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 concerned with economic efficiency, productivity and quality; the collection of data and analysis of data using database and decision-support tools; the comprehensive modeling of uncertainty; the development and creative use of analytical and computational methods for solving these problems; and to obtain the broader skills, background and knowledge necessary to be an effective professional 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 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 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, simulation.

Undergraduate Programs

Industrial Engineering and Operations Research (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/industrial-engineering-operations-research) : BS (offered through the College of Engineering)
Operations Research and Management Science (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/operations-research-management-science) : BA (offered through the College of Letters and Science)
Industrial Engineering and Operations Research (http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/industrial-engineering-operations-research) : Minor

Graduate Programs

Industrial Engineering and Operations Research (http://guide.berkeley.edu/archive/2014-15/graduate/degree-programs/industrial-engineering) : MEng, MS, and PhD

Industrial Engineering and Operations Research

IND ENG 24 Freshman Seminars 1 Unit
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.
Rules & Requirements

Repeat rules: Course may be repeated for credit as topic varies. 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.

IND ENG 98 Supervised Group Study and Research 1 - 3 Units
Supervised group study and research by lower division students.
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 when topic changes.

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.

IND ENG 99 Supervised Independent Study and Research 1 - 4 Units
Supervised independent study for lower division students.
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 when topic changes.

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.

IND ENG 115 Industrial and Commercial Data Systems 3 Units
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.
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

IND ENG 130 Methods of Manufacturing Improvement 3 Units
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.
Rules & Requirements

Prerequisites: 172, Mathematics 54, or Statistics 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

IND ENG 131 Discrete Event Simulation 3 Units
Introductory course on design, programming, and statistical analysis of a simulation study. 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. Techniques to reduce the variance of the resultant estimator and statistical analysis are considered. Final project required.
Rules & Requirements

Prerequisites: 161, 165; 172 or Statistics 134

Hours & Format

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

Summer:
6 weeks - 5 hours of lecture and 1.5 hours of discussion per week
8 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week
10 weeks - 3 hours of lecture and 1.5 hours of discussion per week

Additional Details

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

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

Instructor: Schruben

IND ENG 150 Production Systems Analysis 3 Units
Quantitative models for operational and tactical decision making in production systems, including production planning, inventory control, forecasting, and scheduling.
Rules & Requirements

Prerequisites: 160, 161, 162, 165, and Engineering 120, or senior standing in manufacturing engineering

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

IND ENG 151 Service Operations Design and Analysis 3 Units
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.
Rules & Requirements

Prerequisites: 161, 162, 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.

IND ENG 153 Logistics Network Design and Supply Chain Management 3 Units
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.
Rules & Requirements

Prerequisites: 160, 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

IND ENG 160 Operations Research I 3 Units
Deterministic methods and models in operations research. Unconstrained and constrained optimization. Equality, inequality, and integer constraints. Sequential decisions; dynamic programming. Resource allocation, equipment replacement, inventory control, production planning.
Rules & Requirements

Prerequisites: Mathematics 53 and 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

IND ENG 161 Operations Research II 3 Units
Probability review. Conditional expectation. The exponential distribution and Poisson process. Discrete and continuous-time Markov chains. Applications reliability, transportation, inventory, queueing, financial, and communications models.
Rules & Requirements

Prerequisites: Industrial Engineering 172 or Statistics 134

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.

IND ENG 162 Linear Programming 3 Units
Formulation to linear programs. Optimal allocation and control problems in industry and environmental studies. Convex sets; properties of optimal solutions. The simplex method; theorems of duality; complementary slackness. Problems of post-optimization. Special structures; network problems. Digital computation.
Rules & Requirements

Prerequisites: Mathematics 53 and 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.

IND ENG S162 Linear Programming 3 Units
Formulation to linear programs. Optimal allocation and control problems in industry, environmental studies. Convex sets; properties of optimal solutions. The simplex method; theorems of duality; complementary slackness. Problems of post-optimization. Special structures; network problems. Digital computation.
Rules & Requirements

Prerequisites: Mathematics 50A

Hours & Format

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 not required.

