Industrial Engineering and Operations Research

Overview

The Department of Industrial Engineering and Operations Research (IEOR) educates students to become highly skilled in the quantitative modeling and analysis of a broad array of systems-level decision problems, such as:

- Economic efficiency, productivity, and quality
- The collection and analysis of data using a database and decision-support tools; the comprehensive modeling of uncertainty
- The development and creative use of analytical and computational methods for solving these problems

Students obtain the broader skills, background, and knowledge necessary to be effective professionals in a rapidly-changing global economy. The department's mission includes creating knowledge that advances the state of the art in optimization, stochastic modeling and simulation, and the application of these tools to important societal systems.

IEOR students and faculty members are actively engaged in a variety of research projects that have made and continue to make important contributions to both the theory and practice of operations research and industrial engineering. Some of the research areas represented in the IEOR department are the analysis of algorithms, automation and robotics, combinatorics and integer programming, convex optimization, financial engineering, inventory theory, risk analysis, robust optimization, queueing theory, supply chain management, scheduling, and simulation.

Undergraduate Programs

Industrial Engineering and Operations Research (http://guide.berkeley.edu/archive/2020-21/undergraduate/degree-programs/industrial-engineering-operations-research/): BS (offered through the College of Engineering), Minor
Operations Research and Management Science (http://guide.berkeley.edu/archive/2020-21/undergraduate/degree-programs/operations-research-management-science/): BA (offered through the College of Letters and Science)

Graduate Programs

Industrial Engineering and Operations Research (http://guide.berkeley.edu/archive/2020-21/graduate/degree-programs/industrial-engineering/): MEng, MS, and PhD

Industrial Engineering and Operations Research

Expand all course descriptions [+]Collapse all course descriptions [-]

IND ENG 24 Freshman Seminars 1 Unit

Terms offered: Fall 2017, Fall 2016, Fall 2015
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Freshman Seminars: Read More [+]
Objectives & Outcomes

Course Objectives: Provide an introduction to the field of Industrial Engineering and Operations Research through a series of lectures.

Student Learning Outcomes: Learn more about Industrial Engineering and Operations Research.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Freshman Seminars: Read Less [-]

IND ENG 66 A Bivariate Introduction to IE and OR 3 Units

Terms offered: Fall 2016
This Freshman-level Introductory course will provide an intuitive overview of the fundamental problems addressed and methods in the fields of Industrial Engineering and Operations Research including Constrained Optimization, Human Factors, Data Analytics, Queues and Chains, and Linear Programming. The course will focus on two-dimensional, i.e., bivariate, examples where the problems and methods are amenable to visualization and geometric intuition. The course will discuss applications such as dieting, scheduling, and transportation. This course will not require pre-requisites and will present the core concepts in a self-contained manner that is accessible to Freshmen to provide the foundation for future coursework.
A Bivariate Introduction to IE and OR: Read More [+]
Objectives & Outcomes

Course Objectives: •
Provide a broad survey of the important topics in IE and OR, and develop intuition about problems, algorithms, and abstractions using bivariate examples (2D).
•
Describe different mathematical abstractions used in IEOR (e.g., graphs, queues, Markov chains), and how to use these abstractions to model real-world problems.
•
Introduce students to the data analysis process including: developing a hypothesis, acquiring data, processing the data, testing the hypothesis, and presenting results.
•
Provide students with concrete examples of how the mathematical tools from the class apply to real problems such as dieting, scheduling, and transportation.

Rules & Requirements

Credit Restrictions: Course restricted to Freshman students.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Goldberg

A Bivariate Introduction to IE and OR: Read Less [-]

IND ENG 95 A. Richard Newton Lecture Series 1 Unit

Terms offered: Fall 2021, Spring 2021, Fall 2020
This lecture series serves as an entry point for undergraduate and graduate curriculum sequences in entrepreneurship and innovation. The series, established in 2005, is named in honor of A. Richard Newton, a visionary technology industry leader and late dean of the University of California Berkeley College of Engineering. The course features a selection of high-level industry speakers who share their insights on industry developments, leadership, and innovation based on their careers.
A. Richard Newton Lecture Series: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of colloquium per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

Instructor: Sidhu

A. Richard Newton Lecture Series: Read Less [-]

IND ENG 98 Supervised Group Study and Research 1 - 3 Units

Terms offered: Spring 2019, Fall 2015, Spring 2015
Supervised group study and research by lower division students.
Supervised Group Study and Research: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

Credit Restrictions: Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-3 hours of directed group study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Supervised Group Study and Research: Read Less [-]

IND ENG 99 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Prior to 2007
Supervised independent study for lower division students.
Supervised Independent Study and Research: Read More [+]
Rules & Requirements

Prerequisites: Freshman or sophomore standing and consent of instructor

Credit Restrictions: Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer:
8 weeks - 1.5-7.5 hours of independent study per week
10 weeks - 1.5-6 hours of independent study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Study and Research: Read Less [-]

IND ENG 115 Industrial and Commercial Data Systems 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Design and implementation of databases, with an emphasis on industrial and commercial applications. Relational algebra, SQL, normalization. Students work in teams with local companies on a database design project. WWW design and queries.
Industrial and Commercial Data Systems: Read More [+]
Rules & Requirements

Prerequisites: Upper division standing

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Goldberg

Industrial and Commercial Data Systems: Read Less [-]

IND ENG 120 Principles of Engineering Economics 3 Units

Terms offered: Prior to 2007
Economic analysis for engineering decision making: Capital flows, effect of time and interest rate. Different methods of evaluation of alternatives. Minimum-cost life and replacement analysis. Depreciation and taxes. Uncertainty; preference under risk; decision analysis. Capital sources and their effects. Economic studies. Formerly Engineering 120.
Principles of Engineering Economics: Read More [+]
Rules & Requirements

Credit Restrictions: Students will receive 2 units for 120 after taking Civil Engineering 167. Students will not receive credit after taking Engineering 120.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 4 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Adler

Principles of Engineering Economics: Read Less [-]

IND ENG 130 Methods of Manufacturing Improvement 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Analytical techniques for the improvement of manufacturing performance along the dimensions of productivity, quality, customer service, and throughput. Techniques for yield analysis, process control, inspection sampling, equipment efficiency analysis, cycle time reduction, and on-time delivery improvement. Applications on semiconductor manufacturing or other industrial settings.
Methods of Manufacturing Improvement: Read More [+]
Rules & Requirements

Prerequisites: IND ENG 172, MATH 54, or STAT 134 (STAT 134 may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Leachman

Methods of Manufacturing Improvement: Read Less [-]

IND ENG 135 Applied Data Science with Venture Applications 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020
This highly-applied course surveys a variety of key of concepts and tools that are useful for designing and building applications that process data signals of information. The course introduces modern open source, computer programming tools, libraries, and code samples that can be used to implement data applications. The mathematical concepts highlighted in this course include filtering, prediction, classification, decision-making, Markov chains, LTI systems, spectral analysis, and frameworks for learning from data. Each math concept is linked to implementation using Python using libraries for math array functions (NumPy), manipulation of tables (Pandas), long term storage (SQL, JSON, CSV files), natural language (NLTK), and ML frameworks.
Applied Data Science with Venture Applications: Read More [+]
Objectives & Outcomes

Student Learning Outcomes: Students will be able to design and build data sample application systems that can interpret and use data for a wide range of real life applications across many disciplines and industries;
implement these concepts within applications with modern open source CS tools.
understand relevant mathematical concepts that are used in systems that process data;

Rules & Requirements

Prerequisites: Prerequisites include the ability to write code in Python, and a probability or statistics course. This course is ideal for students who have taken COMPSCI C8 / DATA C8 / INFO C8 / STAT C8

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Sidhu

Applied Data Science with Venture Applications: Read Less [-]

