

## UNDERGRADUATE L&S MAJOR IN OPERATIONS RESEARCH AND MANAGEMENT SCIENCE

In the ORMS major, students will develop solid quantitative, model building, and problem solving skills through core courses in mathematics, statistics, and operations research, and will learn how to apply these skills these skills in solving problems in an area of their choice. We outline four possible concentrations below, but many other areas can also benefit from applying an OR perspective. Students may design their own concentrations according to their interests, with guidance from their faculty advisor in IEOR.

### Curriculum

#### Lower-Division Required Courses

Math 1A	Calculus (4 units)
Math 1B	Calculus (4)
Math 53	Multivariable Calculus (4)
Math 54	Linear Algebra & Diff'l Eqns (4)
Engin 7	Intro. to Computer Programming (4)
or CS61A	Computer Programming (4)
Bus. Admin. 10	Principles of Business (3)
Econ 1, 2, or 3	Intro. To Economics (4)

#### Upper-Division Required Courses

IEOR 172 (*)	Prob. and Risk Analysis (3)
or Stat 134 (or 140)	Probability (for Data Science) (3)
Econ 101A	Economic Theory Micro (4)
IEOR 142	Machine Learning and Data Analytics (3)
or IEOR 165	Eng. Stats, Quality, Forecasting (3)
IEOR 160	Nonlinear & Discrete Optimization (3)
or IEOR 162	Linear Programming (3)
IEOR 173	Intro to Stochastic Processes (3)

#### A Concentration of Four or Five Clustered Electives:

ORMS majors, with the signed advance approval of their faculty advisors, select a minimum of four upper division elective courses (minimum 12 units), in addition to the courses above, to form a coherent cluster, or concentration, in an area where Operations Research is applied. Courses in other departments may count toward this requirement if they have substantial relevant content at an appropriately advanced level. The following are some suggestions for concentration areas.

#### 1. Decision Making in Economic Systems

Econ 101B	Economic Theory Macro (4)	Econ C142	Appl. Econometrics and Pub. Pol. (3)
Econ 104	Advanced Microeconomic Theory (4)	Econ C110 (4), UGBA 143 (3), or STAT 155 (3)	Game Theory
Econ 141	Economic Statistics and Econometrics (4)	IEOR 142	Machine Learning and Data Analytics (3)
IEOR 165	Eng. Stats, Quality Control, Forecasting (3)	Math 104	Introduction to Analysis (4)

#### 2. Decision Making in Industrial and Service Systems

IEOR 150	Production Systems Analysis (3)	IEOR 166	Decision Analysis (3)
or UGBA 141	Prod. and Opns. Mgt. (3)	IEOR 170	Human Factors for Engin Design (3)
IEOR 160 or 162	Linear Prog. or Nonlinear & Discrete Opt.	IEOR 151	Service Opns Design and Analysis (3)
IEOR 153	Logistics and Supply Chain Mgt. (3)	UGBA 102B	Managerial Accounting (3)
IEOR 165	Eng. Stats, Quality Control, Forecasting (3)	Econ C110 (4), UGBA 143 (3), or STAT 155 (3)	Game Theory
IEOR 130	Methods of Manuf. Improvement (3)	IEOR 115	Indust. and Comm'l. Data Syst. (3)
IEOR 142	Machine Learning and Data Analytics (3)		

#### 3. Decision Making in Societal Systems

Soc 101A	Sociological Theory (5)	Soc 119	Society and Info. Theory (4)
Soc 105	Introduction to Sociological Methods (5)	Soc 106	Intermed. Sociolog. Methods (4)
IEOR 165	Eng. Stats, Quality Control, Forecasting (3)	Econ C110 (4), UGBA 143 (3), or STAT 155 (3)	Game Theory
IEOR 142	Machine Learning and Data Analytics (3)	IEOR 166	Decision Analysis (3)

#### 4. Algorithmic Decision Making

(CS 61B)	Data Structures (4) (prereq, not counted)	IEOR 115	Indust. and Comm'l. Data Syst. (3)
CS 170	Efficient Alg. and Intractable Prob. (4)	IEOR 160 or 162	Linear Prog. or Nonlinear & Discrete Opt.
CS 172	Computability and Complexity (4)	IEOR 166	Decision Analysis (3)
CS 174	Combinatorics and Discrete Probability (4)	IEOR 142	Machine Learning and Data Analytics (3)
Math 110	Linear Algebra (4)		