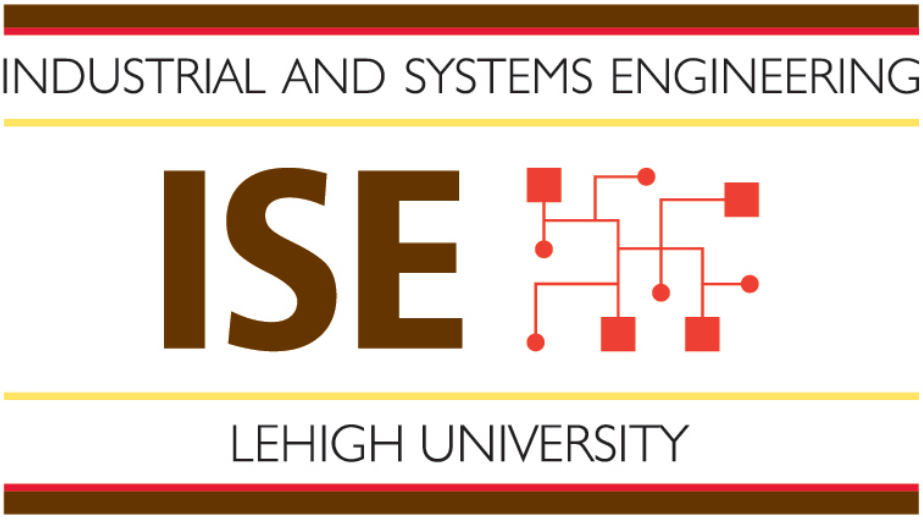


# ISE Masters and Certificate Programs

effective Summer 2026

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# ■ Overview

**Disclaimer:** This document gives a concise overview of the master programs offered in the Department of Industrial and Systems Engineering (ISE). In addition to the program requirements described in this document, the programs are subject to the rules and procedures of Lehigh and the P.C. Rossin College of Engineering and Applied Science (RCEAS). For a comprehensive treatment of all other rules and procedures not stated explicitly in this document, please refer to the RCEAS Graduate Student Handbook.

ISE offers multiple masters programs and certificate programs to meet the educational needs for many people. Each of the programs are designed with significant flexibility, which allows students to design personalized programs to meet their individual needs. The programs are appropriate for full-time or part-time students, and can be completed both in person or remotely. The masters programs can be completed in as little as one year. Although the certificate programs are stand-alone programs, certificates may be obtained while completing a masters program. Moreover, a student completing a certificate program may use those credits towards the completion of a masters degree.

# ■ Masters Programs

The ISE department offers multiple masters degrees to meet the academic needs of many students. The programs are designed to be quite flexible, so that each student may design (in consultation with the M.S. Program Director) a personalized program that prepares them for the next phase in their career. The requirements of the various ISE's masters programs are discussed in the remainder of this section.

# □ Industrial Engineering and Operations Research

ISE offers a Master of Science (M.S.) in Industrial Engineering and Operations Research (IEOR). This program provides engineering graduates the skills and knowledge to pursue careers in their field of interest while meeting the engineering needs of industry, business, health, and government. Graduates will be motivated to continue learning throughout their career, and gain the knowledge and skills to contribute significantly to society. Students graduating from the program will have great knowledge of, and practice in using, a multitude of tools used throughout industrial engineering and operations research.

To complete this program, a student completes 30 credit hours of course work that meets the following requirements.

1. Complete 12 credit hours of course work from the following set of **core IEOR** courses:
    - ISE 402 Operations Research Modeling and Applications
    - ISE 408 Simulation
    - ISE 412 Quantitative Models of Supply Chain Management
    - ISE 424 Industrial Automation and Robots
    - ISE 426 Optimization Models and Applications
    - ISE 427 Facilities Planning and Material Handling
    - ISE 432 Product Quality
    - ISE 434 Operational Excellence
    - ISE 435 Planning and Scheduling in Manufacturing and Services
    - ISE 439 Stochastic Models and Applications
    - ISE 458 Game Theory
    - ISE 462 Logistics and Supply Chain Management
    - ISE 466 Artificial Intelligence for Industrial Engineering and Operations Research
    - ISE 480 ISE Project
    - ISE 482 Leadership Development
    - ISE 485 Industrial Engineering Special Topics
    - ISE 486 Operations Research Special Topics
2. Complete 9 additional credit hours of 400-level course work in the ISE department.
3. Complete 9 additional credit hours of course work at Lehigh; all courses must be at the 300-level or 400-level.