IND ENG 142 Introduction to Machine Learning and Data Analytics 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2019
This course introduces students to key techniques in machine learning and data analytics through a diverse set of examples using real datasets from domains such as e-commerce, healthcare, social media, sports, the Internet, and more. Through these examples, exercises in R, and a comprehensive team project, students will gain experience understanding and applying techniques such as linear regression, logistic regression, classification and regression trees, random forests, boosting, text mining, data cleaning and manipulation, data visualization, network analysis, time series modeling, clustering, principal component analysis, regularization, and large-scale learning.
Introduction to Machine Learning and Data Analytics: Read More [+]
Objectives & Outcomes

Course Objectives: 1.
To expose students to a variety of statistical learning methods, all of which are relevant in useful in wide range of disciplines and applications.
2.
To carefully present the statistical and computational assumptions, trade-offs, and intuition underlying each method discussed so that students will be trained to determine which techniques are most appropriate for a given problem.
3.
Through a series of real-world examples, students will learn to identify opportunities to leverage the capabilities of data analytics and will see how data analytics can provide a competitive edge for companies.
4.
To train students in how to actually apply each method that is discussed in class, through a series of labs and programming exercises.
5.
For students to gain some project-based practical data science experience, which involves identifying a relevant problem to be solved or question to be answered, gathering and cleaning data, and applying analytical techniques.
6.
To introduce students to advanced topics that are important to the successful application of machine learning methods in practice, include how methods for prediction are integrated with optimization models and modern optimization techniques for large-scale learning problems.

Rules & Requirements

Prerequisites: IEOR 165 or equivalent course in statistics. Prior exposure to optimization is helpful but not strictly necessary. Some programming experience/literacy is expected

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructors: Grigas, Paul

Introduction to Machine Learning and Data Analytics: Read Less [-]

IND ENG 150 Production Systems Analysis 3 Units

Terms offered: Fall 2020, Fall 2019, Fall 2018
Quantitative models for operational and tactical decision making in production systems, including production planning, inventory control, forecasting, and scheduling.
Production Systems Analysis: Read More [+]
Rules & Requirements

Prerequisites: IND ENG 160, IND ENG 173, IND ENG 162, IND ENG 165, and ENGIN 120

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Yano

Production Systems Analysis: Read Less [-]

IND ENG 151 Service Operations Design and Analysis 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
This course is concerned with improving processes and designing facilities for service businesses such as banks, health care organizations, telephone call centers, restaurants, and transportation providers. Major topics in the course include design of service processes, layout and location of service facilities, demand forecasting, demand management, employee scheduling, service quality management, and capacity planning.
Service Operations Design and Analysis: Read More [+]
Rules & Requirements

Prerequisites: IND ENG 162, IND ENG 173, and a course in statistics

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Service Operations Design and Analysis: Read Less [-]

IND ENG 153 Logistics Network Design and Supply Chain Management 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
We will focus primarily on both quantitative and qualitative issues which arise in the integrated design and management of the entire logistics network. Models and solution techniques for facility location and logistics network design will be considered. In addition, qualitative issues in distribution network structuring, centralized versus decentralized network control, variability in the supply chain, strategic partnerships, and product design for logistics will be considered through discussions and cases.
Logistics Network Design and Supply Chain Management: Read More [+]
Rules & Requirements

Prerequisites: IND ENG 160, IND ENG 162 or senior standing

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Kaminsky

Logistics Network Design and Supply Chain Management: Read Less [-]

IND ENG 160 Nonlinear and Discrete Optimization 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
This course introduces unconstrained and constrained optimization with continuous and discrete domains. Convex sets and convex functions; local optimality; KKT conditions; Lagrangian duality; steepest descent and Newton's method. Modeling with integer variables; branch-and-bound method; cutting planes. Models on production/inventory planning, logistics, portfolio optimization, factor modeling, classification with support vector machines.
Nonlinear and Discrete Optimization: Read More [+]
Rules & Requirements

Prerequisites: MATH 53 and MATH 54

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Atamturk

Nonlinear and Discrete Optimization: Read Less [-]

IND ENG 162 Linear Programming and Network Flows 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020
This course addresses modeling and algorithms for optimization of linear constrained optimization problems. The simplex method; theorems of duality; complementary slackness. Applications in production planning and resource allocation. Graph and network problems as linear programs with integer solutions. Algorithms for selected network flow problems. Transportation and logistics problems. Dynamic programming and its role in applications to shortest paths, project management and equipment replacement.
Linear Programming and Network Flows: Read More [+]
Rules & Requirements

Prerequisites: MATH 53 and MATH 54

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Hochbaum

Linear Programming and Network Flows: Read Less [-]

IND ENG 164 Introduction to Optimization Modeling 3 Units

Terms offered: Prior to 2007
Designed for students from any science/engineering major, this upper-division course will introduce students to optimization models, and train them to use software tools to model and solve optimization problems. The main goal is to develop proficiency in common optimization modeling languages, and learn how to integrate them with underlying optimization solvers. Students will work primarily on modeling exercises, which will develop confidence in modeling and solve optimization methods using software packages, and will require some programming.
Review of linear and nonlinear optimization models, including optimization problems with discrete decision variables. Applications to practical problems from engineering and data science.
Introduction to Optimization Modeling: Read More [+]
Objectives & Outcomes

Course Objectives: •
To introduce students to the core concepts of optimization

•
To train them in the art and science of using software tools to model and solve optimization problems.

Rules & Requirements

Prerequisites: No prerequisites except some Python programming skills, which can be met by COMPSCI C8 (or any other Python-based course)

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Introduction to Optimization Modeling: Read Less [-]

IND ENG 165 Engineering Statistics, Quality Control, and Forecasting 4 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
This course will introduce students to basic statistical techniques such as parameter estimation, hypothesis testing, regression analysis, analysis of variance. Applications in forecasting and quality control.
Engineering Statistics, Quality Control, and Forecasting: Read More [+]

Rules & Requirements

Prerequisites: IND ENG 172, or STAT 134, or an equivalent course in probability theory

Credit Restrictions: Students will receive no credit for IND ENG 165 after completing STAT 135.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Engineering Statistics, Quality Control, and Forecasting: Read Less [-]

IND ENG 166 Decision Analytics 3 Units

Terms offered: Spring 2021, Fall 2019, Spring 2018
Introductory course on the theory and applications of decision analysis. Elective course that provides a systematic evaluation of decision-making problems under uncertainty. Emphasis on the formulation, analysis, and use of decision-making techniques in engineering, operations research and systems analysis. Includes formulation of risk problems and probabilistic risk assessments. Graphical methods and computer software using event trees, decision trees, and influence diagrams that focus on model design.
Decision Analytics: Read More [+]

Rules & Requirements

Prerequisites: IND ENG 172 or STAT 134

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Oren, Righter

Decision Analytics: Read Less [-]

IND ENG 169 Integer Optimization 3 Units

Terms offered: Spring 2021, Fall 2020, Spring 2020
This course addresses modeling and algorithms for integer programming problems, which are constrained optimization problems with integer-valued variables. Flexibility of integer optimization formulations; if-then constraints, fixed-costs, etc. Branch and Bound; Cutting plane methods; polyhedral theory. Applications in production planning, resource allocation, power generation, network design. Alternate formulations for integer optimization: strength of Linear Programming relaxations. Algorithms for integer optimization problems. Specialized strategies by integer programming solvers.
Integer Optimization: Read More [+]

Objectives & Outcomes

Course Objectives: •
Enable the students to recognize when problems can be modeled as integer optimization problems.
•
Familiarize students in leading methodologies for solving integer optimization problems, and techniques in these methodologies.
•
To acquire skills in the best modeling approach that is suitable to the practical problem at hand.
•
To train students in modeling of integer optimization problems;
•
To train the students in the selection of appropriate techniques to be used for integer optimization problems.

