Operations Research and Management Science

Bachelor of Arts (BA)

The Operations Research and Management Science (ORMS) major is designed for students in the College of Letters & Science. It provides a solid foundation in the quantitative, model building, and problem-solving skills of operations research and management science. It also gives students the flexibility to learn more about a particular field of interest to them in which they can apply these skills.

The major is very math intensive and is appropriate for students who enjoy and are good at mathematics, computers, and solving practical, multidisciplinary problems.

Declaring the Major

The ORMS major is impacted. To be considered for admission, students should have a minimum of a 3.2 overall grade point average (GPA) in the prerequisite courses. Applications must be submitted by invitation only. To be considered for invitation, request to be added to the waiting list at https://ieor.berkeley.edu/undergraduate-resources/orms/

Unit Cap/Semester Cap

Students who entered Berkeley as a freshman must apply for admission by the end of their fifth semester (does not include summers or withdrawn semesters) or prior to the accumulation of 80 units (does not include units earned in high school, but does include units in-progress at the time of application); whichever comes second. For most students, this is the fifth semester.

Transfer students must apply for admission by the end of their first semester. Summer session prior to the academic year does not count as the first semester.

Prerequisite Coursework

All four prerequisite classes (MATH 53, MATH 54, UGBA 10, and either ECON 1, ECON 2 or ECON C3) must be completed prior to acceptance to the major and all must be taken for a letter grade. Students should apply to the major during the semester in which they are enrolled in their final prerequisites. Students should have a minimum of a 3.2 UC Berkeley GPA in the four prerequisite courses.

Many factors are considered in determining admission. The main criterion, however, is academic performance as measured by the Berkeley GPA in the prerequisite courses. Since this major is capped, planning for an alternate major is recommended. There is an Operations Research concentration in the Math Department that might be a good choice if students are not admitted to the ORMS major.

Honors Program

Students with a grade point average (GPA) of at least 3.5 overall and 3.7 in the major should consider participating in the ORMS honors program. To graduate with honors, a student must find a faculty sponsor appropriate for an original research project that he or she wishes to do and enroll in two semesters (6 units) of the honors thesis course.

Alternatively, a student may take two approved graduate courses in Operations Research or a related field, and achieve at least an A- in each course. Courses used for the honors program cannot be used to fulfill the requirements for IEOR graduate programs. The student must also maintain a minimum 3.5 overall GPA and 3.7 in the major.

Minor Program

There is no minor program in Operations Research and Management Science. However, students interested in an ORMS minor, may be interested in the Industrial Engineering and Operations Research minor (http://guide.berkeley.edu/archive/2020-21/undergraduate/degree-programs/industrial-engineering-operations-research/#minorrequirementstext).

In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All courses taken to fulfill the major requirements below must be taken for graded credit, other than courses listed which are offered on a *Pass/No Pass* basis only. Other exceptions to this requirement are noted as applicable. Exceptions for the Spring 2020 semester are listed on the ORMS website (https://ieor.berkeley.edu/undergraduate-resources/orms/).
2. No more than one upper division course may be used to simultaneously fulfill requirements for a student's major and minor programs, with the exception of minors offered outside of the College of Letters & Science.
3. A minimum grade point average (GPA) of 2.0 must be maintained in both upper and lower division courses used to fulfill the major requirements.

For information regarding residence requirements and unit requirements, please see the College Requirements tab.

