

Washington State University  
MAJOR CHANGE FORM -- REQUIREMENTS

(Submit original signed form and **TEN** copies to the Registrar's Office, zip 1035.)

See <https://www.ronet.wsu.edu/ROPubs/Apps/HomePage.ASP> for this form.

\*Submit an additional copy to the Faculty Senate Office, French Administration 338, zip 1038.

Department Name Mathematics

1. CHECK PROPOSED CHANGES.

- \*  Change department/program name from \_\_\_\_\_ to \_\_\_\_\_
- \*  New degree or program in \_\_\_\_\_
- \*  Change name of degree from \_\_\_\_\_ to \_\_\_\_\_
- \*  Drop degree or program in \_\_\_\_\_
- \*  Extend existing degree or program to \_\_\_\_\_ campus
- New Major in \_\_\_\_\_
- Change name of Major from \_\_\_\_\_ to \_\_\_\_\_
- Revise Major requirements in \_\_\_\_\_
- Drop Major in \_\_\_\_\_
- Revise certification requirements for the Major in \_\_\_\_\_
- New Option in MSc in Mathematics (Computational Finance Option)
- Revise requirements for the Option in \_\_\_\_\_
- Drop Option in \_\_\_\_\_
- New Minor in \_\_\_\_\_
- Revise Minor requirements in \_\_\_\_\_
- Drop Minor in \_\_\_\_\_
- New Undergraduate Certificate in \_\_\_\_\_
- Revise Undergraduate Certificate requirements in \_\_\_\_\_
- Drop Undergraduate Certificate in \_\_\_\_\_
- Other \_\_\_\_\_

Effective term/year Fall 2013

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Contact Person	Contact Phone No.	Contact email

2. GIVE REASONS FOR EACH REQUEST MARKED ABOVE. (Attach additional paper if necessary; see reverse side.) See attached.

4. SIGN AND DATE APPROVALS.

*HLi* 9/6/2012     *Carol Long* 10-1-12     \_\_\_\_\_  
 Chair Signature/date     Dean Signature/date     General Education Com/date

\_\_\_\_\_  
 Catalog Subcom/date     Academic Affairs Com/date     Graduate Studies Com/date     Senate/Date

# The Rationale for the MS in Mathematics (Computational Finance Option)

Computational Finance is a cross-disciplinary field which utilizes computational methods (such as numerical analysis, stochastic simulation, and optimization) to investigate financial investment strategies, analyze financial risk arising from financial instruments, and to make trading and hedging decisions. Most equity trades are now done by high speed computer programs on a daily basis in the U.S. and other countries, and computational financial mathematics has become increasingly important in modern finance and actuarial science.

Demand for people who can apply mathematical and computational skills in financial and insurance sectors is growing rapidly, but a typical undergraduate mathematics degree may not adequately prepare a student to work effectively in a business environment that requires modern quantitative risk analysis and technical skills.

Washington State University's MS Degree in Mathematics (Computational Finance Option) prepares a graduate for work in an analytic capacity across a wide spectrum of the financial service industry—investment firms, consulting firms, insurance companies, banks, brokerage houses, government regulatory institutions, natural resource-based firms, power companies, and any large multi-national corporations with exposure to exchange rate or commodities risk.

The proposed program stems from the interdisciplinary strength of the Departments of Mathematics and Finance at WSU, and emphasizes computational financial mathematics, and problem-solving skills that dramatically increase the graduate's value to an employer. The proposed program is summarized as follows.

