

# MASTER OF SCIENCE IN COMPUTATIONAL DECISION SCIENCES AND OPERATIONS RESEARCH

## Collaborative program with the Department of Applied Mathematics

The purpose of this program is to provide students with theoretical skills and knowledge of applications in the areas of optimization, game theory, and machine learning to enable them to contribute towards making business decisions more efficient, or alternatively, to enable them to pursue research in these areas.

## Admission Requirements

Students with bachelor of science degrees in mathematics, computer science, industrial engineering, electrical and computer engineering, mechanical engineering, and business, or related areas, with a minimum cumulative GPA of at least 3.0/4.0, will be considered. Prospective students should have knowledge of linear algebra, discrete mathematics, probability and statistics, and programming.

All applications will be considered on an individual basis and strong applicants without an adequate background might be admitted with a requirement to take additional prerequisite courses. A statement of objectives and a curriculum vitae must be submitted. Two letters of recommendation are required. GRE scores must meet Illinois Institute of Technology institutional requirements.

## Curriculum

Coursework includes 12 credit hours of required core courses and 20 credit hours of elective courses. Up to 12 credit hours of 400-level coursework may be included in the program with adviser approval.

A student may, with permission of a thesis adviser, include in his or her program a thesis of up to five credit hours consisting of a combination of CS 591 and/or MATH 591. The thesis option requires a written thesis and an oral defense of the thesis. Thesis format and deadlines are set by the Graduate College.

| Code  | Title   | Credit Hours |
|---|---|--------------|
| <b>Core Courses (12)</b>  |   |              |
| CS 430<br>or CS 535   | Introduction to Algorithms<br>Dsgn and Anlys of Algorithms  | 3            |
| MATH 481<br>or MATH 564<br>or MATH 565  | Intro to Stochastic Processes<br>Applied Statistics<br>Monte Carlo Methods in Fin                             | 3            |
| CS 539<br>or CS 584<br>or MBA 505<br>or MATH 522  | Game Theory: Algorithms & Apps<br>Machine Learning<br>Microeconomics and Game Theory<br>Mathematical Modeling | 3            |
| CS 538<br>or MATH 535   | Combinatorial Optimization<br>Optimization I  | 3            |
| <b>Computing Sciences Electives (3)</b>   |   |              |
| Select a minimum of one course from the following or from any CS core courses not used to fulfill the core requirements : |   |              |
| CS 422  | Data Mining   | 3            |
| CS 425  | Database Organization   | 3            |
| CS 520  | Data Integration Warehousing  | 3            |
| CS 522  | Advanced Data Mining  | 3            |
| CS 525  | Advanced Database Organization  | 3            |
| CS 529  | Information Retrieval   | 3            |
| CS 554  | Data-Intensive Computing  | 3            |
| CS 577  | Deep Learning   | 3            |
| CS 579  | Online Social Network Analysis  | 3            |

|   |   |      |
|---|---|------|
| CS 583  | Probabilistic Graphical Models                      | 3    |
| CS 585  | Natural Language Processing                         | 3    |
| CS 595  | Topics in Computer Science                          | 3    |
| CS 597  | Reading and Special Problems                        | 1-3  |
| <b>Applied Math Electives (3)</b>   |   |      |
| Select a minimum of one course from the following or from any MATH core courses not used to fulfill the core requirements : |   | 3    |
| MATH 483  | Design and Analysis of Exprmnt                      | 3    |
| MATH 485  | Intro to Mathematical Finance                       | 3    |
| MATH 522  | Mathematical Modeling                               | 3    |
| MATH 546  | Introduction to Time Series                         | 3    |
| MATH 548  | Mathematical Finance I                              | 3    |
| MATH 553  | Discrete Applied Mathematics I                      | 3    |
| MATH 554  | Discrete Applied Math II                            | 3    |
| MATH 569  | Statistical Learning                                | 3    |
| MATH 574  | Bayesian Computational Stats                        | 3    |
| MATH 597  | Reading and Special Projects                        | 1-3  |
| <b>Business and Application Electives (3)</b>   |   |      |
| Select a minimum of one course from the following or from any MBA core courses not used to fulfill the core requirements :  |   | 3    |
| BUS 510   | Strategy & Innovation                               | 3    |
| CAE 581   | Algorithms in Transportation                        | 3    |
| MBA 504   | Analytics for Decision Making                       | 3    |
| MBA 513   | Operations & Tech Management                        | 3    |
| MBA 526   | Supply Chain Management                             | 3    |
| MSC 511   | Math for Mgmt Science I                             | 3    |
| MSC 514   | Math for Mgmt Science II                            | 3    |
| <b>Research (0-5)</b>   |   |      |
| Select zero to five credit hours  |   | 0-5  |
| CS 591<br>or MATH 591   | Reseach and Thesis M.S.<br>Research and Thesis M.S. | 1-5  |
| <b>Additional Computational Decision Science and Operations Research Electives (6-11)</b>                                   |   |      |
| Select 6-11 credit hours <sup>1</sup>   |   | 6-11 |

**Minimum degree credits required: 32**

- <sup>1</sup> Courses listed under core courses may be used as an elective if it is not used to fulfill a core requirement. Note: CS 538 and MATH 535 cannot both be taken for credit. A maximum of five credit hours of CS 597 or MATH 597 may be used towards the elective requirement.