Lower Division Requirements

MATH 1A	Calculus	4
MATH 1B	Calculus	4
MATH 53	Multivariable Calculus	4
MATH 54	Linear Algebra and Differential Equations	4
ECON 1	Introduction to Economics	4
or ECON 2	Introduction to Economics--Lecture Format	
or ECON C3	Introduction to Environmental Economics and Policy	
ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	4
or COMPSCI 61	The Structure and Interpretation of Computer Programs	
or COMPSCI C & COMPSCI 8	Foundations of Data Science and Computational Structures in Data Science	
UGBA 10	Principles of Business	3

Upper Division Requirements

IND ENG 172	Probability and Risk Analysis for Engineers	4
or STAT 134	Concepts of Probability	
or STAT 140	Course Not Available	
IND ENG 173	Introduction to Stochastic Processes [1]	3

One of the following:

IND ENG 160	Nonlinear and Discrete Optimization [3]	
or IND ENG	Linear Programming and Network Flows	
Two of the following:		
IND ENG 142	Introduction to Machine Learning and Data Analytics [3-4]	
or IND ENG	Engineering Statistics, Quality Control, and Forecasting	
or IND ENG	Simulation for Enterprise-Scale Systems	
Four clustered electives (see below for sample clusters):		12
ORMS majors, with the signed advance approval of their faculty advisers, select a minimum of four upper division elective courses to form a coherent cluster, or concentration, in an area where Operations Research is applied. Courses in other departments may count toward this requirement if they have substantial relevant content at an appropriately advanced level. These courses must be taken for a letter grade.		

1   Students will receive no credit for IND ENG 173 after taking IND ENG 161, or for IND ENG 172 after taking STAT 134 or STAT 140.

Sample Clusters

Decision Making in Economic Systems

ECON 101A	Microeconomics (Math Intensive)	4
ECON 101B	Macroeconomics (Math Intensive)	4
ECON 104	Advanced Microeconomic Theory	4
ECON 141	Econometrics (Math Intensive)	4
ECON C142	Applied Econometrics and Public Policy	4
ECON C110	Game Theory in the Social Sciences	4
or UGBA 143	Game Theory and Business Decisions	
or STAT 155	Game Theory	
IND ENG 142	Introduction to Machine Learning and Data Analytics	3
or IND ENG 165	Engineering Statistics, Quality Control, and Forecasting	
or IND ENG 174	Simulation for Enterprise-Scale Systems	
MATH 104	Introduction to Analysis	4

Decision Making in Industrial and Service Systems

ECON C110	Game Theory in the Social Sciences	3-4
or UGBA 143	Game Theory and Business Decisions	
or STAT 155	Game Theory	
IND ENG 115	Industrial and Commercial Data Systems	3
IND ENG 130	Methods of Manufacturing Improvement	3
IND ENG 150	Production Systems Analysis	3
or UGBA 141	Production and Operations Management	
IND ENG 151	Service Operations Design and Analysis	3
IND ENG 153	Logistics Network Design and Supply Chain Management	3
IND ENG 160	Nonlinear and Discrete Optimization	3
or IND ENG 162	Linear Programming and Network Flows	
IND ENG 165	Engineering Statistics, Quality Control, and Forecasting	3
or IND ENG 14	Introduction to Machine Learning and Data Analytics	

or IND ENG 17	Simulation for Enterprise-Scale Systems	
IND ENG 166	Decision Analytics	3
IND ENG 170	Industrial Design and Human Factors	3
UGBA 102B	Managerial Accounting	3

Decision Making in Societal Systems

ECON 101A	Microeconomics (Math Intensive)	4
ECON 101B	Macroeconomics (Math Intensive)	4
ECON C110	Game Theory in the Social Sciences	4
or UGBA 143	Game Theory and Business Decisions	
or STAT 155	Game Theory	
IND ENG 165	Engineering Statistics, Quality Control, and Forecasting	3
or IND ENG 14	Introduction to Machine Learning and Data Analytics	
or IND ENG 17	Simulation for Enterprise-Scale Systems	
IND ENG 166	Decision Analytics	3
SOCIOL 101	Sociological Theory I	5
SOCIOL 105	Research Design and Sociological Methods	5
SOCIOL 106	Quantitative Sociological Methods	4
SOCIOL 119S	Organizational Strategy and Design: A Sociological Perspective	4