Rules & Requirements

Prerequisites: MATH 53, MATH 54, and background in Python and programming

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Rajan

Integer Optimization: Read Less [-]

IND ENG 170 Industrial Design and Human Factors 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
This course surveys topics related to the design of products and interfaces ranging from alarm clocks, cell phones, and dashboards to logos, presentations, and web sites. Design of such systems requires familiarity with human factors and ergonomics, including the physics and perception of color, sound, and touch, as well as familiarity with case studies and contemporary practices in interface design and usability testing. Students will solve a series of design problems individually and in teams.
Industrial Design and Human Factors: Read More [+]

Rules & Requirements

Prerequisites: Upper division standing

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Goldberg

Industrial Design and Human Factors: Read Less [-]

IND ENG 171 Technology Firm Leadership 3 Units

Terms offered: Fall 2020, Spring 2020, Fall 2019
This course explores key management and leadership concepts relevant to the high-technology world. Topics include the firm's key operations, strategic issues, and managerial leadership including personal leadership and talent management. This course prepares technical and business minded students for careers focused on professional and management track careers in high technology. Students undertake intensive study of actual business situations through rigorous case-study analysis.
Technology Firm Leadership: Read More [+]

Rules & Requirements

Prerequisites: Upper division standing

Credit Restrictions: Students will receive no credit for Ind Eng 171 after taking UGBA 105.

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Summer: 8 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Technology Firm Leadership: Read Less [-]

IND ENG 172 Probability and Risk Analysis for Engineers 4 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
This is an introductory course in probability designed to develop a good understanding of uncertain phenomena and the mathematical tools used to model and analyze it. Applications will be given in such areas as reliability theory, risk theory, inventory theory, financial models, and computer science, among others. To complement the theory, the course also covers the basics of stochastic simulation. This course is a probability course and cannot be used to fulfill any engineering unit or elective requirements.
Probability and Risk Analysis for Engineers: Read More [+]

Objectives & Outcomes

Course Objectives: Students will learn how to model random phenomena and learn about a variety of areas where it is important to estimate the likelihood of uncertain events. Students will also learn how to use computer simulation to replicate and analyze these events.

Rules & Requirements

Prerequisites: Students should have a solid knowledge of calculus, including multiple variable integration, such as MATH 1A and MATH 1B or MATH 16A and MATH 16B, as well as programming experience in Matlab or Python

Credit Restrictions: Students will receive no credit for IND ENG 172 after completing STAT 134, or STAT 140. A deficient grade in IND ENG 172 may be removed by taking STAT 140.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Probability and Risk Analysis for Engineers: Read Less [-]

IND ENG 173 Introduction to Stochastic Processes 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
This is an introductory course in stochastic models. It builds upon a basic course in probability theory and extends the concept of a single random variable into collections of random variables known as stochastic processes. The course focuses on discrete-time Markov chains, Poisson process, continuous-time Markov chains, and renewal theory. It also discusses applications to queueing theory, risk analysis and reliability theory. Along with the theory, the course covers stochastic simulation techniques that will allow students to go beyond the models and applications discussed in the course.
Introduction to Stochastic Processes: Read More [+]

Objectives & Outcomes

Course Objectives: Students will learn how to model random phenomena that evolves over time, as well as the simulation techniques that enable the replication of such problems using a computer. By discussing various applications in science and engineering, students will be able to model many real world problems where uncertainty plays an important role.

Rules & Requirements

Prerequisites: Students should have taken a probability course, such as STAT 134 or IND ENG 172, and should have programming experience in Matlab or Python

Credit Restrictions: Students will receive no credit for Ind Eng 173 after taking Ind Eng 161.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Introduction to Stochastic Processes: Read Less [-]

IND ENG 174 Simulation for Enterprise-Scale Systems 3 Units

Terms offered: Fall 2021, Fall 2020, Spring 2020
Introductory course on design, programming, and statistical analysis of simulation methods and tools for enterprise-scale systems such as traffic and computer networks, health-care and financial systems, and factories. Topics include the types of problems that can be solved by such methods. Programming material includes the theory behind random variable generation for a variety of common variables. Advanced techniques such as variance reduction, simulation optimization, or meta-modeling are considered. Student teams implement an enterprise-scale simulation in a semester-length design project.
Simulation for Enterprise-Scale Systems: Read More [+]

Objectives & Outcomes

Course Objectives: •
Exposure students to state-of-art advanced simulation techniques. • Note: the course is a mixture of modeling art, analytical science, and computational technology.
•
Have students communicate their ideas and solutions effectively in written reports.
•
Insure students become familiar with the fundamental similarities and differences among simulation software packages.
•
Introduce students to modern techniques for developing computer simulations of stochastic discrete-event models and experimenting with such models to better design and operate dynamic systems.
•
Introduce the different technologies used to develop simulation models and simulator products in order to become critical consumers of simulation study results.
•
Teach strengths and weaknesses of different approaches for a foundation for selecting methodologies.
•
Teach students how to model random processes and experiment with simulated systems.

Rules & Requirements

Prerequisites: IND ENG 165; IND ENG 173; IND ENG 172 or STAT 134

Credit Restrictions: Students will receive no credit for IND ENG 174 after completing IND ENG 131. A deficient grade in IND ENG 174 may be removed by taking IND ENG 131.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Zheng

Simulation for Enterprise-Scale Systems: Read Less [-]

IND ENG 180 Senior Project 4 Units

Terms offered: Spring 2021, Spring 2020, Fall 2019
Application of systems analysis and industrial engineering to the analysis, planning, and/or design of industrial, service, and government systems. Consideration of technical and economic aspects of equipment and process design. Students work in teams under faculty supervision. Topics vary yearly.
Senior Project: Read More [+]

Rules & Requirements

Prerequisites: 160, 162, 165, 173, Engineering 120, and three other Industrial Engineering and Operations Research electives

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 6 hours of fieldwork per week

Summer: 10 weeks - 3 hours of lecture and 9 hours of fieldwork per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Senior Project: Read Less [-]

IND ENG 185 Challenge Lab 4 Units

Terms offered: Fall 2021, Summer 2021 8 Week Session, Spring 2021
This course is meant for students in engineering and other disciplines who seek a challenging, interactive, team-based, and hands-on learning experience in entrepreneurship and technology. In this highly experiential course, students work in simulated start-up teams to create products or start-up ideas to address a broadly-defined need of an industry partner or social challenge.
Challenge Lab: Read More [+]

Objectives & Outcomes

Course Objectives: 1)
To catalyze learning through experiential entrepreneurship
2)
To help students understand the entrepreneurial context, and how it can create better outcomes.
3)
To help students identify the best role for themselves within an entrepreneurial organization.

Student Learning Outcomes: 1)
Gain experience with effectively refining ideas and pivoting based on feedback and external factors.
2)
Gain experience building effective teams to develop and execute an idea
3)
Become comfortable with failure and how to learn from failure.
4)
Become adept at succinctly communicating ideas in terms of value proposition and business viability.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of seminar per week

Summer:
6 weeks - 10 hours of seminar per week
8 weeks - 7.5 hours of seminar per week
10 weeks - 6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructors: Goldberg, Sidhu, Wroblewki, IEOR / CET Instructors

Challenge Lab: Read Less [-]

IND ENG 186 Product Management 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2019
Too often we are enamored in our brilliant ideas, we skip the most important part: building products consumers will want and use. Precious time and effort is wasted on engineering perfect products only to launch to no users. This course teaches product management skills such as attributes of great product managers, reducing risk and cost while accelerating time to market, product life cycle, stakeholder management and effective development processes.
Product Management: Read More [+]
Objectives & Outcomes

Course Objectives: •
Students will experience a live development of a product within the context of a product development process.
•
Students will learn common methods used in product management
•
Students will understand the difference between engineering design and product development as a process commonly used in new venture environments.