The above requirements can be completed through a combination of standard courses, project-based courses, and masters thesis work. When appropriate, course substitutions may be made with the approval of the M.S. Program Director. All courses used for program requirements must be approved by the M.S. Program Director.

# ☐ Optimization

ISE offers a Master of Science (M.S.) in Optimization. This program is primarily designed to meet the goals and interests of students whose professional plans include research in an educational, governmental, or industrial environment. Students graduating from the program will have a solid understanding of how to design, analyze, implement, and use optimization algorithms for solving problems arising throughout engineering and data science.

To complete this program, a student completes 30 credit hours of course work that meets the following requirements.

1. Complete 12 credit hours of course work from the following set of **core optimization** courses:
    - ISE 401 Convex Analysis
    - ISE 406 Fundamentals of Optimization
    - ISE 407 Numerical Methods and Scientific Computing
    - ISE 411 Graphs and Networks
    - ISE 415 Optimization Under Uncertainty
    - ISE 416 Dynamic Programming
    - ISE 417 Continuous Optimization
    - ISE 418 Discrete Optimization
    - ISE 422 Quantum Computing Optimization
    - ISE 426 Optimization Models and Applications
    - ISE 444 Optimization Methods in Machine Learning
    - ISE 447 Financial Optimization
    - ISE 455 Optimization Algorithms and Software
    - ISE 456 Conic Optimization
2. Complete 9 additional credit hours of 400-level course work in the ISE department.
3. Complete 9 additional credit hours of course work at Lehigh; all courses must be at the 300-level or 400-level.

The above requirements can be completed through a combination of standard courses, project-based courses, and masters thesis work. When appropriate, course substitutions may be made with the approval of the M.S. Program Director. All courses used for program requirements must be approved by the M.S. Program Director.

# ☐ Health Systems Engineering

ISE offers a Master of Science (M.S.) in Health Systems Engineering (HSE). This program produces graduates with strong fundamental skills in industrial and systems engineering and a strong background in health systems and processes. Graduates will be ideally positioned for skilled professional management roles aimed at improving quality, streamlining processes and improving efficiency in health systems. This degree program is designed to prepare graduate students for engineering and management careers in firms or institutions engaged in delivering health-related products and services.

Students seeking to enroll to the program should have a bachelor's degree in engineering, mathematics, science, or business. Students should be quantitatively oriented and have completed a calculus based probability and statistics course. A candidate lacking certain background may be required to take background courses.

To complete this program, a student completes 30 credit hours of course work that meets the following requirements.

1. Complete 9 credit hours of course work from the following set of core health courses:
    - ISE 471 Quality and Process Improvement in Healthcare
    - ISE 472 Financial Management in Healthcare
    - ISE 481 HSE Project
    - BSTA 309/409 Outbreak Science & Public Health Forecasting
    - BSTA 410 Assistive Technologies
    - CGH 313 Health Policy and Politics
    - CGH 331/431 Healthcare Finance
    - CGH 335/435 Healthcare Operations Management
    - EPI 404 Methods in Epidemiology I
    - EPI 405 Methods in Epidemiology II
    - HLTH 400 Philosophical and Theoretical Foundations of Population Health
    - HLTH 412 Research Ethics in Population Health
    - PopH 403 Biological Basis of Population Health: Concepts and Methods
    - PopH 409 Social Determinants of Health
    - PopH 431 Environmental Health Justice
    - PubH 401 Health Promotion & Education
    - PubH 402 Health Services, Administration, Politics and Policy
    - PubH 403 Health Program Planning and Implementation
    - PubH 405 Program Evaluation Methods
2. Complete 9 additional credit hours of 400-level course work in the ISE department.
3. Complete 6 additional credit hours of course work at Lehigh in the College of Engineering; all courses must be at the 300-level or 400-level.
4. Complete 6 additional credit hours of course work at Lehigh; all courses must be at the 300-level or 400-level.

