About the Logic and Reasoning Institute
The Logic and Reasoning minor is an initiative of JMU’s Logic and Reasoning Institute (LRI), which sponsors and encourages logic-related coursework in departments across the university. The LRI promotes interdisciplinary research in logic, its application and its pedagogy, and emphasizes the philosophical foundations of logic and reasoning in and across disciplines.

Faculty
The minor in Logic and Reasoning fosters interdisciplinary cooperation among scholars in participating departments. The faculty members involved in the minor are:

Thomas Adajian, Department of Philosophy and Religion
Elizabeth Brown, Department of Mathematics and Statistics
Sharon Cote, Department of English (Linguistics)
Kethera Fogler, Department of Graduate Psychology
Christopher Fox, Department of Computer Science
Jeffrey Goodman, Department of Philosophy and Religion
Ralph Grove, Department of Computer Science
Brant Jones, Department of Mathematics and Statistics
William Knorpp, Department of Philosophy and Religion
Tracy Lupher, Department of Philosophy and Religion (Coordinator)
Ramon Mata-Toledo, Department of Computer Science
Edwin O’Shea, Department of Mathematics and Statistics
Christopher Runyon, Department of Philosophy and Religion
Jim Sochaki, Department of Mathematics and Statistics
Nathan Sprague, Department of Computer Science
Laura Taalman, Department of Mathematics and Statistics
Logic and Reasoning Minor

The Logic and Reasoning Minor brings together several disciplines — philosophy, mathematics, computer science — that take logic as part of their subject matter, as well as part of their method. The minor emphasizes the core logical elements that are common across disciplines and shows how to apply these common logical concepts and tools in different domains. Graduate schools and employers seek candidates with above-average training in logic and reasoning. This minor supplies such training.

Requirements

The requirement for a minor in Logic and Reasoning is 18 to 19 credits with 12 to 13 credit hours from a set of core courses and 6 credit hours from electives.

Courses

Required Courses:  

| PHIL 250 Introduction to Symbolic Logic | 3 credits |
| PHIL 310 Symbolic Logic | 3 credits |
| PHIL 396 Philosophy of Physics | 3 credits |
| PHIL 397 Philosophy of Space and Time | 3 credits |

Choose either i or ii:

i. MATH 235 Calculus I | 4 credits |

Differential and integral calculus of functions of one variable.

and

MATH 245 Discrete Mathematics | 3 credits |

Logic, set theory, relations and functions, mathematical induction and equivalent forms, recurrence relations, and counting techniques.

ii. MATH/CS 227. Discrete Structures I | 3 credits |

An introduction to discrete mathematical structures for scientists. Functions, relations, sets, logic, matrices, elementary number theory, proof techniques, basics of counting, graph theory, discrete probability, digital logic, finite state machines, integer and floating point representations.

Elective Courses: Choose at least two of the following:

CS 444. Artificial Intelligence | 3 credits (prerequisite CS 240)

Students will study the history, premises, goals, social impact and philosophical implications of artificial intelligence. Students will study heuristic algorithms for large state spaces and learn to develop recursive and non-deterministic algorithms.

MATH 424. Statistical Decision Theory | 3 credits (prerequisite MATH 318)

This course surveys the development and use of probability and statistics for strategic decision making with applications. Topics include decision flow diagrams, analysis of risk and risk aversion, utility theory, Bayesian statistical methods, the economics of sampling, sensitivity analysis and collective decision making.

PHIL 315. Logic and Legal Reasoning | 3 credits

Application of symbolic logic (first-order logic with identity) to legal language and deductive legal argument. Will include close logical analysis of at least one of the following: Supreme Court brief, Supreme Court decision, Supreme Court oral argument.

PHIL 326. Introduction to Non-Standard Logics | 3 credits

This course will examine some non-standard logics and some philosophical issues they raise. Topics may include modal logic, isolationist logic, temporal logic or many valued logics.

PHIL 396. Philosophy of Physics | 3 credits (prerequisite PHIL 101)

This course will examine some non-standard logics and some philosophical issues they raise. Topics may include modal logic, isolationist logic, temporal logic or many valued logics.

PHIL 397. Philosophy of Space and Time | 3 credits

This course will examine some non-standard logics and some philosophical issues they raise. Topics may include modal logic, isolationist logic, temporal logic or many valued logics.

PHIL 398. Philosophy of Quantum Theory | 3 credits

Quantum theory describes atoms and particles and is one of the most empirically successful physical theories. However, quantum theory seems to have revolutionary conceptual implications for metaphysics and epistemology. This course offers an introduction to philosophical problems raised by quantum theory. Topics may include the measurement problem, quantum entanglement, different interpretations of quantum mechanics, the Einstein-Podolsky-Rosen (EPR) paradox, and Bell’s theorem.

PHIL 410. Philosophy of Science | 3 credits

This course surveys a number of topics about the nature of science. The topics may include the problem of distinguishing science from pseudo-science, the nature of scientific explanation, the notion of progress in science, and the realism and anti-realism debate.

Total | 18–19 credits