Student Learning Outcomes: •
Students will actually develop a real world functioning product, to be described as Minimum Viable.
•
Students will be able to manage a product development process that leads to a product that is technically feasible as well as desired by customers.
•
Students will gain experience needed to work as product managers in real life environments.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructors: Shen, Sidhu, IEOR / CET Instructors

Product Management: Read Less [-]

IND ENG 190A Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units

Terms offered: Spring 2018, Fall 2016, Spring 2016
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Advanced Topics in Industrial Engineering and Operations Research: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Advanced Topics in Industrial Engineering and Operations Research: Read Less [-]

IND ENG 190B Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurial Marketing and Finance 1 - 4 Units

Terms offered: Fall 2017, Spring 2014, Fall 2013
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurial Marketing and Finance: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurial Marketing and Finance: Read Less [-]

IND ENG 190C Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Advanced Topics in Industrial Engineering and Operations Research: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Advanced Topics in Industrial Engineering and Operations Research: Read Less [-]

IND ENG 190D Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units

Terms offered: Spring 2017, Fall 2014, Spring 2014
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Advanced Topics in Industrial Engineering and Operations Research: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Advanced Topics in Industrial Engineering and Operations Research: Read Less [-]

IND ENG 190E Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurship & Innovation 1 - 4 Units

Terms offered: Fall 2021, Summer 2021 Second 6 Week Session, Spring 2021
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurship & Innovation: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
6 weeks - 2.5-10 hours of seminar per week
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurship & Innovation: Read Less [-]

IND ENG 190F Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units

Terms offered: Spring 2013, Spring 2012, Spring 2011
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Advanced Topics in Industrial Engineering and Operations Research: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Advanced Topics in Industrial Engineering and Operations Research: Read Less [-]

IND ENG 190G Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Advanced Topics in Industrial Engineering and Operations Research: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Advanced Topics in Industrial Engineering and Operations Research: Read Less [-]

IND ENG 190H Cases in Global Innovation 1 Unit

Terms offered: Spring 2011
This course is designed primarily for upper-level undergraduate and graduate students interested in examining the major challenges and success factors entrepreneurs and innovators face in globalizing a company, product, or service. Over the duration of this course, students will examines case studies of early, mid-stage, and large-scale enterprises as they seek to start a new venture, introduce a new product or service, or capitalize on global economic trends to enhance their existing business. The course content exposes students interested in internationally oriented careers to the strategic thinking involved in international engagement and expansion. Cases will include both U.S. companies seeking to enter emerging markets and emerging market companies looking to expand within their own nations or into markets in developed nations. The course is focused around intensive study of actual business situations through rigorous case-study analysis.
Cases in Global Innovation: Read More [+]

Rules & Requirements

Prerequisites: Junior or Senior standing

Hours & Format

Fall and/or spring: 8 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Cases in Global Innovation: Read Less [-]

IND ENG 190I Cases in Global Innovation: China 1 Unit

Terms offered: Prior to 2007

This course is designed primarily for upper-level undergraduate and graduate students interested in examining the major challenges and success factors entrepreneurs and innovators face in globalizing a company product or service, with a focus on China. Over the duration of this course, students will examine case studies of foreign companies seeking to start a new venture, introduce a new product or service to the China market, or domestic Chinese companies seeking to adapt a U.S. or western business model to the China market. The course content exposes students interested in internationally oriented careers to the strategic thinking involved in international engagement and expansion and the particularities of the China market and their contrast with the U.S. market. The course is focused around intensive study of actual business situations through rigorous case-study analysis and the course size is limited to 30.

Cases in Global Innovation: China: Read More [+]

Rules & Requirements

Prerequisites: Junior or senior standing. Recommended, but not required to be taken after or along with Engineering 198

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Sidhu

Cases in Global Innovation: China: Read Less [-]

IND ENG 190K Cases in Global Innovation: South Asia 1 Unit

Terms offered: Prior to 2007

This course is designed primarily for upper-level undergraduate and graduate students interested in examining the major challenges and success factors entrepreneurs and innovators face in conducting business, globalizing a company product or service, or investing in South Asia. Over the duration of this course, students will examine case studies of foreign companies seeking to start a new venture, introduce a new product or service to the South Asian market, or South Asian companies seeking to adapt a U.S or western business model. The course will put this into the larger context of the political, economic, and social climate in several South Asian countries and explore the constraints to doing business, as well as the policy changes that have allowed for a more conducive business environment.

Cases in Global Innovation: South Asia: Read More [+]

Rules & Requirements

Prerequisites: Junior or senior standing. Recommended but not required to be taken after or along with Engineering 198

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Sidhu

Cases in Global Innovation: South Asia: Read Less [-]

IND ENG 191 Technology Entrepreneurship 3 Units

Terms offered: Fall 2021, Spring 2021, Spring 2020
This course explores key entrepreneurial concepts relevant to the high-technology world. Topics include the entrepreneurial perspective, start-up strategies, business idea evaluation, business plan writing, introduction to entrepreneurial finance and venture capital, managing growth, and delivering innovative products. This course prepares technical and business minded students for careers focused on entrepreneurship, intrapreneurship, and high technology. Students undertake intensive study of actual business situations through rigorous case-study analysis. This course can not be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Technology Entrepreneurship: Read More [+]

Rules & Requirements

Prerequisites: Junior or senior standing

Credit Restrictions: Students will receive no credit for 191 after taking 190A prior to fall 2009.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Sidhu

Technology Entrepreneurship: Read Less [-]

IND ENG 192 Berkeley Method of Entrepreneurship Bootcamp 2 Units

Terms offered: Fall 2021, Summer 2021 8 Week Session, Fall 2020
This course offers the opportunity to understand the Berkeley Method of Entrepreneurship (BME) in an intensive format. The BME curriculum conveys the latest approaches for training global technology entrepreneurs. This method leverages insights on strategy, tactics, culture, and psychology with an accompanying entrepreneurial infrastructure. The curriculum is structured to provide an optimal global entrepreneurship experience from real life experiences.
Berkeley Method of Entrepreneurship Bootcamp: Read More [+]

Objectives & Outcomes

Course Objectives: * To understand and make use of the value of diversity in idea generation and new venture creation.
Student should become aware of the infrastructure available through UC Berkeley that an support them in developing new ventures.
To understand common tactics in starting new ventures including a lean learning cycle.
To understand the mindset of an entrepreneur, including the soft skills, behaviors, and psychological factors most likely to be needed to develop a new venture.

Student Learning Outcomes: Students should be able to consider a greater number of ideas for global entrepreneurship by observing the effect of background diversity in the class.
Students should be able to follow a process of idea generation, rapid prototyping / venture story development, attraction of stakeholders, data collection, and hypothesis testing and regeneration.
Students should become aware of the mindset and behaviour required for entreprenurship and be able to reinforce some of these behavious (eg rejection tolerance, comfort with failing or being wrong, inductive learning, venture story telling/communication abilities) through excercizes in the program.