The above requirements can be completed through a combination of standard courses, project-based courses, and masters thesis work. When appropriate, course substitutions may be made with the approval of the M.S. Program Director. All courses used for program requirements must be approved by the M.S. Program Director.

# ■ Certificate Programs

The ISE department offers multiple certificate programs that cover a wide range of student interests. Although the certificate programs are stand-alone programs, students enrolled in an ISE masters program may apply to receive any of the certificates below provided they complete the program requirements while in the program.

# □ Industrial Engineering and Operations Research

The Certificate in Industrial Engineering and Operations Research (IEOR) provides graduates an introduction into the skills and knowledge to pursue careers in their field of interest within industrial engineering and operations research. Students will be motivated to continue learning throughout their career and gain the knowledge and skills to contribute to society. Students obtaining this certificate may be interested in continuing their studies and receiving a masters degree. Upon completion of the certificate program, students have the option of applying to the IEOR masters program and applying the 12 certificate credits towards that 30-credit master's degree.

To complete this certificate, a student completes 12-credit hours of **core IEOR** coursework (see page 2). When appropriate, course substitutions may be made with the approval of the M.S. Program Director. All courses used for program requirements must be approved by the M.S. Program Director.

# □ Optimization

The Certificate in Optimization is intended for those students that want an introduction to optimization. Students graduating from the program will have a working understanding of how to design, analyze, implement, and use optimization algorithms for solving problems arising throughout engineering and data science. Students will be motivated to continue learning throughout their career and gain the knowledge and skills to contribute to society. Students obtaining this certificate may be interested in continuing their studies and receiving a masters degree. Upon completion of the certificate program, students have the option of applying to the Optimization masters degree program and applying the 12 certificate credits towards that 30-credit master's degree.

To complete this certificate, a student completes 12-credit hours of **core optimization** coursework (see page 3). When appropriate, course substitutions may be made with the approval of the M.S. Program Director. All courses used for program requirements must be approved by the M.S. Program Director.

# □ Health Systems Engineering

The Certificate in Health Systems Engineering provides students and working healthcare professionals an introduction to fundamental skills in industrial and systems engineering and a background in health systems and processes. Individuals completing the certificate program will be better positioned to apply systems engineering knowledge and skills to improve overall quality, streamline processes and improve efficiency in health systems. Upon completion of the certificate program, students have the option of applying to the Health Systems Engineering masters degree program and applying the 12 certificate credits towards that 30-credit master's degree.

Students seeking to enroll to the program should have a bachelor's degree in engineering, mathematics, science, business, or similar field. Students should be quantitatively oriented and have completed a calculus based probability and statistics course. A candidate lacking certain background may be required to take background courses.

To complete this certificate, a student completes 12-credit hours of course work as follows.

- Complete 6 credit hours of **core health** coursework (see page 4).
- Complete 6 additional credit hours of 400-level course work in the ISE department.

When appropriate, course substitutions may be made with the approval of the M.S. Program Director. All courses used for program requirements must be approved by the M.S. Program Director.

# ☐ Data Analytics

The Certificate in Data Analytics is primarily for graduate students who are interested in obtain rigorous training in data analytics. The program offers a solid preparation by providing the knowledge and skills on data processes and algorithms needed for industry or research positions, covering descriptive, predictive, and prescriptive analytics.

To complete this certificate, a student completes 12-credit hours from the following set of data analytics courses.

- ISE 409 Time Series Analysis
- ISE 410 Design of Experiments
- ISE 414 Uncertainty Quantification
- ISE 426 Optimization Models and Applications
- ISE 429 Probability and Stochastic Processes
- ISE 444 Optimization Methods in Machine Learning
- ISE 455 Optimization Algorithms and Software
- ISE 464 Introduction to Machine Learning
- ISE 465 Applied Data Mining
- ISE 466 Artificial Intelligence for Industrial Engineering and Operations Research

When appropriate, course substitutions may be made with the approval of the M.S. Program Director. All courses used for program requirements must be approved by the M.S. Program Director.