Courses that Count Towards Majors and Minors in the IEMS PhD Requirements

The following areas can be chosen as majors or minors in the IEMS PhD course requirements.

- Analytics
- Applied Statistics & Quality Engineering
- Decision and Risk Analysis
- Financial Engineering
- Healthcare Engineering & Decision Sciences
- Optimization
- Organization Theory & Systems Analysis
- Production & Logistics
- Stochastic Modeling and Analysis

In general, any two courses in an area fulfill a minor, and any four courses in an area fulfill a major. The exceptions are that there is no major in Analytics (only a minor), and the rules for Healthcare Engineering & Decision Sciences are more complicated (as explained below).

Some courses belong to multiple areas, but courses cannot be counted towards multiple areas at the same time in a student’s degree plan. Each course taken can be counted only once towards fulfilling the degree requirements.

Courses may not appear here, even if they were approved to count towards an area in the past, if they have not been taught in recent years. They may appear in gray if future offerings are in doubt.

Analytics
There is a minor in Analytics, but no major.

- IEMS 462-1 Predictive Analytics I
- IEMS 490 (Selected Topics) Machine Learning
- MSiA 420 Predictive Analytics
- MSiA 421 Data Mining
- MSiA 490 (Selected Topics) Healthcare Analytics
- MSiA 490 (Selected Topics) Predictive Models in Credit Risk Management
- MSiA 490 (Selected Topics) Smart Grid Analytics
- MSiA 490 (Selected Topics) Text Analytics
- EECS 435 Neural Networks

Applied Statistics & Quality Engineering

- IEMS 462-1 Predictive Analytics I
- IEMS 463 Statistical Analysis of Designed Experiments
- IEMS 465 Simulation Experiment Design and Analysis
- ECON 480-1,2,3 Introduction to Econometrics
- ECON 481-1,2,3 Econometrics
- ECON 482 Applied Econometrics: Time-Series Methods
- ECON 483 Applied Econometrics: Cross-Section Methods
- EECS 510 Statistical Pattern Recognition
- MECS 477 Introduction to Applied Econometrics 2
- STAT 325 Survey Sampling
- STAT 348 Applied Multivariate Analysis
- STAT 350 Regression Analysis
- STAT 351 Design and Analysis of Experiments
- STAT 352 Nonparametric Statistical Methods
- STAT 355 Analysis of Qualitative Data
- STAT 359 (Topics) Data Mining
- STAT 420-1,2,3 Statistical Theory & Methodology
- STAT 448 Multivariate Statistical Methods
- STAT 453 Survival Analysis
- STAT 454 Time-Series Analysis
- STAT 455 Advanced Analysis of Qualitative Data
- STAT 461 (Topics) Theory of Statistical Data Mining

**Decision & Risk Analysis**

- IEMS 445 Decision and Risk Analysis
- IEMS 490 (Selected Topics) Decision Models of Operations Management
- CEE 480-1,2 Travel Demand Analysis and Forecasting
- CEE 482 Evaluation and Decision-Making for Infrastructure Systems
- MECS 460-1 Foundations of Managerial Economics I: Static Decision Models
- MECS 460-2 Foundations of Managerial Economics II: Dynamic Decision Models
- MECS 460-3 Foundations of Managerial Economics III: Game Theory
- MECS 462 Decision Theory
- STAT 350 Regression Analysis
- STAT 351 Design and Analysis of Experiments
- STAT 420-1,2,3 Statistical Theory & Methodology
- STAT 448 Multivariate Statistical Methods
- STAT 453 Survival Analysis
- STAT 454 Time-Series Analysis

**Financial Engineering**

- IEMS 461 Advanced Stochastic Models
- IEMS 473-1,2 Financial Engineering
- IEMS 475 Simulation in Financial Engineering
- FINC 485 Introduction to Financial Theory / 485-1 Asset Pricing I
- FINC 487 Dynamic Asset Pricing Theory / 485-2 Asset Pricing II
• FINC 488 Econometrics of Financial Markets

Healthcare Engineering & Decision Sciences
Courses that belong to Healthcare Engineering & Decision Sciences are classified as category A, B, or C. A minor requires two courses from category A. A major requires at least two courses from category A, three from A + B, and four from A + B + C.

Category A
• MSIA 490 (Selected Topics) Healthcare Analytics
• IEMS 443 Health Policy Modeling
• IEMS 444 Health Management Science
• IEMS 445 Decision and Risk Analysis

Category B
• IEMS 490 (Selected Topics) Humanitarian and Non-profit Logistics
• STAT 453 Survival Analysis
• STAT 465 Statistical Methods for Bioinformatics and Computational Biology

Category C
• IEMS 441 Social Network Analysis
• PUB HLTH 444 Advanced Decision Analysis

Optimization
• IEMS 452 Combinatorial Optimization
• IEMS 454 Large-Scale Optimization
• IEMS 457 Integer Programming
• IEMS 458 Convex Optimization
• IEMS 469 Dynamic Programming
• IEMS 490 (Selected Topics) Machine Learning
• IEMS 490 (Selected Topics) Robust Optimization
• IEMS 490 (Selected Topics) Stochastic Optimization
• EECS 457 Advanced Algorithms
• MECS 460-1 Foundations of Managerial Economics I: Static Decision Models

Organization Theory & Systems Analysis
• EECS 472 Designing and Constructing Models with Multi-Agent Languages
• IEMS 411 Field Research in Organizations
• IEMS 430 Systems Analysis
• IEMS 432 Systems Engineering
• IEMS 433 Theory and Practice of Evaluation
• IEMS 434 Systems Methodology
• IEMS 436 Engineering Project Management
• IEMS 441 Social Network Analysis
• CEE 482 Evaluation and Decision-Making for Infrastructure Systems
• MORS 424-1 The Individual and the Organization
• MORS 424-2 Social Processes in Organizations
• MORS 425-1 Behavior in Organizational Systems
• MORS 425-2 Organizations in their Environments
• MORS 426-1 Micro-Organizational Research Methods
• MORS 426-2 Macro-Organizational Research Methods
• MTS 525 (Selected Topics) Peer Production: Collective Action & Organization

Production & Logistics
• IEMS 482 Routing and Scheduling
• IEMS 489 Transportation Network Design and Operation
• IEMS 490 (Selected Topics) Humanitarian and Non-profit Logistics
• IEMS 490 (Selected Topics) Decision Models of Operations Management
• CEE 471-1,2 Transportation Systems Analysis
• CEE 479 Transportation Systems Planning and Management
• CEE 480-1,2 Travel Demand Analysis and Forecasting
• CEE 482 Evaluation and Decision-Making for Infrastructure Systems
• OPNS 521 Foundations of Operations Management

Stochastic Modeling & Analysis
• IEMS 461 Advanced Stochastic Models
• IEMS 464 Advanced Queueing Theory
• IEMS 465 Simulation Experiment Design and Analysis
• IEMS 468 Stochastic Control
• IEMS 469 Dynamic Programming
• IEMS 490 (Selected Topics) Stochastic Optimization
• MATH 450-1,2 Probability
• MATH 455-1,2 Stochastic Analysis
• OPNS 522 Queueing Networks: Performance Analysis