**OPERATIONS, INFORMATION AND DECISIONS (OIDD)**

**OIDD 005 Grit Lab: The Science and Practice of Passion and Perseverance**
The aims of Grit Lab are two-fold: (1) equip you with generalizable knowledge about the science of passion and perseverance (2) to help you apply these insights to your own life. At the heart of this course are cutting-edge scientific discoveries about how to foster passion and perseverance for long-term goals. As in any undergraduate course, you will have an opportunity to learn from current research. But unlike most courses, Grit Lab encourages you to apply these ideas to your own life and reflect on your experience.

Taught by: Duckworth
Course usually offered in fall term
Also Offered As: PSYC 005
Activity: Lecture
1.0 Course Unit
Notes: There are no prerequisites to Grit Lab, and it is open to all enrolled undergraduate students. However, admittance does require completing an online, written application, which must be completed by the end of the day on December 2, 2020. Use the link after "Additional Course Information." Since enrollment is by application only, accepted applicants will be administratively registered. No need to submit and advance request.

**OIDD 101 An Introduction to Operations, Information and Decisions**
OIDD 101 explores a variety of common quantitative modeling problems that arise frequently in business settings, and discusses how they can be formally modeled and solved with a combination of business insight and computer-based tools. The key topics covered include capacity management, service operations, inventory control, structured decision making, constrained optimization and simulation. This course teaches how to model complex business situations and how to master tools to improve business performance. The goal is to provide a set of foundational skills useful for future coursework at Wharton as well as providing an overview of problems and techniques that characterize disciplines that comprise Operations and Information Management.

One-term course offered either term
Activity: Lecture
1.0 Course Unit

**OIDD 105 Analytics in Excel VBA**
This course provides an introduction to the construction of data analysis tools that are commonly used for business applications, especially in consulting and finance. The course builds on the spreadsheet and analytical skills developed in OPIM101, providing a much more extensive treatment of spreadsheet application development and database management. The first portion of the course will focus on programming in VBA, the embedded programming language in the Microsoft Office suite of applications. This will be supplemented with discussion of industry best practice in software development, such as specification development, interface design, documentation, and testing. The second portion of the class will emphasize data access and analysis utilizing SQL, the industry standard language for interacting with database software.

Taught by: Lorin Hitt
Activity: Lecture
0.5 Course Units

**OIDD 201 Technology Management, Information and the Digital Economy**
OIDD201 introduces students to two critically important and tightly linked concepts. The first is online business model innovation, including key opportunities to exploit information-based strategies in businesses as diverse as Capital One and Uber (newly vulnerable markets) and Amazon and Airbnb (online channel conflict). The second is computer-based simulation modeling to assess the viability of an online innovation, the strategies for its launch, and its economic value.

Activity: Lecture
1.0 Course Unit

**OIDD 210 Online Business Models and the Information-Based Firm**
This course provides a broad-based introduction to the management of information technology focusing on three interrelated themes: technology, organization, and strategy. The goal of this course is to equip students with the knowledge and tools to utilize information systems to pursue a firm’s strategic and organizational goals. The course has no prerequisites other than a general interest in the applications of information technology.

One-term course offered either term
Activity: Lecture
1.0 Course Unit

**OIDD 215 Intro to Analytics and the Digital Economy**
Over the past decade, there has been a dramatic rise in the use of technology skills and data analytic thinking to solve business problems in many domains, including finance, HR, policy, transport, and strategy. As a result, the modern "analytic leader" increasingly requires the use of technology, statistics, and data skills to facilitate business analysis. This includes knowing how to effectively frame data-driven questions and use a new generation of technology tools that are becoming available to acquire, analyze, interpret, and communicate insights derived from data. Students in this hands-on course will engage with weekly labs that introduce them to new technologies, techniques, and data-driven business challenges.

Activity: Lecture
0.5 Course Units

**OIDD 220 Introduction to Operations Management**
This course introduces basic concepts of operations management and application of the same in business practice today. We will examine the theoretical foundations of operations management and how these principles or models can be employed in both tactical and strategic decision making. Topics covered in detail are forecasting techniques, planning under deterministic and uncertain demand, operations planning and scheduling, queuing theory, service operations management, newsvendor models, risk pooling strategies in firms, capacity and revenue management, and supply chain coordination. We will conclude by discussing how supply chains evolve under technological change.

One-term course offered either term
Activity: Lecture
1.0 Course Unit
OIDD 222 Internet Law, Privacy, and Cybersecurity
This course looks at how courts, legislatures, and regulators confront the major issues of the internet world. Billions of people are now active on social media, and firms such as Google, Facebook, Amazon, and Alibaba are among the worlds most valuable and influential. The legal interfaces between the physical world and the digital world are therefore increasingly important. In particular, exploitation of personal information online by governments, digital platforms, and bad actors is becoming a constant source of major controversies. The material in the course ranges from the foundations of cyberlaw, developed during the e-commerce bubble of the 1990s, to current leading-edge questions around the power and responsibility of digital intermediaries; data protection in the U.S. and Europe; cybercrime; blockchain; and network neutrality. No pre-existing legal or technical knowledge is required.
One-term course offered either term
Also Offered As: LGST 222
Activity: Lecture
1.0 Course Unit

OIDD 224 Analytics for Service Operations
This course considers tools and concepts that can generate operational excellence for the production and delivery of services in industries such as banking, transportation, health care, and communications. Since services typically are intangible, not storable or transportable, and often highly variable, the management of their operations is complex and involves distributed operations with a significant amount of customer contact. Therefore, the understanding and effective management of service operations requires specialized analytical tools and customer-centric focus. This course covers a mix of topics with the emphasis on quantitative methods, application of analytics and strategic frameworks. The class will introduce simple models and basic concepts that support analysis of tradeoffs in a variety of common service processes. Students also will have the opportunity to apply the ideas and analytical models developed in the course to a particular service industry. They will do so by conducting a guided, application group project which includes opportunities for in-depth analysis of a particular service process and field work.
Taught by: Faculty
Activity: Lecture
1.0 Course Unit

OIDD 236 Scaling Operations in Technology Ventures: Linking Strategy and Execution
This course helps students learn to make strategic scaling decisions that are grounded in operational reality. Students will study how to build and evaluate the "operation systems" of the firm to maximize value with the focus on scaling the firm's operations. This involves tailoring the firm's operational competencies, assets, and processes to a specific business strategy. The course will approach the challenge of scaling operations and operations strategy by taking a holistic view that incorporates competitive strategy, financial evaluation, and the customer experience.
Activity: Lecture
1.0 Course Unit

OIDD 245 Analytics and the Digital Economy
Students who take this course will engage with the world of data science using tools such as Tableau and R that are becoming increasingly popular in industry. The first half of the course is designed for students with limited experience with data projects, and while familiarity with R, via courses such as STAT 405 or STAT 470, will be ideal preparation, students with other programming exposure can pick up the required skills via review sessions and self-instruction. The second half of the course extends students' experience to industry applications of text mining and machine learning and requires students to work with more unstructured data. Each week of the course will be devoted to analysis of a data set from a particular industry (e.g. HR, sports, fashion, real estate, music, education, politics, restaurants, non-profit work), which we will use to answer business questions by applying analytic techniques. The course is very hands-on, and students will be expected to become proficient at applying data to business decisions and at effectively analyzing large data sets to inform decisions about business problems.
Activity: Lecture
1.0 Course Unit

