Luca Capogna
Department Head

Emily Chen
BS/MS
Actuarial/Financial

Office of Graduate
Admissions

Sarah Olson
Graduate Coordinator

Marcel Blais
Coordinator of
Professional MS Programs

Jon Abraham
Coordinator of
Actuarial Program

Mathematical Sciences @WPI

❖ Seminar Series

❖ Centers: CIMS

DEPARTMENT OF MATHEMATICAL SCIENCES

Industry Panel

Industry Panel on Quantitative Finance

CENTER FOR INDUSTRIAL MATHEMATICS AND STATISTICS

siam Speaker Series Presents...

VERONICA MEJIA BUSTAMANTE

VICE PRESIDENT JP MORGAN

Giving a talk on
"Applications of data science in finance"

Mathematical Sciences @WPI

❖ PhD Programs
  • Mathematical Sciences
  • Statistics

❖ MS Programs
  • Applied Mathematics
  • Applied Statistics
  • Financial Mathematics
  • Industrial Mathematics
  • Mathematics for Educators

Combined BS/MS Programs

❖ Max of 4 courses may be counted toward both degrees

- 4000-level or above

- 3 must be beyond the 7 units of math required for the BS degree (i.e. in free electives, additional courses, …)

- Additional program specific caveats

❖ Must have a B or better to count for both programs

❖ AP credit opens up spots, summer terms, …

GRADUATE STUDY
MATHEMATICAL SCIENCES
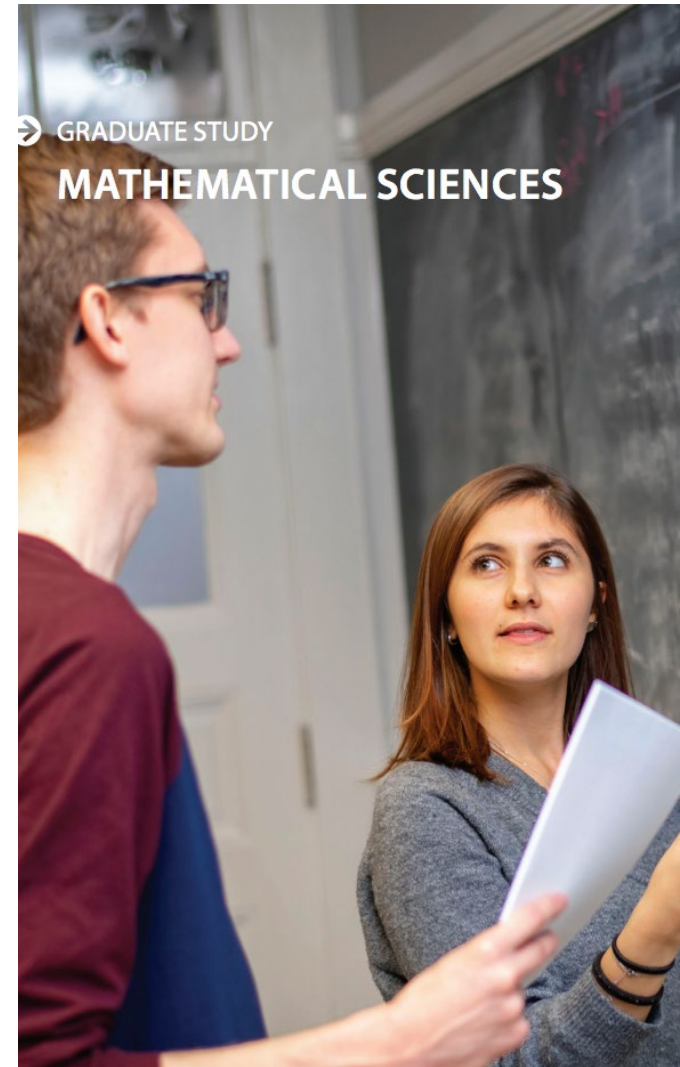
Why a BS/MS?

❖ Done in 5 years!

❖ Career Opportunities: Read the SIAM brochure

❖ Job Titles of recent graduates: Actuarial Analysts, Data Analyst, Data Scientist, Financial Analyst, Quantitative Analyst, Risk Analyst, Statistical Analyst

❖ BS Salaries: Actuarial ~$70K, Mathematical Sciences, ~$80K

❖ MS Salaries: Higher starting salary, additional job opportunities

CAREERS
in applied mathematics

OPTIONS FOR STEM MAJORS

siam. SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS

Career Paths After MS in Applied Stats

❖Pursue PhD Programs
- WPI, University of Wisconsin Madison, University of Connecticut, Iowa State University

❖Industry Positions

Career Paths After MS Financial Math

Career Paths After MS Applied and Industrial Math

❖ PhD studies in math and stats.