Algorithmic Decision Making

COMPSCI 61B	Data Structures (This is a prerequisite and does not count toward the four courses.)	4
COMPSCI 170	Efficient Algorithms and Intractable Problems	4
COMPSCI 172	Computability and Complexity	4
COMPSCI 174	Combinatorics and Discrete Probability	4
IND ENG 115	Industrial and Commercial Data Systems	3
IND ENG 142	Introduction to Machine Learning and Data Analytics	3
or IND ENG 16	Engineering Statistics, Quality Control, and Forecasting	
or IND ENG 17	Simulation for Enterprise-Scale Systems	
IND ENG 160	Nonlinear and Discrete Optimization	3
or IND ENG 162	Linear Programming and Network Flows	
IND ENG 166	Decision Analytics	3
MATH 110	Linear Algebra	4

Undergraduate students must fulfill the following requirements in addition to those required by their major program.

For detailed lists of courses that fulfill college requirements, please review the College of Letters & Sciences (http://guide.berkeley.edu/archive/2020-21/undergraduate/colleges-schools/letters-science/) page in this Guide. For College advising appointments, please visit the L&S Advising (https://ls.berkeley.edu/advising/about-undergraduate-advising-services/) Pages.

University of California Requirements

Entry Level Writing **(**http://writing.berkeley.edu/node/78/**)**

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing requirement. Fulfillment of this requirement is also a

prerequisite to enrollment in all reading and composition courses at UC Berkeley.

American History and American Institutions **(**http://guide.berkeley.edu/archive/2020-21/undergraduate/colleges-schools/letters-science/american-history-institutions-requirement/**)**

The American History and Institutions requirements are based on the principle that a US resident graduated from an American university, should have an understanding of the history and governmental institutions of the United States.

Berkeley Campus Requirement

American Cultures **(**http://americancultures.berkeley.edu/students/courses/**)**

All undergraduate students at Cal need to take and pass this course in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity and culture of the United States. AC courses offer students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American Culture.

College of Letters & Science Essential Skills Requirements

Quantitative Reasoning **(**http://guide.berkeley.edu/archive/2020-21/undergraduate/colleges-schools/letters-science/quantitative-reasoning-requirement/**)**

The Quantitative Reasoning requirement is designed to ensure that students graduate with basic understanding and competency in math, statistics, or computer science. The requirement may be satisfied by exam or by taking an approved course.

Foreign Language **(**http://guide.berkeley.edu/archive/2020-21/undergraduate/colleges-schools/letters-science/foreign-language-requirement/**)**

The Foreign Language requirement may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

Reading and Composition **(**http://guide.berkeley.edu/archive/2020-21/undergraduate/colleges-schools/letters-science/reading-composition-requirement/**)**

In order to provide a solid foundation in reading, writing, and critical thinking the College requires two semesters of lower division work in composition in sequence. Students must complete parts A & B reading and composition courses by the end of their second semester and a second-level course by the end of their fourth semester.

College of Letters & Science 7 Course Breadth Requirements

Breadth Requirements **(**http://guide.berkeley.edu/archive/2020-21/undergraduate/colleges-schools/letters-science/#breadthrequirementstext**)**

The undergraduate breadth requirements provide Berkeley students with a rich and varied educational experience outside of their major program. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and

scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

Unit Requirements

- 120 total units

- Of the 120 units, 36 must be upper division units

- Of the 36 upper division units, 6 must be taken in courses offered outside your major department

Residence Requirements

For units to be considered in "residence," you must be registered in courses on the Berkeley campus as a student in the College of Letters & Science. Most students automatically fulfill the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless you go abroad for a semester or year or want to take courses at another institution or through UC Extension during your senior year. In these cases, you should make an appointment to meet an adviser to determine how you can meet the Senior Residence Requirement.

Note: Courses taken through UC Extension do not count toward residence.

Senior Residence Requirement

After you become a senior (with 90 semester units earned toward your BA degree), you must complete at least 24 of the remaining 30 units in residence in at least two semesters. To count as residence, a semester must consist of at least 6 passed units. Intercampus Visitor, EAP, and UC Berkeley-Washington Program (UCDC) units are excluded.