OIDD 255 Artificial Intelligence, Data and Society
The progression of AI-based technologies promises to transform many aspects of business, labor, and even society. The goal of this course is to provide students with an understanding of the capabilities of modern AI technologies, with an emphasis on being able to critically assess where they can provide societal value, and where they may create new challenges. The course is not intended to provide a deep-dive into the workings of these technologies in the same way as a computer science course might. Rather, business and policy decision-makers will be confronted with a number of important issues as AI becomes integrated into the social decision-making fabric. This course is intended to provide a framework for people who may have to confront these legal, ethical, and economic challenges. In doing so, an objective is to ensure that students who complete the course are comfortable enough in the inner-workings of these technologies to think critically across many AI contexts as well as different domains ranging from public policy, to criminal justice, to health inspections, HR, and marketing. The 0.5 CU course is oriented around hands-on critical written assessments, labs, exams, and a presentation. Broadly, data rich firms in finance, tech, management, marketing, and other industries are increasingly adopting AI as a tool to accelerate and improve decision-making. It is important for modern managers to understand the opportunities and challenges introduced by data and AI so that they can credibly communicate about these issues with others. We will cover many of these issues, so that you will be able to think about the opportunities and challenges that arise when firms try to use AI to solve business problems. Labs will reinforce your learning of how AI works, and how it is being used to solve business problems. During labs, we will focus on gaining experience with introductory machine learning concepts. Students will spend time inside and outside of the classroom combining data and code to provide a foundation for understanding the deep challenges that this will bring to organizations.
Taught by: Prasanna Tambe
Activity: Lecture
0.5 Course Units
**OIDD 261 Risk Analysis and Environmental Management**
This course is designed to introduce students to the role of risk assessment, risk perception and risk management in dealing with uncertain health, safety and environmental risks including the threat of terrorism. It explores the role of decision analysis as well as the use of scenarios for dealing with these problems. The course will evaluate the role of policy tools such as risk communication, economic incentives, insurance, regulation and private-public partnerships in developing strategies for managing these risks. A project will enable students to apply the concepts discussed in the course to a concrete problem. Taught by: Kunreuther
One-term course offered either term
Also Offered As: BEPP 261, BEPP 761, BEPP 961, ESE 567, OIDD 761
Activity: Lecture
1.0 Course Unit
Notes: Crosslisted with OIDD 761, BEPP 261, 761, 961, and ESE 567. See description under OIDD 761.

**OIDD 263 Environmental & Energy Economics and Policy**
This course examines environmental and energy issues from an economist’s perspective. Over the last several decades, energy markets have become some of the most dynamic markets of the world economy, as they experienced a shift from heavy regulation to market-driven incentives. First, we look at scarcity pricing and market power in electricity and gasoline markets. We then study oil and gas markets, with an emphasis on optimal extraction and pricing, and geopolitical risks that investors in hydrocarbon resources face. We then shift gears to the sources of environmental problems, and how policy makers can intervene to solve some of these problems. We talk about the economic rationale for a broad range of possible policies: environmental taxes, subsidies, performance standards and cap-and-trade. In doing so, we discuss fundamental concepts in environmental economics, such as externalities, valuation of the environment and the challenge of designing international agreements. At the end of the course, there will be special attention for the economics and finance of renewable energy and policies to foster its growth. Finally, we discuss the transportation sector, and analyze heavily debated policies such as fuel-economy standards and subsidies for green vehicles. Prerequisites: An introductory microeconomics course (ECON1, or another course approved by the instructor) will be sufficient in most cases; BEPP 250 or an equivalent intermediate microeconomics course is recommended.
Taught by: Arthur van Benthem
Also Offered As: BEPP 263
Activity: Lecture
1.0 Course Unit

**OIDD 290 Decision Processes**
This course is an intensive introduction to various scientific perspectives on the processes through which people make decisions. Perspectives covered include cognitive psychology of human problem-solving, judgment and choice, theories of rational judgment and decision, and the mathematical theory of games. Much of the material is technically rigorous. Prior or current enrollment in STAT 101 or the equivalent, although not required, is strongly recommended.
Prerequisite: STAT 101
Activity: Lecture
1.0 Course Unit

**OIDD 291 Negotiations**
This course examines the art and science of negotiation, with additional emphasis on conflict resolution. Students will engage in a number of simulated negotiations ranging from simple one-issue transactions to multi-party joint ventures. Through these exercises and associated readings, students explore the basic theoretical models of bargaining and have an opportunity to test and improve their negotiation skills.
One-term course offered either term
Also Offered As: LGST 291, MGMT 291
Activity: Lecture
1.0 Course Unit

**OIDD 292 Advanced Negotiation**
This course is designed to teach negotiation principles and to enable students to develop their negotiation skills. This course assumes familiarity with the basic negotiation concepts covered in the prerequisite for this course: Negotiations. In this course, we extend the study and practice of negotiations and we develop a deeper understanding for how specific aspects of the negotiation process (e.g., emotions, deadlines, trust violations) impact outcomes. Through course lectures, readings, and case exercises, students will develop a rich framework for thinking about the negotiation process and acquire tools for guiding the negotiation process.
Taught by: Schweitzer, Staff
One-term course offered either term
Also Offered As: LGST 292, MGMT 292
Prerequisite: LGST 206 OR OIDD 291 OR MGMT 291
Activity: Lecture
1.0 Course Unit

**OIDD 293 People Analytics**
This course examines the use of data to understand and improve how people are managed in organizations. People really are organizations’ most important asset, providing the critical link in converting strategy and capital into value. Yet throughout most of our history, most organizations have relied on long-standing traditions, hear-say, political expediency, prejudice and gut instinct to make decisions about how those people should be managed. Recent years have seen a growing movement to bring more science to how we manage people. In some cases, that means ensuring that whatever practices and approaches we adopt are backed up by solid evidence as to their effectiveness. Often, organizations will seek to go further, analyzing their own data to identify problems and learn what is working and what is not in their own context. This course applies the insights of the people analytics movement to help students become better managers and more critical analysts within their organizations. The course aims to develop students in three specific ways. First, it will provide students with an up-to-the-minute grounding in current evidence about managing people, providing a knowledge base that can ensure that their future management is guided by best practices. Second, we will develop the skills and understanding necessary to be thoughtful, critical consumers of evidence on people management, allowing them to make the most of the analysis available to them as they make people decisions. Third, we will provide guidance and practice in conducting people analytics, preparing students to gather data of their own, and making them more skilled analysts. We will pursue these goals through a mixture of lecture, case discussion, and hands on exploration of a variety of data sets.
Taught by: Professor Tiantian Yang
Course usually offered in spring term
Also Offered As: MGMT 293
Activity: Lecture
1.0 Course Unit
**OIDD 299 Judgment & Decision Making Research Immersion**
This class provides a high-level introduction to the field of judgment and decision making (JDM) and in-depth exposure to the process of doing research in this area. Throughout the semester you will gain hands-on experience with several different JDM research projects. You will be paired with a PhD student or faculty mentor who is working on a variety of different research studies. Each week you will be given assignments that are central to one or more of these studies, and you will be given detailed descriptions of the research projects you are contributing to and how your assignments relate to the successful completion of these projects. To complement your hands-on research experience, throughout the semester you will be assigned readings from the book Nudge by Thaler and Sunstein, which summarizes key recent ideas in the JDM literature. You will also meet as a group for an hour once every three weeks with the class’s faculty supervisor and all of his or her PhD students to discuss the projects you are working on, to discuss the class readings, and to discuss your own research ideas stimulated by getting involved in various projects. Date and time to be mutually agreed upon by supervising faculty and students. the 1CU version of this course will involve approx. 10 hours of research immersion per week and a 10-page paper. The 0.5 CU version of this course will involve approx 5 hours of research immersion per week and a 5-page final paper. Please contact Professor Joseph Simmons if you are interested in enrolling in the course: jsimmo@wharton.upenn.edu

Taught by: Joe Simmons
Course usually offered in fall term
Activity: Lecture
0.5 Course Units
Notes: Instructor permission required to enroll.

**OIDD 311 Business Computer Languages**
This course is taught with the more descriptive title of "Scripting for Business Analytics." "Business Analytics" refers to modeling and analysis undertaken for purposes of management and supporting decision making. The varieties of techniques and methods are numerous and growing, including simple equational models, constrained optimization models, probabilistic models, visualization, data analysis, and much more. Elementary modeling of this sort can be undertaken in Excel and other spreadsheet programs, but "industrial strength" applications typically use more sophisticated tools, based on scripting languages. Scripting languages are programming languages that are designed to be learned easily and to be used for special purposes, rather than for large-scale application programming. This course focuses on the special purposes associated with business analytics and teaches MATLAB and Python in this context. MATLAB and Python are widely used in practice (both in management and in engineering), as are the business analytic methods covered in the course. Prior programming experience is useful, but not required or presumed for this course.

One-term course offered either term
Activity: Lecture
1.0 Course Unit

**OIDD 314 Enabling Technologies**
Conducting business in a networked economy invariably involves interplay with technology. The purpose of this course is to improve understanding of technology (what it can or cannot enable), the business drivers of technology-related decisions in firms, and to stimulate thought on new applications for commerce (including disruptive technologies). The class provides a comprehensive overview of various emerging technology enablers and culminates in discussion of potential business impact of these technologies in the near future. No prior technical background is assumed and hence every effort is made to build most of the lectures from the basics. However, the Fall semester class will assume basic understanding of statistics and will focus more on big data analytics. Some assignments in the fall will involve data analytics using Python or R.