- WPI, MSU, UCSB, FSU, UNCC, JHU, Northeastern, Waterloo

Graduate Courses in Mathematical Sciences

❖ Classes meet either 2x per week or 1 night per week throughout the semester (fall or spring)

❖ Grades: A, B, C, D, F

❖ 3 graduate credits = ½ unit undergraduate

Degree Requirements

Financial Mathematics MS

4 Core Financial Math Courses

MA 571 - Financial Mathematics I
MA 572 - Financial Mathematics II
MA 573 - Computational Methods of Financial Mathematics
MA 574 - Portfolio Valuation and Risk Management
MA 575 - Market and Credit Risk Models and Management

2 Foundation Courses

MA528 - Measure Theoretic Probability Theory
MA529 - Stochastic Processes
MA503 - Lebesgue Measure and Integration
MA540 - Probability and Mathematical Statistics I

2 Out of Department Electives

Capstone Project

1 Math Elective

Professional MS Seminar
MA 562

Minimum of 30 credits
~3 credits per class

MA 500 – Basic Real Analysis
(If required in admission letter)

Out of Department Courses
Common Choices

- ❖ DS 502/MA 543 - Statistical Methods for Data Science

- ❖ DS/CS 541 - Deep Learning

- ❖ CS 539 - Machine Learning

- ❖ Courses offered in other departments or programs in the areas of Financial Management and Information Technology

Capstone Project

Options:

❖ A three to six credit MS project

❖ A three credit MS practicum

❖ A three credit capstone course in financial mathematics
  - MA 572 - Financial Mathematics II
  - MA 573 - Computational Methods of Financial Mathematics
  - MA 574 - Portfolio Valuation and Risk Management
  - MA 575 - Market and Credit Risk Models and Management

Course selections for MAC majors pursuing a Masters in Finance degree:

Credits	FALL	SPRING

MA 3831 & MA 3832

| 6 | **MA 528** — Measure Theoretic Probability → | **MA 529** — Stochastic Processes |

MA 3631

| 6 | **MA 571** — Financial Mathematics 1 → | **MA 572** — Financial Mathematics 2 (recommended) |

| 6 (Pick 2) | **MA 574** — Portfolio Valuation and Risk Management | **MA 573** — Computational Methods of Financial Mathematics |
| | | **MA 575** — Market and Credit Risk Management |

| 3 | **Math Elective** (could be satisfied with MA 4213 Risk Theory plus MA 4214 Survival Models) | Part of undergraduate curriculum |

| 6 | **Business Electives** (could be satisfied with 3 higher level undergraduate management courses, B or better grade) | Part of undergraduate curriculum |

Double count up to four undergraduate classes towards the Masters program.

| 3 | **Capstone** — The capstone requirement is typically satisfied with the 3rd course from MA 573-575 not picked above; students can also discuss with their advisor the possibility of a special project for their capstone. |

| 30 | Total graduate credits needed for Masters degree (B average or better) |

Current Capstones and Projects

Jiahou Hou, Spring 2019
3 credit Project Option
Deep Learning for Solving High Dimensional Parabolic PDEs and Applications to an XVA

Anastasia Parkhomenko, Spring 2016
3 credit MS project
Calibration of an optimal bidding model for the mobile advertisement markets
Advisors: Prof. Marcel Blais and Stephan Sturm
Industry Sponsor: Cidewalk, Inc.

Wenhao Qiu, Spring 2020
3 credit Project Option
Deep Q-Network on High Dimensional PDE

Zhiyuan She, Spring 2020
Research Project
Numerics for Stochastic Differential Equations

Degree Requirements

Applied Mathematics MS

2 Core Courses	1 Discrete Math Course
MA 503 – Lebesgue Measure and Integration MA 510 – Numerical Analysis	Choice of: MA 530 – Discrete Mathematics MA 535 - Algebra

Graduate Seminar MA 557	Capstone Experience	4 Mathematical Sciences Electives
Out of Department Elective(s)	Minimum of 30 credits ~3 credits per class	MA 500 – Basic Real Analysis (If required in admission letter)

Mathematical Sciences Electives
4 Courses (your choice) for MS Applied Mathematics, such as

- ❖ MA 505 – Complex Analysis

- ❖ MA 509 – Stochastic Modeling

- ❖ MA 514 – Numerical Linear Algebra

- ❖ MA 521 – Partial Differential Equations

- ❖ MA 524 – Convex Analysis and Optimization

- ❖ MA 525 – Optimal Control and Design with Composite Materials

- ❖ MA 529 – Stochastic Processes

- ❖ MA 543 – Statistical Methods for Data Sciences

- ❖ Many additional course offerings including special topics and statistics courses

Out of Department Courses
Common Choices

❖ DS 502 - Statistical Methods for Data Science

❖ DS/CS 541 - Deep Learning

❖ CS 539 - Machine Learning

❖ BCB 501 - Bioinformatics

Capstone Experience
For Applied Mathematics MS

Options:

❖ A 3 to 6 credit MS project

- Could include a review report or research proposal, an internship project, a research project, or MS Exams (GCEs)

❖ A 6 credit MS Thesis
- Generally done over 2 semesters, opportunity for publication

❖ Choice will depend on your interests and future career path. The Capstone Experience can be used to focus on: theory and/or methodology, computation, or scientific data analysis.

