

Introduction to the Department

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Mathematical Sciences Orientation
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- 1 Introduction
- 2 Regulations
- 3 Research
- 4 Teaching
- 5 Conclusions

Outline

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- 3 Research
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This week

Orientation and TA training

Today: department information session followed by lunch

Tomorrow: School of Science BBQ

Registration

TA assignments, from Michele Kronau

Office assignments from Dawnmarie

Resources

Dawnmarie Robens

Your advisor

Master TA seminar instructor: Amy Givler

Department graduate committee student representatives:
Mike Caiola and Dan Eckhardt

Other members of the graduate committee:
Profs Herron, Kapila, Kovacic, Mitchell

Office of Graduate Education:
website for new students has a variety of helpful information

ISSS website for International students

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Regulations

The regulations set by the institute can be found in the course catalog, available via <http://sis.rpi.edu>

The graduate tuition policy limits PhD students to 4 semesters of support as teaching assistants. Subsequent support should be either from a fellowship or from a research assistantship.

Similarly, MS students are limited to 2 semesters of support as TAs.

Credit hours

PhD program: 72 credit hours

MS program: 30 credit hours

PhD: No more than 7 years (5 years if entering with an MS).

MS: No more than 2.5 years.

Need to spend at least 3 years on campus for PhD.

Need to complete a [Plan of Study](#) by the end of your first semester.

This is a planning document listing your 72PhD/30MS credits.

Can be updated as often as you want.

Can take a mixture of graduate and undergraduate courses.

There are limits to the number of undergraduate courses.

Can transfer unused credits from your undergraduate degree.

Can apply 24 credits from an earlier MS towards the PhD.

Course requirements per semester

Cannot take more than 15 credits per semester.

Must take at least 12 credits (at least 9 credits if a TA).
First semester TAs should not take more than 9 credits.
GAANN fellows must take at least 12 credits.

Late Add and Drop:

Not allowed. Any adds must be completed within 2 weeks,
any drops must be completed within 8 weeks.

$15 - 4 < 12$, so in effect you can't drop a math course after 2 weeks.

More on courses

8 semesters \times 12 credits = 96 credits \gg 72.

So not every course you take has to be applied to your degree and included in your plan of study.

Can take reading courses.

Towards end of PhD program, almost all credits are research credits.

PhD: must take one course from outside the department.

MS: must complete a capstone experience.

Examinations for PhD program

Preliminary exam:

Written exam, 4 hours, covers single variable calculus, multivariable calculus, introductory linear algebra.

Given on the Saturday before the semester starts.

Must pass it within the first three semesters.

Old exams are available online.

Qualifying exam:

Oral exam covering three graduate level math courses.

Examiners are typically the professors from the courses.

Must be passed within the first 2 years.

One retake is allowed.

Examinations on your research

Candidacy exam:

Should be taken within first 4 years (timetable might change).
You present your research to your advisor and your committee.

Defense:

Defend your thesis and then graduate!

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Choosing a research advisor

Some of you may have precise ideas about area of research, others unsure at this time.

Explore faculty websites, speak to current students, make appointments with faculty. Professors are very willing to discuss their research with you.

It is important that you deliberate, but not excessively.

By the end of year 1 at the latest, find a research topic and advisor.

Then they can influence your course selection.

Will give them time to seek funding if not yet in place.

Waiting 2 years is too long; TA eligibility may well be exhausted, etc.

More on choosing an advisor

Spring course: [Introduction to Research in Mathematics](#).

Each week, a different professor gives a 1-hour introduction to their research.

Taking a course with a professor will give you a good idea of that professor's interests.

It will also let you start to build an academic relationship with the professor.

It is also very useful to attend department colloquia.

Research areas:

- **Fundamental research** in applied mathematics, optimization
- **Applied research** in:
 - Molecular epidemiology of TB
 - Inverse problems: Subsurface, medical, and radar imaging
 - Physical oceanography
 - Atmospheric statistical mechanics
 - Mechanics of biomolecular systems
 - How brain networks change during learning
 - Metamaterials
 - ...

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Recent Thesis Titles

- An examination of nonlinear waves in the cochlea utilizing asymptotic and numerical methods
- Imaging quasivertical geologic faults with earthquake data
- A stochastic method for simulating subdomains of weakly nonlinear dispersive wave systems
- Emergence of hierarchy in networks
- Mathematical models of the human sleep wake system
- A numerical study of shock induced cavity collapse
- Bilevel programming algorithms for machine learning model selection

Interdisciplinary Collaboration

Members of the faculty have many collaborations with other departments on campus, and some of our faculty members have joint appointments in other departments.

For example:

Professor Bennett: ISE, CS, Biology, Chemistry, Biotech

Professor Isaacson: Electrical Engineering

Professor Kramer: Chemical Engineering

Professor Lim: Computer Science (SCNARC)

Professor J. McLaughlin: Mechanical Engineering,
Electrical Engineering, Earth Sciences (IPRPI)

Professor Mitchell: ISE, Civil, CS, Biotech

Several current and recent students have been supported through such collaborations.

Collaborations with other institutes

For example:

Professor Bennett: University of Houston

Professor Kovacic: Courant Institute at New York University

Professor Lvov: Woods Hole Oceanographic Institute

Professor Mitchell: University of Illinois

Professor Schwendeman: Lawrence Livermore National Lab

Professor Siegmann: Woods Hole Oceanographic Institute

Fellowships

Our students have been successful in obtaining external fellowships.

NSF, DOE, DOD all support graduate students and have programs such as SMART and NDSEG.

The Office of Graduate Education can help you identify appropriate fellowships and apply for them. (Dawnmarie can help you make an appointment with the OGE.)

Application deadlines are typically in the fall.

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Teaching assistants

Most of you will serve as Teaching Assistants (TAs) at some point during your time at RPI.

Typically, you will run problem sessions for 4 hours per week, for one of the large courses such as:
Calculus I, Calculus II, Multivariable Calculus, Intro to Diff Eq...

You'll also be grading.

Typically, the professor will prepare exams and homeworks, as well as give the lectures.

Reach out to your professor this week via email and try to arrange a meeting. You need to know what they expect from you, and what to do for the first week.

TA responsibilities

The undergraduates (and especially their parents!) expect good service for their tuition dollars.

Prepare for recitations by going over questions in the book.

Make sure you are on time for recitations and office hours.

If you have to miss a recitation or office hours, let Dawnmarie and your professor know in plenty of time, and try to arrange for another graduate student to cover for you.

Serving as a TA is excellent preparation for an academic career, but it is also useful for other careers. You will learn many skills, and learn about yourself. You'll become more comfortable thinking on your feet and giving public presentations.

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Conclusions

We are delighted that you are here.

Your program will be rigorous, but you will also have time to get to know other students and faculty and to enjoy yourselves.

Try to find time for other activities. Intramural sports, union clubs,...