Hours & Format

Fall and/or spring: 1 weeks - 30 hours of lecture and 20 hours of discussion per week

Summer: 3 weeks - 30 hours of lecture and 20 hours of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructors: Sidhu, Ikhlaq

Berkeley Method of Entrepreneurship Bootcamp: Read Less [-]

IND ENG 195 A. Richard Newton Lecture Series 1 Unit

Terms offered: Fall 2021, Spring 2021, Fall 2020
This lecture series serves as an entry point for undergraduate and graduate curriculum sequences in entrepreneurship and innovation. The series, established in 2005, is named in honor of A. Richard Newton, a visionary technology industry leader and late dean of the University of California Berkeley College of Engineering. The course features a selection of high-level industry speakers who share their insights on industry developments, leadership, and innovation based on their careers.
A. Richard Newton Lecture Series: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of colloquium per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

Instructor: Sidhu

A. Richard Newton Lecture Series: Read Less [-]

IND ENG H196A Operations Research and Management Science Honors Thesis 3 Units

Terms offered: Prior to 2007
Individual study and research for at least one academic year on a special problem approved by a member of the faculty; preparation of the thesis on broader aspects of this work.
Operations Research and Management Science Honors Thesis: Read More [+]
Rules & Requirements

Prerequisites: Open only to students in the honors program

Credit Restrictions: Course may be repeated for credit with consent of instructor.

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of independent study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Operations Research and Management Science Honors Thesis: Read Less [-]

IND ENG H196B Operations Research and Management Science Honors Thesis 3 Units

Terms offered: Prior to 2007
Individual study and research for at least one academic year on a special problem approved by a member of the faculty; preparation of the thesis on broader aspects of this work.
Operations Research and Management Science Honors Thesis: Read More [+]
Rules & Requirements

Prerequisites: Open only to students in the honors program

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of independent study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Operations Research and Management Science Honors Thesis: Read Less [-]

IND ENG 197 Undergraduate Field Research in Industrial Engineering 1 - 12 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Students work on a field project under the supervision of a faculty member. Course does not satisfy unit or residence requirements for bachelor's degree.
Undergraduate Field Research in Industrial Engineering: Read More [+]
Rules & Requirements

Prerequisites: Completion of two semesters of coursework

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-12 hours of fieldwork per week

Summer:
6 weeks - 2.5-30 hours of fieldwork per week
8 weeks - 1.5-22.5 hours of fieldwork per week
10 weeks - 1.5-18 hours of fieldwork per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Undergraduate Field Research in Industrial Engineering: Read Less [-]

IND ENG 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020
Group studies of selected topics. Semester course unit value and contact hours will have a one-to-one ratio.
Directed Group Studies for Advanced Undergraduates: Read More [+]
Rules & Requirements

Prerequisites: Senior standing in Engineering

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Directed Group Studies for Advanced Undergraduates: Read Less [-]

IND ENG 199 Supervised Independent Study 1 - 4 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Supervised independent study. Enrollment restrictions apply.
Supervised Independent Study: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor and major adviser

Credit Restrictions: Course may be repeated for a maximum of four units per semester.

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer:
6 weeks - 2.5-10 hours of independent study per week
8 weeks - 2-7.5 hours of independent study per week
10 weeks - 1.5-6 hours of independent study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/ Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Study: Read Less [-]

IND ENG 215 Analysis and Design of Databases 3 Units

Terms offered: Spring 2021, Spring 2011, Fall 2006
Advanced topics in information management, focusing on design of relational databases, querying, and normalization. New issues raised by the World Wide Web. Research projects on current topics in information technology.
Analysis and Design of Databases: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Goldberg

Analysis and Design of Databases: Read Less [-]

IND ENG 220 Economics and Dynamics of Production 3 Units

Terms offered: Spring 2017, Spring 2016, Spring 2015
Analysis of the capacity and efficiency of production systems. Development of analytical tools for improving efficiency, customer service, and profitability of production environments. Design and development of effective industrial production planning systems. Modelling principles are illustrated by reviewing actual large-scale planning systems successfully implemented for naval ship overhaul and for semiconductor manufacturing.
Economics and Dynamics of Production: Read More [+]
Rules & Requirements

Prerequisites: 262A (may be taken concurrently), Mathematics 104 recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Leachman

Economics and Dynamics of Production: Read Less [-]

IND ENG 221 Introduction to Financial Engineering 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020
A course on financial concepts useful for engineers that will cover, among other topics, those of interest rates, present values, arbitrage, geometric Brownian motion, options pricing, & portfolio optimization. The Black-Scholes option-pricing formula will be derived and studied. Stochastic simulation ideas will be introduced and used to obtain the risk-neutral geometric Brownian motion values for certain types of Asian, barrier, and lookback options. Portfolio optimization problems will be considered both from a mean-variance and from a utility function point of view. Methods for evaluating real options will be presented. The use of mathematical optimization models as a framework for analyzing financial engineering problems will be shown.
Introduction to Financial Engineering: Read More [+]

Rules & Requirements

Prerequisites: 162 or 262A, course in probability, or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Adler, Oren, Ross

Introduction to Financial Engineering: Read Less [-]

IND ENG 222 Financial Engineering Systems I 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
Introductory graduate level course, focusing on applications of operations research techniques, e.g., probability, statistics, and optimization, to financial engineering. The course starts with a quick review of 221, including no-arbitrage theory, complete market, risk-neutral pricing, and hedging in discrete model, as well as basic probability and statistical tools. It then covers Brownian motion, martingales, and Ito's calculus, and deals with risk-neutral pricing in continuous time models. Standard topics include Girsanov transformation, martingale representation theorem, Feyman-Kac formula, and American and exotic option pricings. Simulation techniques will be discussed at the end of the semester, and MATLAB (or C or S-Plus) will be used for computation.
Financial Engineering Systems I: Read More [+]

Rules & Requirements

Prerequisites: 221 or equivalent; 172 or Statistics 134 or a one-semester probability course

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Guo

Financial Engineering Systems I: Read Less [-]

IND ENG 223 Financial Engineering Systems II 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Advanced graduate course for Ph.D. students interested in pursuing a professional/research career in financial engineering. The course will start with a quick review of 222: the basics of Brownian motion, martingales, Ito's calculus, risk-neutral pricing in continuous time models. It then covers rigorously and in depth the most fundamental probability concepts for financial engineers, including stochastic integral, stochastic differential equations, and semi-martingales. The second half of the course will discuss the most recent topics in financial engineering, such as credit risk and analysis, risk measures and portfolio optimization, and liquidity risk and models.
Financial Engineering Systems II: Read More [+]
Rules & Requirements

Prerequisites: 222 or equivalent; 173 or 263A or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Guo

Financial Engineering Systems II: Read Less [-]

IND ENG 224 Portfolio and Risk Analytics 3 Units

Terms offered: Spring 2019, Spring 2018
The course aims to train students in hands-on statistical, optimization, and data analytics for quantitative portfolio and risk management. In addition, the course will introduce elements of financial markets and asset classes. The emphasis will be on computational methods such as variants of GARCH, Black-Litterman, conic optimization, Monte Carlo simulation for risk and optimization, factor modeling. Students will undertake computational assignments and a group project. They will also manage hypothetical portfolios throughout the course.
Portfolio and Risk Analytics: Read More [+]
Rules & Requirements

Prerequisites: A basic understanding of statistics and optimization, as well as fluency in a programming, language is required

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Alper Atamturk

Portfolio and Risk Analytics: Read Less [-]

IND ENG C227A Introduction to Convex Optimization 4 Units

Terms offered: Prior to 2007
The course covers some convex optimization theory and algorithms, and describes various applications arising in engineering design, machine learning and statistics, finance, and operations research. The course includes laboratory assignments, which consist of hands-on experience.
Introduction to Convex Optimization: Read More [+]
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: El Ghaoui, Wainwright

Formerly known as: Electrical Engineering C227A/Industrial Engin and Oper Research C227A

Also listed as: EL ENG C227T

Introduction to Convex Optimization: Read Less [-]

IND ENG C227B Convex Optimization and Approximation 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019, Spring 2018, Spring 2017
Convex optimization as a systematic approximation tool for hard decision problems. Approximations of combinatorial optimization problems, of stochastic programming problems, of robust optimization problems (i.e., with optimization problems with unknown but bounded data), of optimal control problems. Quality estimates of the resulting approximation. Applications in robust engineering design, statistics, control, finance, data mining, operations research.
Convex Optimization and Approximation: Read More [+]
Rules & Requirements