Degree Requirements

Industrial Mathematics MS

2 Core Courses	**2 Foundational Courses**
MA 503 – Lebesgue Measure and Integration MA 510 – Numerical Analysis	Choice of: MA 508 – Mathematical Modeling MA 509 – Stochastic Modeling MA 529 – Stochastic Processes MA 530 – Discrete Mathematics

4 Course Module **Potential Themes:** Materials, Fluid Dynamics	**Industry Project**	**1 Mathematical Sciences Elective**
Professional MS Seminar MA 562	Minimum of 30 credits ~3 credits per class	**MA 500 – Basic Real Analysis** (If required in admission letter)

Example Capstones and Industry Projects

Stephanie Martin, Spring 2019
6 credit Masters Thesis
Computational characterization of thermal processes in an AIN:Mo Susceptor in a millimeter wave heat exchanger
Advisor: Prof. Vadim Yakovlev
Industry Sponsor: Leidows, Inc., AFRL

Liwei Chen, Spring 2014
6 credit Project Option
Dense matrix inversion for biofluids applications
Advisor: Prof. Sarah Olson

Cindy Sabonis, Spring 2014
3 credit Project Option
Conformal mapping approaches to pleated filter efficiency in media with constant permeability
Advisor: Prof. Burt Tilley
Industry Sponsor: Pall Corporation

Degree Requirements

Applied Statistics MS

2 Core Courses	2 Design and Analysis Courses
MA 540 – Mathematical Probability and Statistics I	MA 546 – Design and Analysis of Experiments
MA 541 – Mathematical Probability and Statistics II	MA 547 – Design and Analysis of Observational and Sampling Studies

Statistics Graduate Seminar, MA 559	Capstone Experience	3 Statistics Electives
Optional Elective	Minimum of 30 credits ~3 credits per class	MA 500 – Basic Real Analysis (If required in admission letter)

Statistics Electives
3 Courses (your choice)

- ❖ MA 509 – Stochastic Modeling

- ❖ MA 542 – Regression Analysis

- ❖ MA 543 - Statistical Methods for Data Science

- ❖ MA 548 – Quality Control

- ❖ MA 549 – Analysis of Lifetime Data

- ❖ MA 550 – Time Series Analysis

- ❖ MA 552 – Distribution-Free and Robust Statistical Methods

- ❖ MA 554 – Applied Multivariate Analysis

- ❖ MA 556 – Applied Bayesian Statistics

Capstone Experience

Options:

❖ A 3 to 6 credit MS project
  - Could include a review report or research proposal, an internship project, a research project, or MS Exams (GCEs)

❖ A 6 credit MS Thesis
  - Generally done over 2 semesters, opportunity for publication

❖ Choice will depend on your interests and future career path. The Capstone Experience can be used to focus on: theory and/or methodology, computation, or scientific data analysis.

Recent Capstones

Xueer Jing

Sponsor: OFS A Furukawa Company
(Statistics in the health care insurance industry)

Zhengyu Li, Spring 2019
3 credit Project Option
Statistical methods for image analysis
Advisor: Prof. Buddika Peiris

Xiaohui Chen, Spring 2020
6 credit Thesis Option
Bahadur efficiencies for statistics of truncated p-value combination methods
Advisor: Prof. Zheyang Wu

Chenkai Zheng

Sponsor: Barbour Corporation
(Statistics in process development)

MS Programs in Mathematical Sciences @WPI

❖ WPI Graduate Catalog - course info and degree requirements

❖ Apply by July 1

❖ Please reach out directly to us if you have questions!
- Prof. Jon Goulet for MME
- Prof. Buddika Peiris for Applied Stats
- Profs. Abraham and Blais for Financial Math
- Profs. Blais and Olson for Applied Math and   Industrial Math
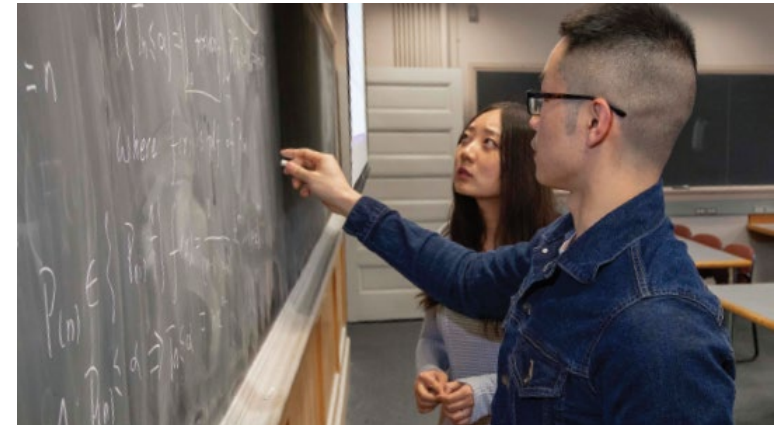
Graduate Costs and Finances

❖ Alumni Incentive Program:
- Full time and part time
- 20% discount on graduate tuition
- Start Summer, Fall, or Spring

❖ Employer Tuition Assistance

❖ Fellowships and Scholarships (Visit Office of Academic Advising, SMART Scholarship)

❖ Can combine sources of support