You may use a Berkeley Summer Session to satisfy one semester of the Senior Residence requirement, provided that you successfully complete 6 units of course work in the Summer Session and that you have been enrolled previously in the college.

Modified Senior Residence Requirement

Participants in the UC Education Abroad Program (EAP), Berkeley Summer Abroad, or the UC Berkeley Washington Program (UCDC) may meet a Modified Senior Residence requirement by completing 24 (excluding EAP) of their final 60 semester units in residence. At least 12 of these 24 units must be completed after you have completed 90 units.

Upper Division Residence Requirement

You must complete in residence a minimum of 18 units of upper division courses (excluding UCEAP units), 12 of which must satisfy the requirements for your major.

Summary of Modifications

1. L&S College Requirements: Reading & Composition, Quantitative Reasoning, and Foreign Language, which typically must be satisfied with a letter grade, can be satisfied with a Passed (P) grade during Fall 2020 and Spring 2021 if a student elects to take the course for P/NP. Note: This does not include Entry Level Writing (College Writing R1A).

2. Requirements within L&S majors and minors can be satisfied with Passed (P) grades during the Fall 2020 and Spring 2021 semesters. This includes prerequisites for majors. Contact your

intended or declared major/minor adviser (http://guide.berkeley.edu/archive/2020-21/undergraduate/degree-programs/) for more details.

3. Departments may create alternative methods for admitting students into their majors.

4. L&S students will not be placed on academic probation automatically for taking all of their courses P/NP during Fall 2020 or Spring 2021.

Learning Goals for the Major

All Operations Research and Management Science (ORMS) graduates are expected to acquire the following general skills and knowledge:

1. Ability to apply mathematics and science to the solution of societal problems.
2. Ability to design and conduct experiments, analyze, and interpret data.
3. Ability to design system and operating policies to meet desired needs.
4. Ability to function on multidisciplinary teams and communicate effectively.
5. Ability to identify, formulate, and solve societal system problems.
6. Understanding of professional and ethical responsibility.
7. Recognize the need for and ability to engage in life-long learning.
8. Knowledge of contemporary issues.
9. Ability to use techniques, skills, and modern tools in practice.

Skills

The ORMS major in the IEOR Department has four general objectives for the Bachelor of Arts degree program. The department aims for the BA degree graduates to become skilled in the following:

1. Quantitative modeling and analysis of a broad array of systems-level decision problems concerned with economic efficiency, productivity, and quality.
2. Development and creative use of analytical and computational methods for solving these problems.
3. Collection and analysis of data and the use of database and decision-support tools.
4. Comprehension and analysis of risk and uncertainty.

In addition, graduates will obtain the broader skills, background, and knowledge necessary to be effective life-long professionals who understand the impact of systems in a societal context in a rapidly changing global economy.

Specific outcomes of the BA degree program are as follows:

1. Develop scientific, quantitative, model building, and problem solving skills through core courses in mathematics, statistics, operations research, and management sciences.
2. Learn how to apply these skills and tools effectively for operational, tactical, and strategic decisions in an area of choice.
3. Pursue graduate study in operations research and the management sciences.

Major Maps help undergraduate students discover academic, co-curricular, and discovery opportunities at UC Berkeley based on intended major or field of interest. Developed by the Division of Undergraduate

Education in collaboration with academic departments, these experience maps will help you:

- **Explore** your major and gain a better understanding of your field of study
- **Connect** with people and programs that inspire and sustain your creativity, drive, curiosity and success
- **Discover** opportunities for independent inquiry, enterprise, and creative expression
- **Engage** locally and globally to broaden your perspectives and change the world
- **Reflect** on your academic career and prepare for life after Berkeley

Use the major map below as a guide to planning your undergraduate journey and designing your own unique Berkeley experience.

View the Operations Research and Management Science Major Map PDF. **(**https://vcue.berkeley.edu/sites/default/files/operations_research_and_management_science.pdf**)**

Operations Research and Management Science

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 [-]