Prerequisites: 227A or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: El Ghaoui

Also listed as: EL ENG C227C

Convex Optimization and Approximation: Read Less [-]

IND ENG 231 Introduction to Data Modeling, Statistics, and System Simulation 3 Units

Terms offered: Spring 2017, Spring 2015, Spring 2014
This course uses simulation models for analyzing and optimizing systems where the underlying processes and/or parameters are not fully known, but data may be available, sampled, or artificially generated. Monte Carlo simulations are used in a weekly laboratory to model systems that may be too complex to approximate accurately with deterministic, stationary, or static models; and to measure the robustness of predictions and manage risks in decisions based on data-driven models.
Introduction to Data Modeling, Statistics, and System Simulation: Read More [+]

Objectives & Outcomes

Course Objectives: Students will understand the similarities and differences in methods for simulating the dynamics of complex, stochastic systems and apply these to model real systems. Special techniques for experimenting with computer simulations and analyzing the results will be used to understand the trade-offs in risk and performance in the presence of uncertainty.

Rules & Requirements

Prerequisites: 262A, 263A or equivalents and some programming experience

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Schruben, Guo, Lim

Introduction to Data Modeling, Statistics, and System Simulation: Read Less [-]

IND ENG 235 Applied Data Science with Venture Applications 3 Units

Terms offered: Fall 2021
This is an advanced project course in data science that offers a "maker" and/or "innovation" viewpoint. The course is focused first on developing an open-ended-real world project relating to data science. Related concepts of computer science tools and theoretical concepts are covered to support the project. These concepts include filtering, prediction, classification, LTI systems, and spectral analysis. After reviewing each concept, we explore implementing it in Python using libraries for math array functions, manipulation of tables, data architectures, natural language, and ML frameworks.
Applied Data Science with Venture Applications: Read More [+]

Rules & Requirements

Prerequisites: Prerequisites include: ability to write code in Python, and a probability or statistics course

Hours & Format

Fall and/or spring:
15 weeks - 3 hours of lecture per week
15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Sidhu

Applied Data Science with Venture Applications: Read Less [-]

IND ENG 240 Optimization Analytics 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Computing technology has advanced to the point that commonly available tools can be used to solve practical decision problems and optimize real-world systems quickly and efficiently. This course will focus on the understanding and use of such tools, to model and solve complex real-world business problems, to analyze the impact of changing data and relaxing assumptions on these decisions, and to understand the risks associated with particular decisions and outcomes.
Optimization Analytics: Read More [+]

Rules & Requirements

Prerequisites: Basic analysis and linear algebra, and basic computer skills and experience

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Optimization Analytics: Read Less [-]

IND ENG 241 Risk Modeling, Simulation, and Data Analysis 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
This is a Masters of Engineering course, in which students will develop a fundamental understanding of how randomness and uncertainty are root causes of risk in modern enterprises. The technical material will be presented in the context of engineering team system design and operations decisions.
Risk Modeling, Simulation, and Data Analysis: Read More [+]
Rules & Requirements

Prerequisites: Basic notions of probability, statistics, and some programming and spreadsheet analysis experience

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Risk Modeling, Simulation, and Data Analysis: Read Less [-]

IND ENG 242 Applications in Data Analysis 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020
This course applies foundational concepts in programming, databases, machine learning, and statistical modeling to answer questions from business and social science. The goal is for students to develop the experience and intuition to gather and build new datasets and answer substantive questions.
Applications in Data Analysis: Read More [+]
Rules & Requirements

Prerequisites: Prerequisites include working knowledge of a programming language (preferably Python), database language (preferably SQL), a statistical package (preferably R), and an understanding of basic linear and non--#linear statistical models. Prior exposure to machine learning is helpful, though this will be covered in the predictive analytics and theory course

Credit Restrictions: Ind Eng 242 shares a fair amount of overlapping content with Ind Eng 142. Students taking Ind Eng 242 cannot receive credit for Ind Eng 142.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Fleming

Applications in Data Analysis: Read Less [-]

IND ENG 243 Analytics Lab 4 Units

Terms offered: Not yet offered
A project course to provide hands-on experience in end-to-end analytics development from
exploratory analytics to systems analytics in an industry context, including communication of
recommendations. Students will work in teams on projects and build solutions to
business/industry challenges using Python packages such as Pandas, NumPy, Matplotlib, scikit-
learn, Bokeh, and relevant optimization and simulation software.
Analytics Lab: Read More [+]
Objectives & Outcomes

Student Learning Outcomes: Learning goals include technical communication and project presentation.

Rules & Requirements

Prerequisites: IEOR 240 Optimization Analytics, IEOR 241 Risk Modeling & Simulation Analytics, IEOR 242 Applications in Data Analysis. Familiarity with the Python programming language is also expected

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Aswani, Grigas

Analytics Lab: Read Less [-]

IND ENG 248 Supply Chain Innovation, Strategy, and Analytics 3 Units

Terms offered: Fall 2013
This course introduces you to the field of supply chain management through a series of lectures and case studies that emphasize innovative concepts in supply chain management that have proven to be beneficial for a good number of adopters. Innovations that we will discuss include collaborative forecasting, social media, online procurement, and technologies such as RFID.
Supply Chain Innovation, Strategy, and Analytics: Read More [+]
Rules & Requirements

Prerequisites: Introductory course on Production and Inventory Control or Operations Management

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Supply Chain Innovation, Strategy, and Analytics: Read Less [-]

IND ENG 250 Introduction to Production Planning and Logistics Models 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
This will be an introductory first-year graduate course covering fundamental models in production planning and logistics. Models, algorithms, and analytical techniques for inventory control, production scheduling, production planning, facility location and logistics network design, vehicle routing, and demand forecasting will be discussed.
Introduction to Production Planning and Logistics Models: Read More [+]

Rules & Requirements

Prerequisites: 262A and 263A taken concurrently

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Kaminsky

Introduction to Production Planning and Logistics Models: Read Less [-]

IND ENG 251 Facilities Design and Logistics 3 Units

Terms offered: Fall 2012, Spring 2005, Spring 2004
Design and analysis of models and algorithms for facility location, vehicle routing, and facility layout problems. Emphasis will be placed on both the use of computers and the theoretical analysis of models and algorithms.
Facilities Design and Logistics: Read More [+]

Rules & Requirements

Prerequisites: 262A, and either 172 or Statistics 134

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Kaminsky

Facilities Design and Logistics: Read Less [-]

IND ENG 252 Service Operations Management 3 Units

Terms offered: Spring 2021, Spring 2014, Spring 2013
This course focuses on the design of service businesses such as commercial banks, hospitals, airline companies, call centers, restaurants, Internet auction websites, and information providers. The material covered in the course includes internet auctions, procurement, service facility location, sevice quality management, capacity planning, airline ticket pricing, financial plan design, pricing of digital goods, call center management, service competition, revenue management in queueing systems, information intermediaries, and health care. The goal of the instructors is to equip the students with sufficient technical background to be able to do research in this area.
Service Operations Management: Read More [+]

Rules & Requirements

Prerequisites: Students who have not advanced to M.S., M.S./Ph.D., or Ph.D. levels or are not in the Industrial Engineering and Operations Research Department must consult with the instructor before taking this course for credit

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Shen, Chen

Service Operations Management: Read Less [-]

