

# 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 (minor only)
- Applied Statistics & Statistical Learning
- Financial Engineering
- Healthcare Engineering
- Optimization
- Management Science
- Logistics & Operations
- Stochastic Analysis & Simulation

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 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 455 Machine Learning
- IEMS 462-1 Predictive Analytics I
- IEMS 462-2 Predictive Analytics II
- MSiA 420 Predictive Analytics
- MSiA 421 Data Mining
- MSiA 490-23 Health Analytics and Decision Making
- MSiA 490-21 Predictive Models for Credit Risk Management
- MSiA 490 (Selected Topics) Smart Grid Analytics
- MSiA 490-20 Text Analytics
- EECS 435 Neural Networks

## Applied Statistics & Statistical Learning

- 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 433 Statistical Pattern Recognition
- EECS 474 Probabilistic Graphical Models
- MECS 477 Introduction to Applied Econometrics 2
- MECS 478 Introduction to Applied Econometrics 3
- 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 356 Hierarchical Linear Models
- 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
- STAT 461 (Topics) Advanced Survey Sampling

## Financial Engineering

- IEMS 461 Advanced Stochastic Models
- IEMS 473-1,2 Financial Engineering
- IEMS 475 Simulation in Financial Engineering
- EECS 495 Game Theory and Networked Systems
- 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

Courses that belong to Healthcare Engineering 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 451 Stochastic Optimization
- IEMS 452 Combinatorial Optimization
- IEMS 453 Robust Optimization
- IEMS 454 Large-Scale Optimization
- IEMS 455 Machine Learning
- IEMS 457 Integer Programming
- IEMS 459 Convex Optimization
- IEMS 469 Dynamic Programming
- IEMS 490 (Selected Topics) Data-Driven Decisions Under Uncertainty
- IEMS 490 (Selected Topics) Machine Learning
- IEMS 490 (Selected Topics) Robust Optimization
- IEMS 490 (Selected Topics) Stochastic Optimization
- EECS 457 Advanced Algorithms
- EECS 495 Distributed Optimization
- MECS 460-1 Foundations of Managerial Economics I: Static Decision Models
- MECS 460-2 Dynamic Optimization

## Management Science

- 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
- IEMS 490 (Selected Topics) Computational Social Science
- 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
- MORS 522 Economics, Social Psychology and their Experiments
- MTS 525 (Selected Topics) Peer Production: Collective Action & Organization
- EECS 495 Game Theory and Networked Systems

## Logistics & Operations

- IEMS 482 Routing and Scheduling
- IEMS 489 Transportation Network Design and Operation
- IEMS 490 (Selected Topics) Humanitarian and Non-profit Logistics
- 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
- EECS 495 Game Theory and Networked Systems

## Stochastic Analysis & Simulation

- IEMS 451 Stochastic Optimization
- 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 451 Stochastic Optimization
- MATH 450-1,2 Probability
- MATH 450-3 Stochastic Analysis III
- MATH 455-1,2 Stochastic Analysis
- OPNS 516 Stochastic Foundations
- OPNS 522 Queueing Networks: Performance Analysis