One-term course offered either term
Also Offered As: OIDD 662
Activity: Lecture
1.0 Course Unit

**OIDD 315 Databases for Analytics**
Relational databases are the primary way in which business data is stored and processed. This course focuses on the analysis of data in databases and the development of databases to support analytical tasks. Over the course of the semester, students will learn the database language SQL and use this language to perform analytical tasks on existing and self-created databases. In addition, we will cover database scripting languages and extensions. The course is intended as students with little or no database background and does not presume prior computer science or coding experience. This course is nearly all hands-on coding. Students interested in more conceptual discussions of technology should consider other OIDD offerings.

taught by: Lorin Hitt
Activity: Lecture
0.5 Course Units

**OIDD 319 Advanced Decision Systems: Evolutionary Computation**
This course is taught with the more descriptive title of "Agents, Games, and Evolution." It explores applications and fundamentals of strategic behavior. Strategic, or game-theoretic, topics arise throughout the social sciences. The topics include--and we discuss--trust, cooperation, market-related phenomena (including price equilibria and distribution of wealth), norms, conventions, commitment, coalition formation, and negotiation. They also include such applied matters as design of logistics systems, auctions, and markets generally (for example, markets for electric power generation). In addressing these topics we focus on the practical problem of finding effective strategies for agents in strategic situations (or games). Our method of exploration will be experimental: we review and discuss experiments, principally computational experiments, on the behavior of bounded rational agents in strategic (or game-theoretic) situations. Course work includes readings, discussions in class (organized as a seminar), examinations, and a course project on a topic chosen by the participants.

One-term course offered either term
Activity: Seminar
1.0 Course Unit
OIDD 321 Introduction to Management Science
Understanding how to use data and business analytics can be the key differential for a company's success or failure. This course is designed to introduce fundamental quantitative decision-making tools for a broad range of managerial decision problems. Topics covered include linear, nonlinear, and discrete optimization, dynamic programming, and simulation. Students will apply these quantitative models in applications of portfolio management, electricity auctions, revenue management for airlines, manufacturing, advertising budget allocation, and healthcare scheduling operations. Emphasis in this course is placed on mathematical modeling of real world problems and implementation of decision making tools. Taught by: Faculty
One-term course offered either term
Activity: Lecture
1.0 Course Unit

OIDD 325 Computer Simulation Models
This course focuses on agent-based computational models in the social sciences, especially in economic, in commercial and in strategic (game-theoretic) contexts. This relatively recent and now rapidly-developing form of computer simulation seeks to explain and predict complex social phenomena "from the ground up", through interactions of comparatively simple agents. The course reviews experimental and theoretical results, and exposes the students to modern development environments for this form of simulation. Students have the opportunity to design and implement agent-based simulations. Programming, however, is not required. This course aims to integrate various topics in agent-based simulation, while developing an appreciation of the problems that are particularly characteristic of this form of simulation so that students will understand its promise and potential. One-term course offered either term
Activity: Lecture
1.0 Course Unit

OIDD 353 Mathematical Modeling and its Application in Finance
Quantitative methods have become fundamental tools in the analysis and planning of financial operations. There are many reasons for this development: the emergence of a whole range of new complex financial instruments, innovations in securitization, the increased globalization of the financial markets, the proliferation of information technology and the rise of high-frequency traders, etc. In this course, models for hedging, asset allocation, and multi-period portfolio planning are developed, implemented, and tested. In addition, pricing models for options, bonds, mortgage-backed securities, and other derivatives are studied. The models typically require the tools of statistics, optimization, and/or simulation, and they are implemented in spreadsheets or a high-level modeling environment, MATLAB. This course is quantitative and will require extensive computer use. The course is intended for students who have strong interest in finance. The objective is to provide students the necessary practical tools they will require should they choose to join the financial services industry, particularly in roles such as: derivatives, quantitative trading, portfolio management, structuring, financial engineering, risk management, etc. Prospective students should be comfortable with quantitative methods such as basic statistics and the methodologies (mathematical programming and simulation) in OIDD 612 Business Analytics and OIDD 321 Management Science (or equivalent). Students should seek permission from the instructor if the background requirements are not met. Taught by: Faculty
One-term course offered either term
Also Offered As: OIDD 653
Prerequisite: OIDD 321
Activity: Lecture
1.0 Course Unit

OIDD 380 Operations Strategy Practicum
This course focuses on the management of operations at manufacturing and service facilities located in Israel that are used either by domestic corporations or by multinational companies. The emphasis is on the evolving patterns of operations strategies adopted by firms for producing products, sourcing manufacturing, distributing products, delivering services and managing product design as well as on programs for enhancing quality, productivity and flexibility and managing technology. We will focus on formulation and execution of such strategies for established Israeli multinationals with world class operations and innovative strategies as well as start-ups and smaller companies that are scaling their global supply chain infrastructure to support growth. The course will consist of a set of site visits in Israel during Winter Break that will provide the opportunity to observe company processes directly and in-class sessions which include lectures, case discussions and management speakers who will describe their companies' current strategy. NOTE: THIS COURSE REQUIRES YOU TO SUBMIT AN APPLICATION FOR ADMISSION. Enrollment will be limited. Please contact Ramon Jones at ramjones@wharton.upenn.edu for more information. Application available at https://global.upenn.edu/pennabroad/pgs OIDD 101 is recommended but not required.
Activity: Lecture
1.0 Course Unit
**OIDD 397 Retail Supply Chain Management**
This course is highly recommended for students with an interest in pursuing careers in: (1) retailing and retail supply chains; (2) businesses like banking, consulting, information technology, that provides services to retail firms; (3) manufacturing companies (e.g., P&G) that sell their products through retail firms. Retailing is a huge industry that has consistently been an incubator for new business concepts. This course will examine how retailers understand their customers’ preferences and respond with appropriate products through effective supply chain management. Supply chain management is vitally important for retailers and has been noted as the source of success for many retailers such as Wal-mart and Home Depot, and as an inhibitor of success for e-tailers as they struggle with delivery reliability. See M. L. Fisher, A. Raman and A. McClelland, ”Rocket Science Retailing is Coming - Are You Ready?,” Harvard Business Review, July/August 2000 for related research.
Taught by: Faculty
Also Offered As: OIDD 697
Activity: Lecture

**OIDD 399 Supervised Study**
This course number is currently used for several course types including independent studies, experimental courses and Management & Technology Freshman Seminar. Instructor permission required to enroll in any independent study. Wharton Undergraduate students must also receive approval from the Undergraduate Division to register for independent studies. Section 002 is the Management and Technology Freshman Seminar; instruction permission is not required for this section and is only open to M&T students. For Fall 2020, Section 004 is a new course titled AI, Business, and Society. The course provides a overview of AI and its role in business transformation. The purpose of this course is to improve understanding of AI, discuss the many ways in which AI is being used in the industry, and provide a strategic framework for how to bring AI to the center of digital transformation efforts. In terms of AI overview, we will go over a brief technical overview for students who are not actively immersed in AI (topic covered include Big Data, data warehousing, data-mining, different forms of machine learning, etc). In terms of business applications, we will consider applications of AI in media, Finance, retail, and other industries. Finally, we will consider how AI can be used as a source of competitive advantage. We will conclude with a discussion of ethical challenges and a governance framework for AI. No prior technical background is assumed but some interest in (and exposure to) technology is helpful. Every effort is made to build most of the lectures from the basics.
One-term course offered either term
Activity: Independent Study
1.0 Course Unit

**OIDD 410 Decision Support Systems**
The past few years have seen an explosion in the amount of data collected by businesses and have witnessed enabling technologies such as database systems, client-server computing and artificial intelligence reach industrial strength. These trends have spawned a new breed of systems that can support the extraction of useful information from large quantities of data. Understanding the power and limitations of these emerging technologies can provide managers and information systems professionals new approaches to support the task of solving hard business problems. This course will provide an overview of these techniques (such as genetic algorithms, neural networks, and decision trees) and discuss applications such as fraud detection, customer segmentation, trading, marketing strategies and customer support via cases and real datasets.
Taught by: Faculty
One-term course offered either term
Also Offered As: OIDD 672
Activity: Lecture
1.0 Course Unit
Notes: Crosslisted with OIDD 672. See description under OIDD 672.