- The degree program combines MS level coursework in Mathematics (theories and computing/simulation) with MBA level coursework in Finance (markets, instruments, and management). The degree requires at least 31 semester credit hours, including 12 credits from financial markets and risk management, at least 15 credits in computational and statistical methods, and a 4 credit industry internship/final exam.
- A core curriculum consists of four mathematics courses in Financial Mathematics, Optimization, Stochastic Simulation. Two new courses, Math 575 (Asset Pricing in Financial Engineering) and Math 575 (Quantitative Risk Management), have been approved by the WSU Faculty Senate.
- A formal agreement between the Department of Mathematics and College of Business has been established in writing (see attached) that allows the students in this proposed program to enroll in graduate level finance courses offered at the WSU College of Business. The contact person at the College of Business is Cheryl Oliver, Director of Graduate Programs (509-335-7617, [cheryl.oliver@wsu.edu](mailto:cheryl.oliver@wsu.edu)).
- All the courses will be available from Fall 2013 and taught by the current mathematics and finance faculty members.
- The proposed program is expected to attract students with interests in STEM fields and financial economics.

## Math Graduate Handbook Description

### The Requirements for the MS in Mathematics (Computational Finance Option)

This is a Master of Science degree especially designed to train students with strong mathematics backgrounds in up-to-date mathematical and computational skills in quantitative finance and insurance. Such training is intended to produce high caliber individuals who can confidently undertake interdisciplinary research and analysis in modern financial risk management. The focus will be in preparing talented individuals to face the quantitative and computational challenges in financial service and insurance sectors.

In order to achieve these goals the program requires:

- a solid training in Financial Mathematics, Optimization, Stochastic Simulation;
- a broad background in the areas of Finance and Insurance, Numerical Analysis, and Statistical Analysis;
- practice in both professional written and oral communication;
- both group and individual projects;
- a strong computing component.

Departmental requirements and regulations for the MS in Computational Finance are specified below. The regulations of the Graduate School for master's programs are available in the Graduate School Policies and Procedures Manual (<http://www.gradsch.wsu.edu>).

### Prerequisites

All graduate students are expected to have a background in mathematics equivalent to that provided by our undergraduate degree. Ideally, this would include familiarity with the material covered in Math 401 and 402, and Math 420 and 421, and some experience with computer programming. Students with a deficient background are expected to make up these deficiencies at the earliest opportunity.

### Courses and Hours

A candidate must complete at least 31 semester hours of course work. This includes:

(a) a core consisting of:

Math 464 or Math 564, Optimization;  
Math 516 or Stat 536, Simulation;  
Math 575, Asset Pricing in Financial Engineering;  
Math 576, Quantitative Risk Management; and

(b) at least two additional graduate level courses from Group 1 and at least three additional graduate level courses from Group 2:

(1) Fin 521 (Interest Rates and Financial Markets), 526 (Problem in Financial Management), 527 (Investment Analysis), 528 (Portfolio Management), 581 (International Finance).

(2) Math 545 (Numerical Analysis of Evolution Equations), Math 548 (Numerical Analysis), Math 565 (Nonlinear Optimization), Math 523 (Statistical Methods), Stat 516 (Time Series), Stat 519 (Applied Multivariate Analysis).

## **Transfer Credit**

Up to eight hours of transfer credit may be given for suitable course work done elsewhere.

## **The Program of Study**

A Program of Study must be submitted by the deadlines indicated in Section 3. It is however suggested that this be done in the second semester of graduate work. The appropriate form is available at the Graduate School Office or may be downloaded from its web site.

## **The MS Examination**

Each MS student must pass a final oral examination that covers all of the student's course work, and includes an oral presentation on the results of the student's Math 702 individual project (see below). This examination may be scheduled when all requirements of the Department and the Graduate School have been satisfied (or are expected to be satisfied by the end of the current semester). The deadlines for scheduling this examination are indicated in §3. The student's advisory committee will conduct this examination.

## **The Application for Degree**

An Application for Degree must be led with the Graduate School by the deadlines in Section 3. An approved Program of Study must be on file in the Graduate School before the Application for Degree may be filed. Candidates may not schedule a final examination until an Application for Degree has been filed.

## **Thesis**

There is no thesis requirement. However, a student must take four hours of Math 702 that must involve the completion of an individual project. The individual project should normally be completed by the end of the fourth semester of the student's work on the degree. The student's advisory committee members will supervise this project. A written project report should be submitted when the project is completed. The final MS examination must include an oral presentation by the student about the results of the project, with questions from the student's MS committee.