IND ENG 165 Engineering Statistics, Quality Control, and Forcasting 3 Units
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.
Rules & Requirements

Prerequisites: Industrial Engineering 172 or Statistics 134 or an equivalent course in probability theory

Credit Restrictions: Students will receive no credit for Industrial Engineering 165 after taking Statistics 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 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.

IND ENG 166 Decision Analysis 3 Units
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.
Rules & Requirements

Prerequisites: 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/ Undergraduate

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

Instructor: Oren

IND ENG 170 Industrial Design and Human Factors 3 Units
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.
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

IND ENG 171 Technology Firm Leadership 3 Units
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.
Rules & Requirements

Prerequisites: Upper division standing

Credit Restrictions: Students will receive no credit for 171 after taking Undergraduate Business Administration 105.

Repeat rules: Students cannot receive credit for both 171 and Business Administration 105. Course may be repeated for credit when topic changes.

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.

IND ENG 172 Probability and Risk Analysis for Engineers 3 Units
This is an introductory probability course for students in engineering. It focuses mostly on random variables and their applications. Applications will be given in such areas as reliability theory, risk theory, inventory theory, financial models, computer science, and others. Note: This course is a statistics course and cannot be used to fulfill any engineering unit or elective requirements.
Rules & Requirements

Prerequisites: Mathematics 1A-1B or 16A-16B

Credit Restrictions: Students will receive no credit for 172 after taking Statistics 134.

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

Hours & Format

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

Summer: 6 weeks - 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.

IND ENG 180 Senior Project 4 Units
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.
Rules & Requirements

Prerequisites: 131, 160, 161, 162, 165, Engineering 120, and three other Industrial Engineering and Operations Research electives

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture, 1 hour of discussion, and 6 hours of fieldwork per week

Summer: 10 weeks - 1.5 hours of lecture, 1.5 hours of discussion, 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.

IND ENG 185 Challenge Lab 4 Units
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.
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

IND ENG 186 Product Management 3 Units
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.
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

IND ENG 190A Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Rules & Requirements

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

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.

IND ENG 190B Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurial Marketing and Finance 1 - 4 Units
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Rules & Requirements

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

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.

IND ENG 190C Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Rules & Requirements

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

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.

IND ENG 190D Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Rules & Requirements

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

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.

IND ENG 190E Advanced Topics in Industrial Engineering and Operations Research: Entrepreneurship & Innovation 1 - 4 Units
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Rules & Requirements

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

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.

IND ENG 190F Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Rules & Requirements

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

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.

IND ENG 190G Advanced Topics in Industrial Engineering and Operations Research 1 - 4 Units
The 190 series cannot be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Rules & Requirements

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

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.

IND ENG 190H Cases in Global Innovation 1 Unit
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.
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.

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

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

IND ENG 191 Technology Entrepreneurship 3 Units
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).
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

IND ENG 192 Berkeley Method of Entrepreneurship Bootcamp 1 Unit
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.
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 - 15 hours of lecture and 15 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.

Instructor: IEOR / CET Instructors

IND ENG H196A Operations Research and Management Science Honors Thesis 3 Units
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.
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 consent of instructor. Course may be repeated for credit when topic changes.

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.

IND ENG H196B Operations Research and Management Science Honors Thesis 3 Units
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.
Rules & Requirements

Prerequisites: Open only to students in the honors program

Repeat rules: Course may be repeated for credit with consent of instructor. Course may be repeated for credit when topic changes.

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.

IND ENG 197 Undergraduate Field Research in Industrial Engineering 1 - 12 Units
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.
Rules & Requirements

Prerequisites: Completion of two semesters of coursework

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

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.

IND ENG 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units
Group studies of selected topics. Semester course unit value and contact hours will have a one-to-one ratio.
Rules & Requirements

Prerequisites: Senior standing in Engineering

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

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.