**OIDD 411 How to Make Things: Production Prototyping Studio**
The course centers around a sequence of three projects that each culminate in the design and fabrication of functional objects. A 2D Design, 3D Design, and final “Micro-Manufacturing” project will introduce students to a wide variety of design, engineering, and fabrication skills made possible by the new Studios @ Tangen Hall. The micro-manufacturing final project will task interdisciplinary student teams to create a "micro-business" where they will design and utilize 3D printed molding and casting techniques to create a small-scale run of functional products. These products will then be showcased in an end of semester exposition, where the teams will merchandise and market their products to the Penn community. This exposition will also be a wonderful inaugural use of the student and alumni retail space on the 1st floor of Tangen Hall and serve as a great university-wide event to show case the work of SEAS students. Requires proficiency in solid modeling software (e.g., SolidWorks, Maya, Rhino), practice with design process, and hands-on fabrication experience.
Taught by: Dustyn Roberts
Also Offered As: IPD 511, MEAM 411, OIDD 511
Activity: Studio
1.0 Course Unit

**OIDD 415 Product Design**
This course provides tools and methods for creating new products. The course is intended for students with a strong career interest in new product, development, entrepreneurship, and/or technology development. The course follows an overall product design methodology, including the identification of customer needs, generation of product concepts, prototyping, and design-for-manufacturing. Weekly student assignments are focused on the design of a new product and culminate in the creation of a prototype, which is launched at an end-of-semester public Design Fair. The course project is a physical good - but most of the tools and methods apply to services and software products. The course is open to any Penn sophomore, junior, senior or graduate student.
Taught by: Faculty
Also Offered As: IPD 515, MEAM 415, OIDD 515
Activity: Lecture
1.0 Course Unit
OIDD 418 The India Startup Ecosystem
The objective of OIDD/ MGMT 418 and the Wharton India Fellows program is to introduce Penn juniors to the entrepreneurship and innovation ecosystem in India through a course covering topics in entrepreneurship, innovation, venture capital and technology in India and then matching students to a specific short-term project with a Bangalore-based early-stage startup or rapidly scaling company. Students will complete preliminary work on the project assignment during the course, and then travel as a group to Bangalore with the instructor for a two week immersion in the company to which they have been assigned for their entrepreneurship project. Penn Wharton Entrepreneurship will cover airfare and lodging expenses for students selected as Wharton India Fellows for the duration of the 2 week immersion in India. For more information: https://entrepreneurship.wharton.upenn.edu/wharton-india-fellows/
Also Offered As: MGMT 418
Activity: Lecture
0.5 Course Units

OIDD 469 Information Strategy and Economics
This course is devoted to the study of the strategic use of information and the related role of information technology, and designed for students who want to manage and compete in technology-intensive businesses. The topics of the course vary year to year, but generally include current issues in selling digital products, intermediation and disintermediation, competing in online markets, emerging technologies, managing artificial intelligence and data science for business, and technology project management. Heavy emphasis is placed on utilizing information economics to analyze businesses in information-intensive industries. Technology skills are not required, although a background in information technology management, strategic management or managerial economics is helpful. The course is designed to complement OIDD 210, OIDD 215, OIDD 245, and OIDD 255X.
Taught by: Faculty
One-term course offered either term
Activity: Lecture
1.0 Course Unit

OIDD 477 Introduction to Python for Data Science
The goal of this course is to introduce the Python programming language within the context of the closely related areas of statistics and data science. Students will develop a solid grasp of Python programming basics, as they are exposed to the entire data science workflow, starting from interacting with SQL databases to query and retrieve data, through data wrangling, reshaping, summarizing, analyzing and ultimately reporting their results. Competency in Python is a critical skill for students interested in data science. Prerequisites: No prior programming experience is expected, but statistics, through the level of multiple regression is required. This requirement may be fulfilled with Undergraduate courses such as Stat 102, Stat 112.
Taught by: Richard Waterman
Also Offered As: OIDD 777, STAT 477, STAT 777
Activity: Lecture
0.5 Course Units

OIDD 490 The Science of Behavior Change
The objective of this 14-week discussion-based seminar for advanced undergraduates is to expose students to cutting-edge research from psychology and economics on the most effective strategies for changing behavior sustainably and for the better (e.g., promoting healthier eating and exercise, encouraging better study habits, and increasing savings rates). The weekly readings cover classic and current research in this area. The target audience for this course is advanced undergraduate students interested in behavioral science research and particularly those hoping to learn about using social science to change behavior for good. Although there are no pre-requisites for this class, it is well-suited to students who have taken (and enjoyed) courses like OIDD 290: Decision Processes, PPE 203/PSYC 265: Behavioral Economics and Psychology, and MKTG 266: Marketing for Social Impact and are interested in taking a deeper dive into the academic research related to promoting behavior change for good. Instructor permission is required to enroll in this course. Please complete the application if interested in registering for this seminar: http://bit.ly/bcfg-class-2020. The application deadline is July 31, 2020. Prerequisite: Permission of instructor required.
Taught by: Katherine Milkman and Angela Duckworth
One-term course offered either term
Also Offered As: PSYC 490
Activity: Seminar
1.0 Course Unit

OIDD 511 How to Make Things: Production Prototyping Studio
The course centers around a sequence of three projects that each culminate in the design and fabrication of functional objects. A 2D Design, 3D Design, and final "Micro-Manufacturing" project will introduce students to a wide variety of design, engineering, and fabrication skills made possible by the new Studios @ Tangen Hall. The micro-manufacturing final project will task interdisciplinary student teams to create a "micro-business" where they will design and utilize 3D printed molding and casting techniques to create a small-scale run of functional products. These products will then be showcased in an end of semester exposition, where the teams will merchandise and market their products to the Penn community. This exposition will also be a wonderful inaugural use of the student and alumni retail space on the 1st floor of Tangen Hall and serve as a great university-wide event to show case the work of SEAS students. Requires proficiency in solid modeling software (e.g., SolidWorks, Maya, Rhino), practice with design process, and hands-on fabrication experience.
Taught by: Dustyn Roberts
Also Offered As: IPD 511, MEAM 411, OIDD 411
Activity: Studio
1.0 Course Unit
OIDD 515 Product Design
This course provides tools and methods for creating new products. The course is intended for students with a strong career interest in new product development, entrepreneurship, and/or technology development. The course follows an overall product design methodology, including the identification of customer needs, generation of product concepts, prototyping, and design-for-manufacturing. Weekly student assignments are focused on the design of a new product and culminate in the creation of a prototype, which is launched at an end-of-semester public Design Fair. The course project is a physical good - but most of the tools and methods apply to services and software products. The course is open to any Penn sophomore, junior, senior or graduate student. Also Offered As: IPD 515, MEAM 415, OIDD 415
Activity: Lecture
1.0 Course Unit
Notes: Only Wharton MBA candidates are allowed to register for OIDD 515. Non-MBA students must register for the OIDD 415, MEAM 415 or IPD 515 cross-listing for the course.

OIDD 525 Thinking with Models: Business Analytics for Energy and Sustainability
Models are lenses. They are instruments with which we view, interpret, and give meaning to data. In this course, students will be exposed to and do work in all phases of the modeling life-cycle, including model design and specification, model construction (including data gathering and testing), extraction of information from models during post-solution analysis, and creation of studies that use modeling results to support conclusions for scientific or decision making purposes. In addition, the course will cover critical assessments of fielded models and studies using them. The course will focus broadly on models pertaining to energy and sustainability. This is not only an inherently interesting and important area, but it is very much a public one. In consequence, models, data, and studies using them are publicly and profusely available, as is excellent journalism, which facilitates introductions to specific topics. The course covers selected topics in energy and sustainability. Essential background will be presented as needed, but the course is not a comprehensive overview of energy and sustainability. Modeling in the area of energy and sustainability analytics is rife with uncertainty, and yet decisions must be made. Uncertainty, and how to deal with it in model-based decision making, is an overarching theme of the course. We will focus on energy and sustainability, but that area is hardly unique in being beset with deep and vexing uncertainties. The lessons we learn will generalize. The overall aim of the course is to teach facility with modeling and to use real-world data, models, and studies in doing so. In addition, students with interests in investment or policy analysis in the energy sphere will find the course's subject area focus useful. OIDD 325 is not a prerequisite for this course, but it's helpful if you have already taken it.
Taught by: Steve O Kimbrough
Activity: Lecture
1.0 Course Unit

