OPERATIONS RESEARCH (PHD)

Graduate School

Program Website (https://www.engineering.cornell.edu/orie/phd-operations-research/)

CIP: 14.3701 | **HEGIS:** 0913.00 | **NYSED:** 76433

Graduate Field

Operations Research and Information Engineering (https://catalog.cornell.edu/graduate-school/operations-research-information-engineering/)

Program Description

Doctoral students majoring in operations research concentrate in one of three areas:

Applied probability and statistics stresses the techniques and associated underlying theory of probability and statistics, particularly as applied to problems in science, finance, and engineering. The techniques emphasized are those associated with applied stochastic processes (for example, mathematical finance, queuing theory, traffic theory, and inventory theory) and statistics (including statistical decision theory, reliability theory, analysis of life data, and the statistical aspects of the design, analysis, and interpretation of experiments and of ranking and selection theory).

Manufacturing systems engineering is concerned with the analysis and design of complex manufacturing and distribution systems. Problems studied include the establishment of inventory-control policies in multistage production and distribution systems; design of manufacturing plants with optimal amounts of equipment and optimal materials-handling systems; planning and scheduling of production in large-scale, multi-item, multi-location systems; and economic analysis of engineering processes. Students use modern analytic and computer techniques in the design and analysis of such systems. Students are expected to understand the manufacturing processes associated with some type of industry. Research, which may involve development of new mathematical methodology, is often conducted directly with a cooperating company, for example, in automotive or semiconductor manufacturing.

Mathematical programming concentrates on optimization, including linear, nonlinear, integer, and combinatorial programming; network flows; problems of scheduling and sequencing; and discrete and computational geometry. Research ranges from the development and applications of computational algorithms (exact and approximate) to the associated studies of duality theory, convex and variational analysis, polyhedra, combinatorics, and graph theory.

Doctoral students also select two minor subjects for the Ph.D. degree, one of which must be outside the field. A minor may be in operations research or in a subject offered in another field, such as computer science, econometrics and economic statistics, environmental systems engineering, managerial economics, mathematics, or planning theory and systems analysis.

In addition to the examinations required by the Graduate School, the field requires a qualifying examination for Ph.D. degree candidates, normally taken in the third term of graduate study at Cornell.

Concentrations

- Applied probability and statistics
- Manufacturing systems engineering
- Mathematical programming

Program Information

- Instruction Mode: In Person
- Location: Ithaca, NY
- Minimum Credits for Degree: 72

Program Requirements

- Minimum Semesters for Degree: 6

Graduate School Milestones

- Responsible Conduct of Research Training: Required
- Open Researcher and Contributor ID (ORCID): Required
- Student Progress Reviews (SPR) begin: Second Year
- Examination for admission to candidacy (A Exam): Spring of third year
- Defense of Dissertation (B Exam): Spring of fifth year

Field Specific Milestones

- Qualifying Examination (Q Exam): Spring of second year

Course Requirements

- Course requirements are determined by the student's Special Committee.
- Enrollment in a GRAD research course or the equivalent field specific research course is expected of all students.

University Graduation Requirements Requirements for All Students

In order to receive a Cornell degree, a student must satisfy academic and non-academic requirements.

Academic Requirements

A student's college determines degree requirements such as residency, number of credits, distribution of credits, and grade averages. It is the student's responsibility to be aware of the specific major, degree, distribution, college, and graduation requirements for completing their chosen program of study. See the individual requirements listed by each college or school or contact the college registrar's office (https://registrar.cornell.edu/service-resources/college-registrar-directory/) for more information.

Non-academic Requirements

Conduct Matters. Students must satisfy any outstanding sanctions, penalties or remedies imposed or agreed to under the Student Code of Conduct (Code) or Policy 6.4. Where a formal complaint under the Code or Policy 6.4 is pending, the University will withhold awarding a degree otherwise earned until the adjudication process set forth in those

procedures is complete, including the satisfaction of any sanctions, penalties or remedies imposed.

Financial Obligations. Outstanding financial obligations will not impact the awarding of a degree otherwise earned or a student's ability to access their official transcript. However, the University may withhold issuing a diploma until any outstanding financial obligations owing to the University are satisfied.

Learning Outcomes

- Master the core tools of operations research and the mathematical foundations on which they rest.
- Demonstrate computational proficiency.
- Develop expertise in one of three areas of concentration -- applied probability and statistics, manufacturing systems engineering, or mathematical programming (optimization) -- and depth in two minor subjects in engineering, science (including mathematics), or technical areas of business (e.g., finance).
- Develop and demonstrate advanced research skills, including ability to identify research opportunities, synthesize and extend existing knowledge, and communicate effectively in both written and oral exposition.
- Make an original and significant contribution to the discipline.