

# INDUSTRIAL ENGINEERING (INDE)

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## INDE 501 - FUNDAMENTALS OF INDUSTRIAL ENGINEERING

**Short Title:** FUND INDUSTRIAL ENGINEERING

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** Introduction to fundamental tools in industrial engineering. Topics include productivity analysis, material handling, logistics, design of experiments, quality control, location theory, warehouse design, supply chain management and scheduling. Instructor Permission Required.

## INDE 509 - INTRODUCTION TO HUMAN FACTORS ENGINEERING

**Short Title:** INTRO TO HUMAN FACTORS ENG

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Prerequisite(s):** INDE 501

**Description:** Analysis and design of engineering systems considering human characteristics and limitations. Design of control, displays, tools, workstations and groups. Human factors research methods. Instructor Permission Required.

## INDE 511 - GRAPH ALGORITHMS

**Short Title:** GRAPH ALGORITHMS

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** Graph Algorithms in Operations Research. Topics include: spanning trees, graph search algorithms, shortest path problems, worst case time complexity analysis, computational complexity, dominating set problems, vertex and edge cover problems, python implementations, and other problems in graph optimization. Instructor Permission Required. Recommended Prerequisite(s): INDE 545 or CAAM 378

## INDE 543 - MANUFACTURING PROCESSES AND SYSTEMS

**Short Title:** MANUFACTURING PROC AND SYS

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Prerequisite(s):** INDE 501

**Description:** Fundamentals of manufacturing processes and systems. Topics include machining, casting, 2D printing, material flow, capacities, bottlenecks, and just-in-time systems. Simulation and optimization of various manufacturing systems. Trade-offs among various processes. Instructor Permission Required.

## INDE 545 - PRESCRIPTIVE ANALYTICS

**Short Title:** PRESCRIPTIVE ANALYTICS

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** A survey of methods for combining mathematical models and large data sets to produce optimal decisions. Topics include decision analysis, dynamic programs, mathematical programs and various heuristics. Instructor Permission Required.

## INDE 546 - COMPUTATIONAL PRESCRIPTIVE ANALYTICS

**Short Title:** COMP PRESCRIPTIVE ANALYTICS

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Prerequisite(s):** INDE 545

**Description:** A continuation of INDE 545 that focuses on computational approaches to prescriptive analytics. Topics include decomposition approaches to large-scale optimization, modeling languages, decision analysis and discrete-event simulation software. Emphasis will be placed on using relevant software on practical problems. Instructor Permission Required.

## INDE 561 - SUPPLY CHAIN MANAGEMENT

**Short Title:** SUPPLY CHAIN MANAGEMENT

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Prerequisite(s):** INDE 545

**Description:** Supply chain management is the integrated management of the flow of materials, products, services, and cash from the suppliers all the way to the customers and from the customers back to the suppliers. Due to the complex nature of today's supply chains, effective management of these flows is a challenging task. This course aims to familiarize students with the concepts and models that are useful in designing and managing effective and efficient supply chains. Topics include facility location and distribution models, forecasting, sales & operations planning, supply chain coordination, inventory management, transportation, supplier selection, pricing & revenue management, and sustainability in supply chains. Instructor Permission Required. Graduate/Undergraduate Equivalency: CAAM 421. Mutually Exclusive: Cannot register for INDE 561 if student has credit for CAAM 421.

**INDE 562 - INTRODUCTION TO CONTINUOUS OPTIMIZATION**

**Short Title:** INTRO TO CONTINUOUS OPT

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** An introduction to the formulation of unconstrained and constrained optimization models, and their numerical implementations to problems in science and engineering. Emphasis on Newton-type and interior-point methodologies. Instructor Permission Required.

Recommended Prerequisite(s): INDE 545 or CAAM 378

**INDE 567 - OPTIMIZATION METHODS IN FINANCE**

**Short Title:** OPT METHODS IN FINANCE

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Prerequisite(s):** MATH 212 and CAAM 210

**Description:** Fundamentals of financial optimization. Asset-liability management, arbitrage and asset pricing, mean-variance models, portfolio optimization. This course covers models and algorithms for solving linear, quadratic, integer, and stochastic optimization models encountered in financial and data science applications. Students who have taken CAAM 467 should consult their advisor before attempting to register for INDE 567. Department Permission Required. Graduate/Undergraduate Equivalency: CAAM 467. Recommended Prerequisite(s): INDE 545

**INDE 571 - PROBABILITY AND STATISTICAL INFERENCE**

**Short Title:** PROB & STATISTICAL INFERENCE

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** Topics include probability, random variables, probability distributions, transformations, moment generating functions, common families of distributions, independence, sampling and convergence, basics of estimation theory, hypothesis testing, Bayesian inference, ANOVA, regression. Introduction to statistical software. Department Permission Required.

**INDE 572 - STOCHASTIC PROCESSES AND SIMULATION**

**Short Title:** STOCH PROCESSES & SIMULATION

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Prerequisite(s):** INDE 571

**Description:** Topics include Markov chains, renewal processes, queueing theory, statistical quality control, discrete-event simulation, random number generators, Monte Carlo methods, resampling methods, Markov Chain Monte Carlo, importance sampling and simulation based estimation for stochastic processes.

**INDE 573 - DISCRETE-EVENT SIMULATION**

**Short Title:** DISCRETE-EVENT SIMULATION

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Prerequisite(s):** (STAT 518 and STAT 519) or INDE 571

**Description:** Simulation of discrete-event dynamic systems. Topics include introduction to simulation models; modeling with Simio, a comprehensive simulation package with animation capabilities; statistical aspects such as input and output analysis, random variate generation, variance reduction techniques; optimization via simulation. Students who have taken CAAM 485 should consult their advisor before attempting to register for INDE 573. Department Permission Required. Graduate/Undergraduate Equivalency: CAAM 485.

**INDE 577 - DATA SCIENCE AND MACHINE LEARNING**

**Short Title:** DATA SCI & MACHINE LEARNING

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** Fundamentals of data science and machine learning. Topics include: introduction to scikit-learn, Keras and tensorflow2, linear and logistic regression, clustering, support vector machines, random forest trees, neural networks, deep learning, natural language processing. Instructor Permission Required. Recommended Prerequisite(s): Three semesters of calculus recommended. A background in some programming language would be extremely useful.

**INDE 590 - MASTER'S IN INDUSTRIAL ENGINEERING CAPSTONE**

**EXPERIENCE**

**Short Title:** MIE CAPSTONE EXPERIENCE

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Research

**Credit Hour:** 1

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** MIE students are required to write a field report related to one of the required core courses in the curriculum. Students should coordinate this with the INDE 590 instructor/capstone director, prepare a report relevant to the course material, and present it in class. Instructor Permission Required. Recommended Prerequisite(s): INDE 501 and INDE 545 and INDE 571. Repeatable for Credit.

**INDE 597 - TOPICS IN INDUSTRIAL ENGINEERING**

**Short Title:** TOPICS IN INDUSTRIAL ENG

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Lecture

**Credit Hours:** 3

**Restrictions:** Enrollment is limited to Graduate level students.

**Course Level:** Graduate

**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Instructor Permission Required. Repeatable for Credit.

**INDE 677 - SPECIAL TOPICS**

**Short Title:** SPECIAL TOPICS

**Department:** Industrial Engineering

**Grade Mode:** Standard Letter

**Course Type:** Internship/Practicum, Laboratory, Lecture, Seminar, Independent Study

**Credit Hours:** 1-4

**Restrictions:** Enrollment is limited to Graduate or Visiting Graduate level students.

**Course Level:** Graduate

**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.