OIDD 611 Quality and Productivity
Matching supply with demand is an enormous challenge for firms: excess supply is too costly, inadequate supply irritates customers. In the course, we will explore how firms can better organize their operations so that they more effectively align their supply with the demand for their products and services. Throughout the course, we illustrate mathematical analysis applied to real operational challenges—we seek rigor and relevance. Our aim is to provide both tactical knowledge and high-level insights needed by general managers and management consultants. We will demonstrate that companies can use (and have used) the principles from this course to significantly enhance their competitiveness.
Course usually offered in fall term
Activity: Lecture
0.5 Course Units

OIDD 612 Business Analytics
"Managing the Productive Core: Business Analytics" is a course on business analytics tools and their application to management problems. Its main topics are optimization, decision making under uncertainty, and simulation. The emphasis is on business analytics tools that are widely used in diverse industries and functional areas, including operations, finance, accounting, and marketing.
Course usually offered in spring term
Activity: Lecture
0.5 Course Units

OIDD 613 Online Business Models and the Information-Based Firm
Information technology has transformed many industries, including media, financial services, and retailing, among others. These technologies have changed not only how we produce services (e.g., outsourcing and offshoring, and their newest extension, cloud computing) but what services we offer (virtual experiences, online advertising, long tail products and services, and social networking). The purpose of this course is to improve understanding of how information technologies enable transformation of business models within existing organizations as well as the development of completely new business models and new organizational forms. The course will serve as an introductory course on information technologies and will serve as a foundation on which students can explore more advanced technology concepts.
Course usually offered in spring term
Activity: Lecture
0.5 Course Units

OIDD 614 Innovation
The course is first and foremost an intensive, integrative, project course in which student teams create one or more real businesses. Some businesses spun out of the course and now managed by alumni include Terrapass Inc. and Smatchy Inc. The project experience is an exciting context in which to learn key tools and fundamentals useful in innovation, problem solving, and design. Examples of these tools and fundamentals are: problem definition, identification of opportunities, generating alternatives, selecting among alternatives, principles of data graphics, and managing innovation pipelines. The course requires a commitment of at least 10 hours of work outside of class and comfort working on unstructured, interdisciplinary problems. Students with a strong interest in innovation and entrepreneurship are particularly encouraged to enroll. Please read carefully the syllabus posted on-line before registering for this course.
Taught by: Faculty
Course usually offered in fall term
Activity: Lecture
0.5 Course Units
OIDD 615 Operations Strategy
Operations strategy is about organizing people and resources to gain a competitive advantage in the delivery of products (both goods and services) to customers. This course approaches this challenge primarily from two perspectives: 1) how should a firm design their products so that they can be profitably offered; 2) how can a firm best organize and acquire resources to deliver its portfolio of products to customers. To be able to make intelligent decisions regarding these high-level choices, this course also provides a foundation of analytical methods. These methods give students a conceptual framework for understanding the linkage between how a firm manages its supply and how well that supply matches the firm’s resulting demand. Specific course topics include designing service systems, managing inventory and product variety, capacity planning, approaches to sourcing and supplier management, constructing global supply chains, managing sustainability initiatives, and revenue management. This course emphasizes both quantitative tools and qualitative frameworks. Neither is more important than the other.

Taught by: Faculty
Course usually offered in spring term
Activity: Lecture
0.5 Course Units

OIDD 636 Scaling Operations: Linking Strategy and Execution
The goal of this course is to make strategic scaling decisions that are grounded in operational reality. We study how to build and evaluate the operational business model of the firm to maximize value with the focus on scaling the firm’s operations. We will approach the challenge of scaling by taking a holistic view that incorporates competitive strategy, financial evaluation, and the customer experience. We focus on decisions and challenges that many firms that try to scale their operations face with the focus on assessing the readiness of the firm to scale, and the required steps to scale. In particular, we will discuss whether the firm should build competencies in-house (i.e., investing in a portfolio of assets) or buy them (i.e., developing and implementing a global sourcing strategy and integrating external partners) and the risks associated with scaling these. We will also discuss the organizational implications of scaling. There are no formal prerequisites to the class. Students who have already taken OIDD 611, OIDD 615, and STAT 613 should be well-equipped for the class. Other students should have a solid understanding of elementary probability and statistics. For questions regarding the specifics of your background, please contact the instructor.

Taught by: Gad Allon
Activity: Lecture
0.5 Course Units

OIDD 642 Analytics for Services
This course covers a range of analytical methods that are useful tools for capacity management in services, and it will provide you with insights into the economics of a range of services businesses including (i) High-level planning models that account for multiple dimensions of service capacity, (ii) Low-level models of system congestion that capture the relationship between capacity choices, quality of service and, in some cases, system revenue, (iii) Statistical estimation and forecasting models to characterize key measures of future supply and demand. Students who have already taken OIDD 611, OIDD 612, and STAT 613 should be well-equipped for the class. Other students should have a solid understanding of elementary probability, statistics and linear programming. For questions regarding the specifics of your background, please contact the instructor.

Activity: Lecture
0.5 Course Units
Notes: Class participation, case write-ups, online quizzes, self-study exercises and a final exam.

OIDD 643 Analytics for Revenue Management
This course introduces you to the essential concepts and techniques required to understand and implement revenue management (RM). The need for repeated, rapid cycles of estimation and optimization has driven the development of a set of analytical tools that are particularly well suited for RM. This course focuses on those tools. Prerequisites: Students who have already taken OIDD 612 and STAT 613 should be well-equipped for this class. Other students should have a solid understanding of elementary probability, statistics and constrained optimization. For questions regarding the specifics of your background, please contact the instructor.

Taught by: Faculty
Activity: Lecture
0.5 Course Units
Notes: Class participation, case write-ups, online quizzes, self-study exercises and a final exam.

OIDD 652 Design and Development of Web-Based Products and Services
This course is designed as an introduction to the process of product design with a focus on Web-based desktop and mobile consumer products and services. This is a course on designing products as distinct from (and complementary to) building a business. The course is implemented as a team-based experiential learning exercise; students learn the design process by developing multiple prototypes of a Web/mobile-based product or service. Teams will apply different prototyping techniques (paper, wireframes, landing pages) over multiple iterations of their project. This is not a course on Web engineering. Technical skills are not a prerequisite. Neither should students expect to learn specific programming tools or techniques. This is not an entrepreneurship course. Students do not analyze business models, market size, pricing, costs, etc. This class introduces an iterative, data-driven, experiment-based design process. Through their project, students will practice multiple design iterations and gain exposure to tools for designing digital products and services.

Taught by: Faculty
Course not offered every year
Prerequisite: OIDD 614
Activity: Lecture
0.5 Course Units
**OIDD 653 Mathematical Modeling and its Application in Finance**
Quantitative methods have become fundamental tools in the analysis and planning of financial operations. There are many reasons for this development: the emergence of a whole range of new complex financial instruments, innovations in securitization, the increased globalization of the financial markets, the proliferation of information technology and the rise of high-frequency traders, etc. In this course, models for hedging, asset allocation, and multi-period portfolio planning are developed, implemented, and tested. In addition, pricing models for options, bonds, mortgage-backed securities, and other derivatives are studied. The models typically require the tools of statistics, optimization, and/or simulation, and they are implemented in spreadsheets or a high-level modeling environment, MATLAB. This course is quantitative and will require extensive computer use. The course is intended for students who have strong interest in finance. The objective is to provide students the necessary practical tools they will require should they choose to join the financial services industry, particularly in roles such as: derivatives, quantitative trading, portfolio management, structuring, financial engineering, risk management, etc. Prospective students should be comfortable with quantitative methods, such as basic statistics and the methodologies (mathematical programming and simulation) taught in OIDD 612 Business Analytics or OIDD 321 Management Science (or equivalent). Students should seek permission from the instructor if the background requirements are not met.
Taught by: Tsoukalas
One-term course offered either term
Also Offered As: OIDD 353
Prerequisite: OIDD 321 OR OIDD 612
Activity: Lecture
1.0 Course Unit

**OIDD 654 Product Management**
The course provides the student with a number of tools and concepts necessary for the contemporary practice of product management. The course is most relevant to those who hope to work as product managers, as well as for entrepreneurs who will typically serve as their venture's initial product managers. General managers and other functional managers may also find the course valuable to better understand the product management function. The key modules in the course comprise (a) creating something from nothing, (b) design and design thinking, (c) performance measurement and the communication of quantitative information, (d) agile development processes, and (e) managing growth. Alumni guest speakers in interesting product management roles will typically be scheduled weekly in the course. Many examples, tools, and methods will come from technology-based industries, but applications will also be drawn from financial services and consumer products. Most assignments will be completed for a focal product selected by each student, which could be an entrepreneurial project, something related to current or prior employment, or simply a product of personal interest. A recent Canvas site for the course is here, and should be viewable by the public. https://canvas.upenn.edu/courses/1529286 Other Information: Pedagogy includes lectures, small-group discussion, current and historical cases, podcasts, documentary films, and application of tools to a focal product. Most assignments are individual. PLEASE NOTE: Only Wharton MBA students may register for OIDD 654.
Course usually offered in spring term
Activity: Lecture
0.5 Course Units
Notes: Lectures, case and problem analyses, group presentations, the development of a new product to the prototype stage.