IND ENG 199 Supervised Independent Study 1 - 4 Units
Supervised independent study. Enrollment restrictions apply.
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 when topic changes.

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.

IND ENG 215 Analysis and Design of Databases 3 Units
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.
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

IND ENG 220 Economics and Dynamics of Production 3 Units
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.
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

IND ENG 221 Introduction to Financial Engineering 3 Units
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, and 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.
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 per week

Additional Details

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

Grading: Letter grade.

Instructors: Adler, Oren, Ross

IND ENG 222 Financial Engineering Systems I 3 Units
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.
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

IND ENG 223 Financial Engineering Systems II 3 Units
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.
Rules & Requirements

Prerequisites: 222 or equivalent; 161 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

IND ENG C227A Introduction to Convex Optimization 4 Units
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.
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

IND ENG C227B Convex Optimization and Approximation 3 Units
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.
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

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

IND ENG 240 Optimization Analytics 3 Units
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.
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.

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

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

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

IND ENG 251 Facilities Design and Logistics 3 Units
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.
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

IND ENG 252 Service Operations Management 3 Units
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.
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

IND ENG 253 Supply Chain Operation and Management 3 Units
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.
Rules & Requirements

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

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

IND ENG C253 Supply Chain and Logistics Management 3 Units
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.
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

IND ENG 254 Production and Inventory Systems 3 Units
Mathematical and computer methods for design, planning, scheduling, and control in manufacturing and distribution systems.
Rules & Requirements

Prerequisites: 262A or 150; 263A or 161 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.

IND ENG 261 Experimenting with Simulated Systems 3 Units
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.
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

IND ENG 262A Mathematical Programming I 4 Units
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.
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

IND ENG 262B Mathematical Programming II 3 Units
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.
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

IND ENG 263A Applied Stochastic Process I 4 Units
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.
Rules & Requirements

Prerequisites: Industrial Engineering 172, or Statistics 134 or Statistics 200A. Probability background with Industrial Engineering 161 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

IND ENG 263B Applied Stochastic Process II 3 Units
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.
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

IND ENG 264 Computational Optimization 3 Units
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.
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

IND ENG 265 Learning and Optimization 3 Units
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.
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

IND ENG 266 Network Flows and Graphs 3 Units
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.
Rules & Requirements

Prerequisites: 262A (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/Graduate

Grading: Letter grade.

Instructors: Adler, Hochbaum

IND ENG 267 Queueing Theory 3 Units
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.
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.

IND ENG 268 Applied Dynamic Programming 3 Units
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.
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

IND ENG 269 Integer Programming and Combinatorial Optimization 3 Units
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.
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

IND ENG 270 Current Readings in Innovation 3 Units
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.
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

IND ENG 280 Systems Analysis and Design Project 3 Units
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.
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.

IND ENG 288 Automation Science and Engineering 3 Units
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.
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.

IND ENG 290 Special Topics in Industrial Engineering and Operation Research 2 - 3 Units
Lectures and appropriate assignments on fundamental or applied topics of current interest in industrial engineering and operations research.
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.

IND ENG 290A Dynamic Production Theory and Planning Models 3 Units
Development of dynamic activity analysis models for production planning and scheduling. Relationship to theory of production, inventory theory and hierarchical organization of production management.
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.

IND ENG 290G Advanced Mathematical Programming 3 Units
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).
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.

IND ENG 290R Topics in Risk Theory 3 Units
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.
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.

IND ENG 298 Group Studies, Seminars, or Group Research 1 - 4 Units
Advanced seminars in industrial engineering and operations research.
Rules & Requirements

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

Hours & Format

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

IND ENG 299 Individual Study or Research 1 - 12 Units
Individual investigation of advanced industrial engineering problems.
Rules & Requirements

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

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

IND ENG 601 Individual Study for Master's Students 1 - 12 Units
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.
Rules & Requirements

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

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.

IND ENG 602 Individual Study for Doctoral Students 1 - 12 Units
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.
Rules & Requirements

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

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.