or another faculty member.

D. First time you TA you must take CETL 8000 with Klara Grodzinsky. This is a 1 credit hour course (P/F).

E. In your first semester you should take MATH 6001 – Intro. to Graduate Math. It will complete your RCR training requirement. This is a 2-credit hour course (PF).

F. Many/most international students will also take Math 8305 (ESL) with Mo Burke. This is a 2-credit hour course (PF).

G. In the first semester, you have the option to take GT 6000 – Grad Groups. This is a 1 credit hour course (PF).

Registration Issues

First semester **Math** students typically take:

i. CETL 8000 (1 hr, P/F) and GT 6000 (1hr, P/F)

ii. 2 or 3 of the following courses (each is 3 hours and should be taken LG):
   - MATH 6112 — Advanced Linear Algebra
   - MATH 6121 — Algebra I
   - MATH 6337 — Real Analysis I

iii. MATH 6001 (2 hr, P/F)

iv. Math 8997 for GTA or Math 8998 for GRA (3 hr, Audit)

v. International students might take MATH 8305 — ESL (2hr, P/F)

ACO, BINF, CSE, ML, and QBioS students typically take the same except item ii is replaced with core courses form their programs (see above).

NOTE: If you sign up for 15 hours then you can drop a course later and still be full time (and hence keep being a TA/RA!).

Outline

Finding help

Comprehensive info about all **Graduate Programs** in the School of Math is available at:

www.math.gatech.edu/graduate/doctoral-programs

In particular, see the **Page for Current Students**:

www.math.gatech.edu/graduate/grad-current-students

and specially the **Frequently Asked Questions**:

www.math.gatech.edu/graduate/current-graduate-students-faq

There is also a list of **Faculty Contacts**:

www.math.gatech.edu/graduate/faculty-contacts

Finding help

- Academic and programatic concerns:
  - Xingxing Yu — Director of Graduate Studies

    (All matters concerning graduate program, including student/advisor relations)
  - Chris Jankowski — Director of Advising and Assessment for the Grad Program

    (RCR training, Credit Transfer, MS degree, general academic issues)
  - Tranae Caldwell — Grad. Program Coordinator

    (Office space, registration issues, visa issues, forms, general administrative issues)

  All the above people read emails sent to dgs@math.gatech.edu.
- For teaching concerns:
  - Klara Grodzinsky — TA Coordinator
  - Mo Burke — International TA Coordinator
  - Igor Belegradek — Director of Teaching Effectiveness
- For registration and permit issues:
  - Send an email to academics@math.gatech.edu

Finding help

- For personal support:
  - Office of the Dean of Students
    studentlife.gatech.edu/about/office-dean-students

    (Can direct you to a variety of support services)
  - Stamps Health Services
    health.gatech.edu

    (Primary care, pharmacy, women's health, psychiatry, immunization and allergy)
  - Center for Mental Health Care & Resources
    mentalhealth.gatech.edu/

    (individual counseling, testing and assessment, referral services, and crisis intervention.)
  - Students Temporary Assistance and Resources
    star.studentlife.gatech.edu

    (Can assist with emergency short term housing needs, food, and clothing)

Finding Help

Supporting Student **Mental Health** & **Well-Being** at Georgia Tech

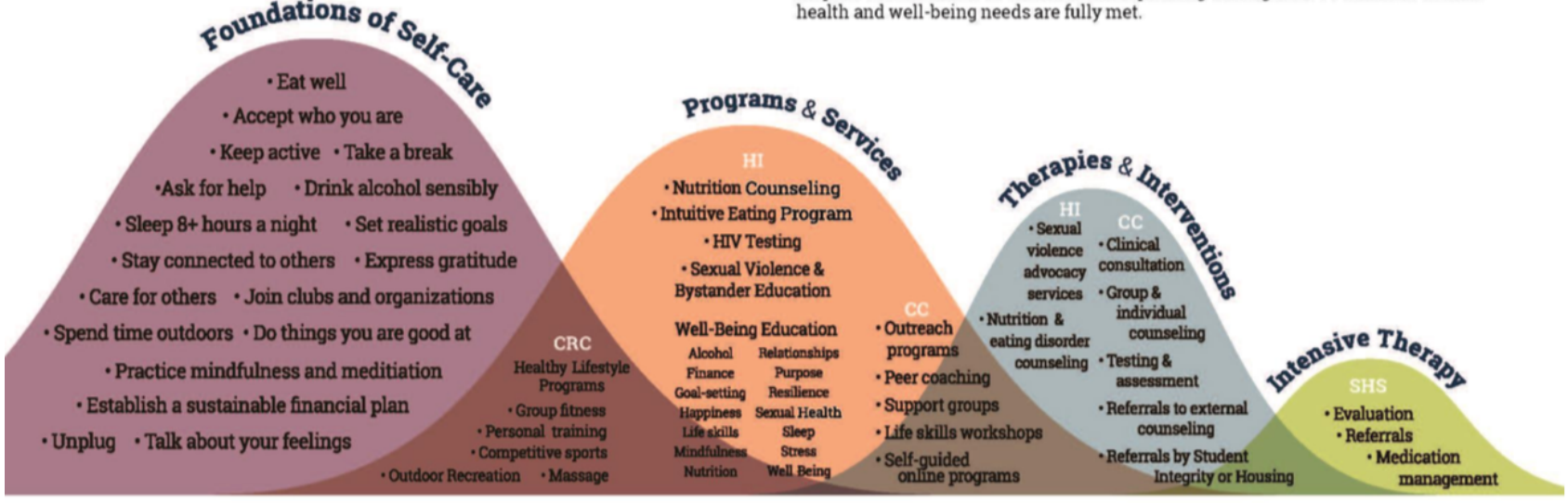
STUDENTS CAN BEGIN THEIR MENTAL HEALTH AND WELL-BEING JOURNEY AT GEORGIA TECH AT ANY POINT IN THIS SPECTRUM.

All students should be practicing self-care. These activities and actions create a foundation of positive mental health and well-being.

All students can take advantage of programs offered by Campus Recreation, Health Initiatives, and the Counseling Center. These programs and services help students build the skills they need to maintain positive health and well-being.

Some students may need therapies and interventions. Health Initiatives offers services for vicitims and survivors of sexual violence and has two VOICE advocates on staff to meet the needs of students. Health Initiatives also offers two registered dietitians who can provide individual nutrition counseling and also are members of the Georgia Tech Eating disorder treatment team. The Counseling Center offers a variety of therapies and interventions from testing and assessment to group and individual counseling.

A few students may need more intensive therapies. Stamps Health Services' Psychiatry Clinic provides therapies to students already coming to campus needing medication management, evaluation for students who may need the assistance of medication, and helps to refer students to external care depending on diagnosis so that their mental health and well-being needs are fully met.



Self-Care activities are things that everyone should do to take care of their emotional, physical, social, and spiritual well-being.

Programs & Services support students in building vital skills to improve their holistic well-being and thrive.

Therapies & Interventions are direct services for students struggling with their mental health and well-being who need additional help.

Intensive therapy is for students who need medication management.

Campus Recreation (CRC)
crc.gatech.edu
404-385-7529

Health Initiatives (HI)
healthinitiatives.gatech.edu
404-894-9980

Counseling Center (CC)
counseling.gatech.edu
404-894-2575

Stamps Health Services Psychiatry Clinic (SHS)
health.gatech.edu
404-894-2585

Finding Help

Best wishes and good luck!