**OIDD 658 Service Operations Management**
The service sector represents the largest segment of most industrial economies. In the U.S., for example, it accounts for approximately 70% of GDP and 70% of employment. In addition to this "pure" service sector, the operations and competitive positions of many manufacturing firms are becoming increasingly service-oriented. While operational excellence is critical for success in most industries today, in a wide range of service industries this is particularly true. For example, recent, significant deregulation in banking, health care, and communications has led to intensified competition and pressure on operations. At the same time, the rapid evolution of information technology has enabled firms to operate in a fashion - and offer a level of service - that has not been previously possible. Elements common to most services make the management of their operations complex, however. In particular, services are intangible, not storable or transportable, and often highly variable. Frequently their delivery involves distributed operations with a significant amount of customer contact. All of these factors make service operations end up looking quite a bit different than manufacturing operations, and the task of achieving excellence in them requires specialized analysis frameworks and tools. This course covers a mix of qualitative and quantitative models that provide the necessary tools. The class will focus on simple models that should help you to better understand both the difficulty of managing and the underlying economics of the service operations being considered. You will have the opportunity to apply these course tools in a group service assessment field project. Prerequisite: Courses in operations management, linear programming, probability and statistics
One-term course offered either term
Activity: Lecture
0.5 Course Units

**OIDD 659 Advanced Topics**
The specific content of this course varies from semester to semester, depending on student and faculty interest. Recent topics have included global operations, product design and development, quality management, and logistics strategy. See department for course description.
Prerequisites for the course change semester to semester depending on the course content.
One-term course offered either term
Activity: Lecture
1.0 Course Unit

**OIDD 662 Enabling Technologies**
This course is about understanding emerging technology enablers with a goal of stimulating thinking on new applications for commerce. The class is self-contained (mainly lecture-based) and will culminate in a class-driven identification of novel businesses that exploit these enablers. No prerequisite or technical background is assumed. Students with little prior technical background can use the course to become more technologically informed. Those with moderate to advanced technical background may find the course a useful survey of emerging technologies. The course is recommended for students interested in careers in consulting, investment banking and venture capital in the tech sector.
Taught by: Faculty
Also Offered As: OIDD 314
Activity: Lecture
1.0 Course Unit
Notes: Lectures, discussions, assignments and class participation.
OIDD 663 Databases for Analytics
Relational databases are the primary way in which business data is stored and processed. This course focuses on the analysis of data in databases and the development of databases to support analytical tasks. Over the course of the semester, students will learn the database language SQL and use this language to perform analytical tasks on existing and self-created databases. In addition, we will cover database scripting languages and extensions. The course is intended as students with little or no database background and does not presume prior computer science or coding experience. This course is nearly all hands-on coding. Students interested in more conceptual discussions of technology should consider other OIDD offerings such as OIDD 662.
Taught by: Lorin Hitt
Activity: Lecture
0.5 Course Units

OIDD 667 A.I., Business, and Society
The course provides an overview of AI and its role in business transformation. The purpose of this course is to improve understanding of AI, discuss the many ways in which AI is being used in the industry, and provide a strategic framework for how to bring AI to the center of digital transformation efforts. In terms of AI overview, we will go over a brief technical overview for students who are not actively immersed in AI (topics covered include Big Data, data warehousing, datamining, machine learning, etc.). In terms of business applications, we will consider applications of AI in Media, Finance, Healthcare, Retail, and other industries. Finally, we will consider how AI can be used as a source of competitive advantage. We will conclude with a discussion of ethical challenges and a governance framework for AI. No prior technical background is assumed but some interest in (and exposure to) technology is helpful. Every effort is made to build most of the lectures from the basics.
Taught by: Kartik Hosanagar
Activity: Lecture
0.5 Course Units

OIDD 673 Global Supply Chain Mgmt.
Several forces, ranging from technology that has dramatically reduced the cost of communication, to political developments such as the opening up of China, Vietnam, and Eastern Europe, have created an avalanche of outsourcing and offshoring and lead to supply chains that stretch halfway around the world. This course will study the many questions that arise in the management of such global supply chains, including: Which design and production activities to do in-house and which to outsource? Where to locate various activities around the world? How to forecast the many factors that influence these decisions, including inflation in cost factors such as labor and freight, and the likelihood of future government regulation or political instability? How to keep the supply chain flexible so as to adapt to change? How to manage a geographically dispersed supply chain, including what relationships to have with vendors to ensure low cost, high quality, flexibility, safety, humane labor practices and respect for sustainability of the environment? The course is highly interactive, using case discussions in most classes and senior supply chain executives in many sessions. Grades are based on a class participation, individual write-ups of the discussion questions for 3 of the class sessions, and a course paper.
Taught by: Faculty
Activity: Lecture
0.5 Course Units

OIDD 680 Operations Strategy Practicum
This course will focus on the management of operations at manufacturing and service facilities of domestic corporations and foreign multinational companies. Our emphasis will be on the evolving patterns of operations strategies adopted by firms for producing products, sourcing manufacturing, distributing products, delivering services and managing product design as well as on programs for enhancing quality, productivity and flexibility. The course will focus on the formulation and execution of such strategies for a collection of firms in the context of the current dynamics of global competition. The course consists of a set of site visits and in-class sessions which include lectures, case discussions and management speakers who will describe their company's current strategy.
Taught by: Morris Cohen
Activity: Lecture
1.0 Course Unit

OIDD 690 Managerial Decision Making
The course is built around lectures reviewing multiple empirical studies, class discussion, and a few cases. Depending on the instructor, grading is determined by some combination of short written assignments, tests, class participation and a final project (see each instructor's syllabus for details).
One-term course offered either term
Also Offered As: MGMT 690
Activity: Lecture
1.0 Course Unit
Notes: Crosslisted with MGMT 690.

OIDD 691 Negotiations
This course examines the art and science of negotiation, with additional emphasis on conflict resolution. Students will engage in a number of simulated negotiations ranging from simple one-issue transactions to multi-party joint ventures. Through these exercises and associated readings, students explore the basic theoretical models of bargaining and have an opportunity to test and improve their negotiation skills. Cross-listed with MGMT 691/OIDD 691/LGST 806. Format: Lecture, class discussion, simulation/role play, and video demonstrations. Materials: Textbook and course pack.
Taught by: Faculty
One-term course offered either term
Also Offered As: LAW 518, LGST 806, MGMT 691
Activity: Lecture
1.0 Course Unit
Notes: Crosslisted with LGST 806, MGMT 691.

OIDD 692 Advanced Topics Negotiation
This is a course that builds on the basic Negotiation course. In this course, we explore a wide range of negotiation topics from crisis and hostage negotiations, to the role of emotions including anxiety, envy and anger in negotiations, to backlash effects for women in negotiations, and the role of alcohol in negotiations. We will survey many aspects of current negotiation research, discuss historic negotiation cases, and students will participate in role-play exercises. Many of the role play exercises will involve multi-party negotiations and afford opportunities to hone skills in team-based negotiations.
Taught by: Faculty
One-term course offered either term
Also Offered As: LGST 692, MGMT 692
Activity: Lecture
1.0 Course Unit
Notes: Cases, presentations, and written assignments.
OIDD 693 Influence
Building, protecting and using influence is critical for achieving your goals. This requires good personal decision making as well as understanding others' decision-making, proficiency at the negotiation table as well as with the tacit negotiations before and after sitting at the table. In this course, we focus on building your facility with a wide range of influence tools to help with these efforts. Topics include power and status, informal networks, coalitions and persuasion.