IND ENG 253 Supply Chain Operation and Management 3 Units

Terms offered: Spring 2013, Spring 2012, Spring 2011
Supply chain analysis is the study of quantitative models that characterize various economic trade-offs in the supply chain. The field has made significant strides on both theoretical and practical fronts. On the theoretical front, supply chain analysis inspires new research ventures that blend operations research, game theory, and microeconomics. These ventures result in an unprecedented amalgamation of prescriptive, descriptive, and predictive models characteristic of each subfield. On the practical front, supply chain analysis offers solid foundations for strategic positioning, policy setting, and decision making.
Supply Chain Operation and Management: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Shen

Supply Chain Operation and Management: Read Less [-]

IND ENG C253 Supply Chain and Logistics Management 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
Supply chain analysis is the study of quantitative models that characterize various economic trade-offs in the supply chain. The field has made significant strides on both theoretical and practical fronts. On the theoretical front, supply chain analysis inspires new research ventures that blend operations research, game theory, and microeconomics. These ventures result in an unprecedented amalgamation of prescriptive, descriptive, and predictive models characteristic of each subfield. On the practical front, supply chain analysis offers solid foundations for strategic positioning, policy setting, and decision making.
Supply Chain and Logistics Management: Read More [+]
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Shen

Also listed as: CIV ENG C258

Supply Chain and Logistics Management: Read Less [-]

IND ENG 254 Production and Inventory Systems 3 Units

Terms offered: Spring 2014, Fall 2011, Fall 2009
Mathematical and computer methods for design, planning, scheduling, and control in manufacturing and distribution systems.
Production and Inventory Systems: Read More [+]
Rules & Requirements

Prerequisites: 262A or 150; 263A or 173 recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Production and Inventory Systems: Read Less [-]

IND ENG 258 Control and Optimization for Power Systems 3 Units

Terms offered: Spring 2019, Spring 2017
One of the grand challenges of this century is the modernization of electrical power networks. This graduate-level course provides a fundamental understanding of the mathematics behind the operation of power grids.
Control and Optimization for Power Systems: Read More [+]
Objectives & Outcomes

Course Objectives:
Students will understand the operation of power networks from a control and optimization perspective. They will learn how mathematical tools and computational methods are used for the design, modeling, planning, and real-time operation of power grids. They will also learn about the interaction between operation and electricity market.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Lavaei

Control and Optimization for Power Systems: Read Less [-]

IND ENG 261 Experimenting with Simulated Systems 3 Units

Terms offered: Spring 2009, Spring 2007, Spring 2006
This course will introduce graduate and upper division undergraduate students to modern methods for simulating discrete event models of complex stochastic systems. About a third of the course will be devoted to system modeling, with the remaining two-thirds concentrating on simulation experimental design and analysis.
Experimenting with Simulated Systems: Read More [+]
Rules & Requirements

Prerequisites: 165 or equivalent statistics course, and some computer programming background

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Ross, Schruben, Shanthikumar

Experimenting with Simulated Systems: Read Less [-]

IND ENG 262A Mathematical Programming I 4 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Basic graduate course in linear programming and introduction to network flows and non-linear programming. Formulation and model building. The simplex method and its variants. Duality theory. Sensitivity analysis, parametric programming, convergence (theoretical and practical). Polynomial time algorithms. Introduction to network flows models. Optimality conditions for non linear optimization problems.
Mathematical Programming I: Read More [+]
Rules & Requirements

Prerequisites: Mathematics 110

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Adler, Oren

Mathematical Programming I: Read Less [-]

IND ENG 262B Mathematical Programming II 3 Units

Terms offered: Spring 2021, Fall 2020, Spring 2020
Basic first year graduate course in optimization of non-linear programs. Formulation and model building. Theory of optimization for constrained and unconstrained problems. Study of algorithms for non-linear optimization with emphasis on design considerations and performance evaluation.
Mathematical Programming II: Read More [+]
Rules & Requirements

Prerequisites: Math 110 or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Adler, Oren

Mathematical Programming II: Read Less [-]

IND ENG 263A Applied Stochastic Process I 4 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Conditional Expectation. Poisson and general point process and renewal theory. Renewal reward processes with application to inventory, congestion, and replacement models. Discrete and continuous time Markov chains; with applications to various stochastic systems--such as queueing systems, inventory models and reliability systems.
Applied Stochastic Process I: Read More [+]
Rules & Requirements

Prerequisites: Industrial Engineering
172, or Statistics 134 or Statistics 200A. Probability background with Industrial Engineering 173 or equivalent is recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Righter

Applied Stochastic Process I: Read Less [-]

IND ENG 263B Applied Stochastic Process II 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
Continuous time Markov chains. The reversed chain concept in continuous time Markov chains with applications of queueing theory. Semi-Markov processes with emphasis on application. Brownian Motion. Random walks with applications. Introduction to Martinjales.
Applied Stochastic Process II: Read More [+]
Rules & Requirements

Prerequisites: 263A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Righter

Applied Stochastic Process II: Read Less [-]

IND ENG 264 Computational Optimization 3 Units

Terms offered: Spring 2017, Spring 2016, Spring 2015
This course is on computational methods for the solution of large-scale optimization problems. The focus is on converting the theory of optimization into effective computational techniques. Course topics include an introduction to polyhedral theory, cutting plane methods, relaxation, decomposition and heuristic approaches for large-scale optimization problems.
Computational Optimization: Read More [+]
Rules & Requirements

Prerequisites: 262A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Atamturk

Computational Optimization: Read Less [-]

IND ENG 265 Learning and Optimization 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
This course will cover topics related to the interplay between optimization and statistical learning. The first part of the course will cover statistical modeling procedures that can be defined as the minimizer of a suitable optimization problem. The second part of the course will discuss the formulation and numerical implementation of learning-based model predictive control (LBMPC), which is a method for robust adaptive optimization that can use machine learning to provide the adaptation. The last part of the course will deal with inverse decision-making problems, which are problems where an agent's decisions are observed and used to infer properties about the agent.
Learning and Optimization: Read More [+]
Rules & Requirements

Prerequisites: Course on optimization (Industrial Engineering 162 or equivalent); course on statistics or stochastic processes (Industrial Engineering 165 or equivalent) Industrial Engin and Oper Research 165

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Aswani

Learning and Optimization: Read Less [-]

IND ENG 266 Network Flows and Graphs 3 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
Survey of solution techniques and problems that have formulations in terms of flows in networks. Max-flow min-cut theorem. Minimum cost flows. Multiterminal and multicommodity flows. Relationship with linear programming, transportation problems, electrical networks and critical path scheduling.
Network Flows and Graphs: Read More [+]
Rules & Requirements

Prerequisites: 262A (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Adler, Hochbaum

Network Flows and Graphs: Read Less [-]

IND ENG 267 Queueing Theory 3 Units

Terms offered: Spring 2016, Spring 2015, Fall 2011
The result "L = (lambda) w" and other conservation laws. Elementary queueing models; comparing single- and multiple-server queues. PASTA. Work. Markovian queues; product form results. Overflow models. Embedded Markov chains. Random walks and the GI/G/l queues. Work conservation; priorities. Bounds and approximations.
Queueing Theory: Read More [+]
Rules & Requirements

Prerequisites: IND ENG 263A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Queueing Theory: Read Less [-]

IND ENG 268 Applied Dynamic Programming 3 Units

Terms offered: Fall 2021, Spring 2018, Spring 2017
Dynamic programming formulation of deterministic decision process problems, analytical and computational methods of solution, application to problems of equipment replacement, resource allocation, scheduling, search and routing. Brief introduction to decision making under risk and uncertainty.
Applied Dynamic Programming: Read More [+]
Rules & Requirements

Prerequisites: Mathematics 51

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Dreyfus

Applied Dynamic Programming: Read Less [-]

