

MATHEMATICAL METHODS IN THE SOCIAL SCIENCES

mmss.northwestern.edu

MMSS is an adjunct major and must be completed with a stand-alone major in a social science or other approved area. See the Mathematics Second Major or Minor for MMSS Students (<https://catalogs.northwestern.edu/undergraduate/arts-sciences/mathematics/mathematics-second-major-minor-mmss-students/>) for information about the major or the minor in mathematics when combined with the MMSS adjunct major; see the program website (<https://www.mmss.northwestern.edu/undergraduate/>) and relevant sections of this Catalog for information on adjustments to requirements in other majors for students in MMSS.

A central feature of modern social, behavioral, managerial, and policy sciences is the use of mathematics, statistics, and computers, both as languages and as methods of abstraction and analysis. Most undergraduate programs in the social sciences do not incorporate mathematical approaches in an organized and consistent manner, however. The Mathematical Methods in the Social Sciences Program (MMSS) was created to give undergraduate students an opportunity to combine the study of social sciences with training in formal analytical methods.

Key objectives students should develop from graduating from the MMSS Program

- Understand normative principles of Social Science and identify key tradeoffs in practical policy questions.
- Develop fluency in the use of formal models to capture and quantify essential themes.
- Understand the limitations of Social Science data and learn to recognize the appropriate empirical tools for overcoming these limitations.
- Formulate and execute original research questions.
- Communicate in both formal and informal language the key ideas in practical policy debates.

MMSS students pursue a double course of study: a common mathematics/quantitative methods sequence and the social science major of their choice. (In some cases, students choose their joint major from outside the social sciences.) The program is for students with high mathematical aptitude and strong interest in social problems and issues, including policy and research implications. It provides excellent preparation for graduate study in social or managerial sciences as well as for careers requiring quantitative skills and a solid background in the social sciences.

In the first two years of the program, students enroll in a coordinated sequence of 12 1-quarter courses (two courses per quarter) covering mathematical methods and their applications in the social sciences. These courses are open only to MMSS students and are taught at an appropriately advanced level. In senior year, all MMSS students participate in a senior seminar in which they write a thesis. There are no other required MMSS courses, but students must fulfill the requirements of their joint major.

Admission to the MMSS program is very selective and is limited to first-year students and to Northwestern sophomores with superior academic records and a demonstrated strong aptitude in mathematics.

A full-year course in calculus is a prerequisite for admission. High school students fulfilling this prerequisite are encouraged to enter the program as first-year students, applying to both Northwestern and the program.

Sophomore Entry to MMSS

To be considered for admission as sophomores, students lacking calculus should complete at least two quarters of calculus (MATH 220-1 Single-Variable Differential Calculus and MATH 220-2 Single-Variable Integral Calculus) in the first year of college. Those with sufficient background in calculus are advised to register for a 200-level calculus/linear algebra sequence in the first year such as:

| Course | Title |
|--------------------------------------|---|
| MATH 226-0 | Sequences and Series |
| MATH 230-1 | Multivariable Differential Calculus |
| MATH 230-2 | Multivariable Integral Calculus |
| MATH 240-0 | Linear Algebra |
| MATH 290-1 & MATH 290-2 & MATH 290-3 | MENU: Linear Algebra and Multivariable Calculus and MENU: Linear Algebra and Multivariable Calculus and MENU: Linear Algebra and Multivariable Calculus |
| MATH 291-1 & MATH 291-2 & MATH 291-3 | MENU: Intensive Linear Algebra and Multivariable Calculus and MENU: Intensive Linear Algebra and Multivariable Calculus and MENU: Intensive Linear Algebra and Multivariable Calculus |
| ES_APPM 252-1 & ES_APPM 252-2 | Honors Calculus for Engineers and Honors Calculus for Engineers |

Students with less mathematics preparation who are admitted to the program after the first year may be required to take all or part of the first-year MMSS math sequence.

Northwestern applicants interested in the program should see Special Admission Programs (<https://catalogs.northwestern.edu/undergraduate/admission/>). Current students who wish to be considered for the program should complete an online application at mmss.northwestern.edu.

Program of Study

- MMSS Adjunct Major (<https://catalogs.northwestern.edu/undergraduate/arts-sciences/mathematical-methods-social-sciences/mmss-adjunct-major/>)

Please note, MMSS students are required to take six mathematics courses/units which include: MATH 285-1, MATH 285-2, MATH 285-3, MATH 385-0, MATH 386-1, and MATH 386-2 in addition to the MMSS course list.

MMSS Courses

MMSS 211-1 Social Science Theories & Meth-First Yr (1 Unit) A fast-paced mathematical treatment of intermediate microeconomics designed for mathematically sophisticated students. No previous training in microeconomics is assumed. Topics covered include consumer and producer behavior in market economies, equilibrium in competitive and monopolistic markets, public goods and externalities, and welfare analysis. *Social Behavioral Sciences Distro Area*

MMSS 211-2 Social Science Theories & Meth-First Yr (1 Unit) Game theory.

MMSS 211-3 Social Science Theories & Meth-First Yr (1 Unit) Formal models in social science disciplines other than economics. *Social Behavioral Sciences Distro Area*

MMSS 300-0 Foundations of Mathematical Social Science (1 Unit) Introduction to the core mathematical elements of formal Social Science, including Individual Decision Making, Choice Under Uncertainty, Social Choice and Welfare, Efficiency Concepts, and Dynamic Decision-Making.

MMSS 311-1 Social Science Theories & Meth-2nd Yr (1 Unit) Advanced game theory.

MMSS 311-2 Social Science Theories & Meth-2nd Yr (1 Unit) Advanced formal models in social science disciplines other than economics.

MMSS 398-1 Senior Seminar (1 Unit) Senior thesis seminar. *Advanced Expression*

MMSS 398-2 Senior Seminar (1 Unit) Senior thesis seminar. *Advanced Expression*

MMSS 398-3 Senior Seminar (1 Unit) Senior thesis seminar. *Advanced Expression*