Taught by: Faculty
One-term course offered either term
Also Offered As: LGST 693
Activity: Lecture
0.5 Course Units

OIDD 695 Semester in San Francisco Regional Seminar
As part of the Wharton Semester in San Francisco (SSF) program, this course is designed to (i) provide integrative material that emphasizes links between finance, marketing, product design, negotiations, and other themes in the SSF academic curriculum; (ii) link classroom theories and principles to actual practice by reflecting on the academic literature and (iii) highlight the unique characteristics of, and the program's proximity to, the Bay Area economy. All students participating in the SSF are required to register for this Regional Seminar.
One-term course offered either term
Activity: Lecture
0.5 Course Units

OIDD 697 Retail Supply Chain Management
This course is highly recommended for students with an interest in pursuing careers in: (1) retailing and retail supply chains; (2) businesses like banking, consulting, information technology, that provides services to retail firms; (3) manufacturing companies (e.g. P&G) that sell their products through retail firms. Retailing is a huge industry that has consistently been an incubator for new business concepts. This course will examine how retailers understand their customers' preferences and respond with appropriate products through effective supply chain management. Supply chain management is vitally important for retailers and has been noted as the source of success for many retailers such as Wal-mart and Home Depot, and as an inhibitor of success for e-tailers as they struggle with delivery reliability. See M. L. Fisher, A. Raman and A. McClelland, "Rocket Science Retailing is Coming - Are You Ready?" Harvard Business Review, July/August 2000 for related research.
One-term course offered either term
Also Offered As: OIDD 397
Activity: Lecture
0.5 Course Units
Notes: Lectures, case discussion, guest speakers. Class participation, papers, and a team report.

OIDD 705 Leading With Grit: How to Inspire with Passion and Perseverance for Long-Term Goals
The aims of Leading With Grit are two-fold: (1) to help students apply scientific insights about passion and perseverance for long-term goals to their own career, and (2) to prepare them to lead an organization that encourages grit among its employees. At the heart of this course are cutting-edge scientific insights on the mindsets, strategies, and contextual factors that incline individuals to pursue challenges that take years (or more) to complete. Each week, in addition to a three-hour seminar, students will complete an experiential activity, a brief written reflection, and readings. Most weeks, we will welcome a Grit Guest, an outside speaker who exemplifies grit, for a fireside chat on that week's topic.
Taught by: Angela Duckworth
Activity: Lecture
1.0 Course Unit

OIDD 761 Risk Analysis and Environmental Management
This course will introduce students to concepts in risk governance. We will delve into the three pillars of risk analysis: risk assessment, risk management, and risk communication. The course will spend time on risk financing, including insurance markets. There will be particular emphasis on climate risk management, including both physical impact risk and transition risk, although the course will also discuss several other examples, including management of environmental risks, terrorism, and cyber-security, among other examples. The course will cover how people perceive risks and the impact this has on risk management. We will explore public policy surrounding risk management and how the public and private sector can successfully work together to build resilience, particularly to changing risks.
One-term course offered either term
Also Offered As: BEPP 261, BEPP 761, BEPP 961, ESE 567, OIDD 261
Activity: Lecture
1.0 Course Unit
Notes: Cross-listed with OIDD 261, BEPP 261, 761, 961, and ESE 567

OIDD 762 Environmental Sustainability and Value Creation
This course provides an overview of topics related to corporate sustainability with a focus on how environmentally sustainable approaches can create value for the firm. The course explores trends in corporate practices and students consider specific examples of such practices to examine the interactions between the firm and the environment. This course has three objectives: to increase students' knowledge of sustainability practices and their impact on firm performance; to teach students to think strategically and act entrepreneurially on environmental issues; and to help students design business approaches to improve environmental outcomes, while simultaneously creating value.
Taught by: G. Survís
One-term course offered either term
Also Offered As: LGST 762
Activity: Lecture
0.5 Course Units
**OIDD 763 Energy Markets & Policy**

Over the last several decades, energy markets have become some of the most dynamic markets of the world economy. Traditional fossil fuel and electricity markets have been seen a partial shift from heavy regulation to market-driven incentives, while rising environmental concerns have led to a wide array of new regulations and "environmental markets". The growth of renewable energy could be another source of rapid change, but brings with it a whole new set of technological and policy challenges. This changing energy landscape requires quick adaptation from energy companies, but also offers opportunities to turn regulations into new business. The objective of this course is to provide students with the economist’s perspective on a broad range of topics that professionals in the energy industry will encounter. Topics include the effect of competition, market power and scarcity on energy prices, the impact of deregulation on electricity and fossil fuel markets, extraction and pricing of oil and gas, geopolitical uncertainty and risk in hydrocarbon investments, the environmental impact and policies related to the energy sector, environmental cap-and-trade markets, energy efficiency, the economics and finance of renewable energy, and recent developments in the transportation sector.

Taught by: Arthur Van Benthem
Also Offered As: BEPP 763
Activity: Lecture
1.0 Course Units

**OIDD 777 Introduction to Python for Data Science**

The goal of this course is to introduce the Python programming language within the context of the closely related areas of statistics and data science. Students will develop a solid grasp of Python programming basics, as they are exposed to the entire data science workflow, starting from interacting with SQL databases to query and retrieve data, through data wrangling, reshaping, summarizing, analyzing and ultimately reporting their results. Competency in Python is a critical skill for students interested in data science. Prerequisites: No prior programming experience is expected, but statistics, through the level of multiple regression is required. This requirement may be fulfilled with MBA courses such as STAT 613/621; or by waiving MBA statistics.

Taught by: Richard Waterman
Also Offered As: OIDD 477, STAT 477, STAT 777
Activity: Lecture
0.5 Course Units

**OIDD 793 People Analytics**

This course examines the use of data to improve how people are managed within organizations. Recent years have seen a growing movement to bring more science to how we manage people. In some cases, that means ensuring that whatever practices and approaches we adopt are backed up by solid evidence as to their effectiveness. Often, organizations will seek to go further, analyzing their own data to identify problems and learn what is working and what is not in their own context. This course applies the insights of the people analytics movement to help students become better managers and more critical analysts within their organizations. The course aims to develop students in three specific ways. First, it provides students with an up-to-the-minute grounding in current evidence about managing people, providing a knowledge base that can ensure that their future management is guided by best practices. Second, it develops the skills and understanding necessary to be thoughtful, critical consumers of evidence on people management, allowing them to make the most of the analysis available to them as they make people decisions. Third, it provides guidance and practice in conducting people analytics, preparing students to gather data of their own, and making them more skilled analysts. The course addresses these topics through a mixture of lecture, case discussion, and hands on exploration of a variety of data sets.

Taught by: Matthew Bidwell
Also Offered As: MGMT 793
Activity: Lecture
0.5 Course Units

**OIDD 895 Global Business Week**

Activity: Lecture
0.5 Course Units

**OIDD 898 Advanced Topics**

The specific content of this course varies from semester to semester, depending on student and faculty interest.

Taught by: Faculty
Course not offered every year
Activity: Lecture
1.0 Course Unit

**OIDD 900 Foundations of Decision Processes**

The course is an introduction to research on normative, descriptive and prescriptive models of judgement and choice under uncertainty. We will be studying the underlying theory of decision processes as well as applications in individual group and organizational choice. Guest speakers will relate the concepts of decision processes and behavioral economics to applied problems in their area of expertise. As part of the course there will be a theoretical or empirical term paper on the application of decision processes to each student's particular area of interest.

One-term course offered either term
Activity: Lecture
1.0 Course Unit

Notes: Non-PhD students must contact instructor for permission to enroll.
**OIDD 901 Introduction to OID Faculty and Their Research**
This course introduces first-year Operations, Information and Decisions (OID) PhD students to OID Department faculty members and their research. The course is designed to meet once a week, both in the fall and the spring, allowing most (if not all) OID faculty to present to first-year PhD students either classic or current research in their fields of expertise. The course’s goals are twofold. First, it seeks to introduce first-year PhD students to OID faculty in a substantive (as opposed to social) manner and to expose students to the breadth of research conducted in the department. Second, through early exposure, the course aims to pique students’ interest in the department’s foundational courses in decision making, information systems, and operations management. Taught by: Faculty
Activity: Seminar
1.0 Course Units

**OIDD 904 Experimental Economics**
This course will help prepare you to run your own economics laboratory and field experiments. Experimental methods have been widely adopted by economists to develop new insights, and some economic theories and hypotheses are uniquely well-suited for testing with experimental tools and data. Achieving high internal and external validity requires careful experimental design. Substantive areas of application in the course will include market equilibrium, asset bubbles, learning in games, public good provision, and labor market relationships. Additional topics may include biases in individual decision-making, field experiments in development economics; and happiness, neuroeconomics, and behavioral/experimental welfare economics. Economists’ typical interests in strategic and market-based interactions raise particular methodological challenges and opportunities.
Course not offered every year
Also Offered As: BEPP 904
Activity: Lecture
0.5 Course Units

**OIDD 906 Proseminar in Operations and Information Management**
Advanced seminar focusing on topics in Operations, Information and Decisions research
Course not offered every year
Activity: Seminar
1.0 Course Unit

**OIDD 910 Introduction to Linear, Nonlinear and Integer Optimization**
Introduction to mathematical optimization for graduate students who would like to be intelligent and sophisticated users of mathematical programming but do not necessarily plan to specialize in this area. Linear, integer and nonlinear programming are covered, including the fundamentals of each topic together with a sense of the state-of-the-art and expected directions of future progress. Homework and projects emphasize modeling and solution analysis, and introduce the students to a large variety of application areas.
Course usually offered in fall term
Also Offered As: ESE 504
Activity: Lecture
1.0 Course Unit
Notes: Crosslisted w/ ESE 504.