IND ENG 269 Integer Programming and Combinatorial Optimization 3 Units

Terms offered: Spring 2020, Spring 2010, Spring 2009
The course deals with discrete optimization problems and their complexity. These topics include complexity analysis of algorithms and its drawbacks; solving a system of linear integer equations and inequalities; strongly polynomial algorithms, network flow problems (including matching and branching); polyhedral optimization; branch and bound and lagrangean relaxation.
Integer Programming and Combinatorial Optimization: Read More [+]
Rules & Requirements

Prerequisites: 262A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructor: Hochbaum

Integer Programming and Combinatorial Optimization: Read Less [-]

IND ENG 270 Current Readings in Innovation 3 Units

Terms offered: Fall 2015, Fall 2014
This seminar and discussion class aims to survey current and classic research on innovation and help
doctoral students formulate their research designs. Readings are drawn from economics, organizations,
and other social sciences, and engineering and in particular, data science research on analyzing large
data sets. Students develop research designs and present each week and formally for their final. A
written paper is also required. Authors join us, physically or virtually.
Current Readings in Innovation: Read More [+]
Rules & Requirements

Prerequisites: Background: upper level standing or graduate student, any school

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Instructors: Fleming, Lee

Current Readings in Innovation: Read Less [-]

IND ENG 280 Systems Analysis and Design Project 3 Units

Terms offered: Spring 2011, Spring 2010, Spring 2009
A project course for students interested in applications of operations research and engineering methods. One or more systems, which may be public or in the private sector, will be selected for detailed analysis and re-designed by student groups.
Systems Analysis and Design Project: Read More [+]

Rules & Requirements

Prerequisites: 262A, 263A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Systems Analysis and Design Project: Read Less [-]

IND ENG 288 Automation Science and Engineering 3 Units

Terms offered: Prior to 2007
Automation is a central aspect of contemporary industrial engineering that combines sensors, actuators, and computing to monitor and perform operations. It is applied to a broad range of applications from manufacturing to transporation to healthcare. This course provides an introduction to analysis, models, algorithms, research, and practical skills in the field and includes a laboratory component where students will learn and apply basic skills in computer programming and interfacing of sensors and motors that will culminate in a team design project.
Automation Science and Engineering: Read More [+]

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture, 1 hour of discussion, and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Automation Science and Engineering: Read Less [-]

IND ENG 290 Special Topics in Industrial Engineering and Operation Research 2 - 3 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020
Lectures and appropriate assignments on fundamental or applied topics of current interest in industrial engineering and operations research.
Special Topics in Industrial Engineering and Operation Research: Read More [+]

Rules & Requirements

Prerequisites: Upper level standing or graduate student

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-3 hours of lecture per week

Summer:
6 weeks - 5-7.5 hours of lecture per week
10 weeks - 3-4.5 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Special Topics in Industrial Engineering and Operation Research: Read Less [-]

IND ENG 290A Dynamic Production Theory and Planning Models 3 Units

Terms offered: Spring 2014, Fall 2008, Spring 2008
Development of dynamic activity analysis models for production planning and scheduling. Relationship to theory of production, inventory theory and hierarchical organization of production management.
Dynamic Production Theory and Planning Models: Read More [+]

Rules & Requirements

Prerequisites: 220 and 254

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Dynamic Production Theory and Planning Models: Read Less [-]

IND ENG 290G Advanced Mathematical Programming 3 Units

Terms offered: Spring 2017, Spring 2014, Spring 2011
Selected topics in mathematical programming. The actual subjects covered may include: Convex analysis, duality theory, complementary pivot theory, fixed point theory, optimization by vector space methods, advanced topics in nonlinear algorithms, complexity of mathematical programming algorithms (including linear programming).
Advanced Mathematical Programming: Read More [+]
Rules & Requirements

Prerequisites: 262A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Advanced Mathematical Programming: Read Less [-]

IND ENG 290R Topics in Risk Theory 3 Units

Terms offered: Spring 2016, Spring 2015, Spring 2014
Seminar on selected topics from financial and technological risk theory, such as risk modeling, attitudes towards risk and utility theory, portfolio management, gambling and speculation, insurance and other risk-sharing arrangements, stochastic models of risk generation and run off, risk reserves, Bayesian forecasting and credibility approximations, influence diagrams, decision trees. Topics will vary from year to year.
Topics in Risk Theory: Read More [+]
Rules & Requirements

Prerequisites: IND ENG 263A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Letter grade.

Topics in Risk Theory: Read Less [-]

IND ENG 295 A. Richard Newton Lecture Series 1 Unit

Terms offered: Fall 2021, Spring 2021, Fall 2020
This lecture series serves as an entry point for undergraduate and graduate curriculum sequences in entrepreneurship and innovation. The series, established in 2005 is named in honor of A. Richard Newton, a visionary technology industry leader and late dean of the University of California-Berkeley College of Engineering. The course features a selection of high-level industry speakers who share their insights on industry developments, leadership and innovation based on their careers.
A. Richard Newton Lecture Series: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of colloquium per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Sidhu

A. Richard Newton Lecture Series: Read Less [-]

IND ENG 298 Group Studies, Seminars, or Group Research 1 - 4 Units

Terms offered: Fall 2021, Spring 2021, Fall 2020
Advanced seminars in industrial engineering and operations research.
Group Studies, Seminars, or Group Research: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of colloquium per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: The grading option will be decided by the instructor when the class is offered.

Group Studies, Seminars, or Group Research: Read Less [-]

IND ENG 299 Individual Study or Research 1 - 12 Units

Terms offered: Fall 2019, Fall 2016, Spring 2016
Individual investigation of advanced industrial engineering problems.
Individual Study or Research: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 3-36 hours of independent study per week

Summer:
6 weeks - 7.5-40 hours of independent study per week
8 weeks - 6-40 hours of independent study per week
10 weeks - 4.5-40 hours of independent study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Study or Research: Read Less [-]

IND ENG 375 GSI Proseminar on Teaching Engineering 2 Units

Terms offered: Fall 2021, Fall 2020, Fall 2019
This course provides basic training for graduate student instructors (GSIs). Discussion, practice, and review of fundamentals, issues, and best practices in teaching for any engineering course. Topics include: preparing a syllabus; public speaking and coping with language barriers; creating effective slides and exams; differing student learning styles; grading; encouraging diversity, equity, and inclusion; ethics; dealing with conflict and misconduct; and other topics relevant to serving as an effective teaching assistant.
GSI Proseminar on Teaching Engineering: Read More [+]

Objectives & Outcomes

Course Objectives: 2. Organize concepts and objectives covered in an engineering course.
3. Design activities and discussions to promote learning and provide practice in course concepts and objectives.
4. Integrate verbal and visual methods of conveying engineering concepts and practices in the classroom and in discussions.
5. Practice fair and helpful evaluation of student work.
After completion of the course, GSIs will be able to perform the following course-related tasks:
1. Understand the University policies and procedures on academic integrity and ethics.

Rules & Requirements

Prerequisites: Graduate Standing or ASE (Academic Student Employee) Status

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: Goldberg

GSI Proseminar on Teaching Engineering: Read Less [-]

IND ENG 601 Individual Study for Master's Students 1 - 12 Units

Terms offered: Fall 2010, Fall 2008, Spring 2008
Individual study for the comprehensive in consultation with the field adviser. Units may not be used to meet either unit or residence requirements for a master's degree.
Individual Study for Master's Students: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer: 8 weeks - 6-68 hours of independent study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Study for Master's Students: Read Less [-]

IND ENG 602 Individual Study for Doctoral Students 1 - 12 Units

Terms offered: Fall 2010, Spring 2008, Fall 2007
Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. (and other doctoral degrees). May not be used for unit or residence requirements for the doctoral degree.
Individual Study for Doctoral Students: Read More [+]

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer: 8 weeks - 6-68 hours of independent study per week

Additional Details

Subject/Course Level: Industrial Engin and Oper Research/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Study for Doctoral Students: Read Less [-]