Social Science, Ph.D.

Potential graduate students should apply to the Office of Research and Graduate Studies for admission to the Ph.D. program in Mathematical Behavioral Sciences.

http://www.imbs.uci.edu/graduate (http://www.imbs.uci.edu/graduate/)

The concentration in Mathematical Behavioral Sciences offers a program of interdisciplinary and mathematical approaches to the study of human behavior, providing high levels of training in current mathematical modeling and in mathematics and software use and programming. The program is administered by an interdisciplinary group of faculty. Within the concentration, two optional emphases are available: Social Networks; and Games, Decisions, and Dynamical Systems. Specific requirements are detailed below.

Admission

Admission to the concentration in Mathematical Behavioral Sciences requires evidence of appreciable mathematical skill and knowledge. As an absolute minimum, a candidate should have taken one full year of calculus, including calculus of several variables, and one course in linear algebra, and should also provide evidence of additional mathematical depth. This depth can be manifested in a number of different ways including, but not restricted to, an undergraduate degree in mathematics or physical science, a high score on the quantitative section of the GRE general test, or a strong undergraduate minor in mathematics. In addition, students should have some exposure to a behavioral science field. Especially useful is some experience with behavioral science modeling.

Those students interested in either the emphasis in Social Networks or the emphasis in Games, Decisions, and Dynamical Systems should make this clear in their application. A student is free at any time after admission to move into or out of either emphasis, but will be subject to the requirements in effect at the time of original admission to the concentration in Mathematical Behavioral Sciences.

General Requirements

Four major classes of requirements must be fulfilled. Since a number of options are available, the student will, in consultation with an advisor, develop a plan of study.

Quantitative/Mathematical. To be completed by the end of the third year:

a. one course each in analysis beyond calculus, abstract algebra beyond linear algebra, and logic; and
b. two quarters of mathematical statistics, with calculus as a prerequisite and covering the fundamentals of probability and random variables.

A list of courses eligible for satisfying the Quantitative/Mathematical requirement is available at the Institute for Mathematical Behavioral Sciences website (http://www.imbs.uci.edu/graduate/masters.php).

Language/Computer. All students must be sufficiently familiar with various computer programs and languages to be able to conduct serious research in their field of interest and must submit either proposed courses or some demonstration of competency as part of their plan of study. In addition, students must either

a. attain proficiency in reading social science technical publications in one foreign language with a substantial relevant technical literature or
b. demonstrate proficiency in computer programming considerably beyond that of the standard computer requirement.

Because of the continually changing nature of computer languages and software, the conditions for fulfilling this additional computer expertise requirement is left to the judgment of the faculty subcommittee on computers of the Ph.D. program.

Substantive Minor. Students are expected to develop considerable expertise in some substantive field and in the application of models to it. This requires the completion of three courses at the upper-division or graduate level that do not necessarily entail extensive modeling, and three courses or seminars in which the primary thrust is mathematical modeling.

Research Papers and Colloquia. At the end of the second year, a 10–20-page paper reporting original research or a penetrating analysis of some subtopic of mathematical behavioral science (or either social networks, or games, decisions, and dynamical systems with a formal or mathematical component) is expected. An oral presentation will be given to faculty and graduate students. Two faculty members are assigned to read and evaluate the paper and talk.

Students are required to take for credit four quarters of the Mathematical Behavioral Sciences Colloquium, SOC SCI 211A--SOC SCI 211C, during their first three years. Although not a formal requirement, students are expected to attend the colloquium on a regular basis whenever in residence.

Time to Degree. Students must advance to candidacy in their fourth year. The normative time for completion of the Ph.D. is six years. The maximum time permitted is seven years.

Emphasis in Social Networks

The requirements for the emphasis in Social Networks are the same as the general requirements noted above, with the following exceptions:

Students may choose to complete the first part of the Quantitative/Mathematical requirement with one course each in discrete mathematics, graph theory, and logic.

Social Networks students are required to attend about 75 percent of the Mathematical Behavioral Sciences Colloquia, including all that are designated as Social Networks Colloquia, and also must attend occasional colloquia, usually of local faculty and graduate students, which are separate from the general Mathematical Behavioral Sciences Colloquia.

Emphasis in Games, Decisions, and Dynamical Systems

The requirements for the emphasis in Games, Decisions, and Dynamical Systems are the same as the general requirements noted above, with the following exceptions:

Students must complete eight graduate courses emphasizing game theory, decision theory, or dynamical systems. Examples of such courses are:

ANTHRO 289	Special Topics in Anthropology (when topics are Networks and Social Evolution; Cognition, Technology, and Genes; Dynamical Processes.)
ECON 243A	Game Theory
ECON 270A- 270B- 270C	Political Economy I and Political Economy II and Political Economy III

These courses will count toward the substantive minor requirement.

Students are required to attend about 75 percent of the Mathematical Behavioral Sciences Colloquia, including all that are designated as Games, Decisions, and Dynamical Systems colloquia, and must also must attend occasional colloquia, usually of local faculty and graduate students, which are separate from the general Mathematical Behavioral Sciences Colloquia.