**OIDD 912 Introduction to Optimization**
This course constitutes the second part of a two-part sequence and serves as a continuation of the summer math camp. Mathematical optimization provides a unifying framework for studying issues of rational decision-making, optimal design, effective resource allocation and economic efficiency. It is a central methodology of many business-related disciplines, including operations research, marketing, accounting, economics, game theory and finance. In many of the disciplines, a solid background in optimization theory is essential for doing research. This course provides a rigorous introduction to the fundamental theory of optimization. It examines optimization theory in two primary settings: static optimization and optimization over time (dynamic programming). Applications from problem areas in which optimization plays a key role are also introduced. The goal of the course is to provide students with a foundation sufficient to use basic optimization in their own research work and/or to pursue more specialized studies involving optimization theory. The course is designed for entering doctoral students. The prerequisites are calculus, linear algebra and some familiarity with real analysis, as covered in summer math camp. Other concepts are developed as needed throughout the course.
Prerequisite: OIDD 910
Activity: Lecture
0.5 Course Units

**OIDD 913 Advanced Linear Programming**
Course not offered every year
Prerequisite: OIDD 910 OR ESE 504
Activity: Lecture
1.0 Course Unit

**OIDD 914 Advanced Non-Linear Programming**
Course not offered every year
Prerequisite: OIDD 910
Activity: Lecture
1.0 Course Unit

**OIDD 915 Advanced Graph Theory**
Deals mainly with algorithmic and computational aspects of graph theory. Topics and problems include reachability and connectivity, setcovering, graph coloring, location of centers, location of medians, trees, shortest path, circuits, traveling salesman problem, network flows, matching, transportation, and assignment problems.
Course not offered every year
Activity: Lecture
1.0 Course Unit
OIDD 916 Advanced Integer Programming
In-depth review of solution methods: Lagrangean relaxation and column generation, Benders partitioning, cross-decomposition, surrogate relaxation, cutting planes and valid inequalities, logical processing, probing, branch-and-bound, branch-and-price. Study of special problems and applications: matching, location, generalized assignment, traveling salesman, forest planning, production scheduling. Prerequisite: OIDD 910/ESE 504 or equivalent. Please email the instructor for any questions regarding the prerequisite.
Course not offered every year
Prerequisite: OIDD 910 OR ESE 504
Activity: Lecture
1.0 Course Unit

OIDD 920 Empirical Research in Operations Management
Empirical research in Operations Management has been repeatedly called for over the last 10-15 years, including calls made from the academic thought leaders in the field as well as by many of the editors of the top academic journals. Remarkably though, most researchers in the field would be pressed to name even three empirical papers published in such journals like Management Science or Operations Research. But, has there really been so little published related to empirical Operations Management (you might be surprised to learn that all five bullets listed above has been addressed by Management Science papers)? What types of problems in operations are interesting and worthwhile studying from an empirical viewpoint? How can one get started with an empirical research project in Operations Management? These are the questions that are at the heart of this course. Specifically, the objective of this course is to (a) expose doctoral students to the existing empirical literature and (b) to provide them with the training required to engage in an empirical study themselves.
Activity: Lecture
0.5 Course Units

OIDD 930 Stochastic Models
This course introduces mathematical models describing and analyzing the behavior of processes that exhibit random components. The theory of stochastic processes will be developed based on elementary probability theory and calculus. Topics include random walks, Poisson processes, Markov chains in discrete and continuous time, renewal theory, and martingales. Applications from the areas of inventory, production, finance, queueing and communication systems will be presented throughout the course.
Course usually offered in fall term
Prerequisite: STAT 510 OR STAT 550
Activity: Lecture
0.5 Course Units

OIDD 931 Stochastic Processes II
Extension of the material presented in OIDD930 to include renewal theory, martingales, and Brownian motion.
Course usually offered in spring term
Prerequisite: OIDD 930
Activity: Lecture
0.5 Course Units

OIDD 932 Queuing Theory
This course presents the mathematical foundations for the analysis of queueing systems. We will study general results like Little’s law and the PASTA property. We will analyze standard queueing systems (Markovian systems and variations thereof) and simple queueing networks, investigate infinite server models and many server approximations, study GI/G/1 queues through random walk approximations, and read papers on applied queueing models.
Course offered spring; even-numbered years
Prerequisite: OIDD 930
Activity: Lecture
0.5 Course Units

OIDD 934 Dynamic Programming and Stochastic Models
The course goal is to provide a brief but fairly rigorous introduction to the formulation and solution of dynamic programs. Its focus is primarily methodological. We will cover discrete state space problems, over finite or infinite time horizon, with and without discounting. Structured policies and their theoretical foundation will be of particular interest. Computational methods and approximation methods will be addressed. Applications are presented throughout the course, such as inventory policies, production control, financial decisions, and scheduling.
Course usually offered in spring term
Prerequisite: OIDD 930
Activity: Lecture
0.5 Course Units

OIDD 937 Methods Stumblers: Pragmatic Solutions to Everyday Challenges in Behavioral Research
This PhD-level course is for students who have already completed at least a year of basic stats/methods training. It assumes students already received a solid theoretical foundation and seeks to pragmatically bridge the gap between standard textbook coverage of methodological and statistical issues and the complexities of everyday behavioral science research. This course focuses on issues that (i) behavioral researchers are likely to encounter as they conduct research, but (ii) may struggle to figure out independently by consulting a textbook or published article.
One-term course offered either term
Activity: Lecture
0.5 Course Units

OIDD 940 Operations Management
Concepts, models, and theories relevant to the management of the processes required to provide goods or services to consumers in both the public and private sectors. Includes production, inventory and distribution functions, scheduling of service or manufacturing activities, facility capacity planning and design, location analysis, product design and choice of technology. The methodological basis for the course includes management science, economic theory, organization theory, and management information system theory.
One-term course offered either term
Activity: Lecture
1.0 Course Unit
Notes: Crosslisted with ESE 620

OIDD 941 Distribution Systems Seminar
Seminar on distribution systems models and theory. Reviews current research in the development and solution of models of distribution systems. Emphasizes multi-echelon inventory control, logistics management, network design, and competitive models.
Course usually offered in spring term
Prerequisite: OIDD 940
Activity: Lecture
0.5 Course Units
OIDD 943 Retail Operations
Activity: Lecture
0.5 Course Units

OIDD 950 Perspectives on Information Systems
Provides doctoral students in Operations and Information Management and other related fields with a perspective on modern information system methodologies, technologies, and practices. State-of-the-art research on frameworks for analysis, design, and implementation of various types of information systems is presented. Students successfully completing the course should have the skills necessary to specify and implement an information system to support a decision process.
One-term course offered either term
Activity: Lecture
1.0 Course Unit

OIDD 951 Seminar on Logic Modeling
Seminar on the elements of formal logic necessary to read and contribute to the Logic modeling literature, as well as the implementation principles for logic models. The primary topics include elements of sentence and predicate logic, elements of modal logics, elements of semantics, mechanical theorem proving, logic and database, nonmonotonic reasoning, planning and the frame problem, logic programming, and metainterpreters. Permission of the instructor and some prior knowledge of logic or Prolog.
Course not offered every year
Activity: Seminar
1.0 Course Unit

OIDD 952 Computational Game Theory
Seminar on principles of knowledge-based systems including expert systems. Topics include basics of expert systems, knowledge representation, meta-level reasoning, causal reasoning, truth maintenance systems, model management, planning systems and other applications. Permission of instructor and knowledge of logic and Prolog or Lisp.
Course not offered every year
Activity: Seminar
1.0 Course Unit

OIDD 953 Explaining Explanation
In the social sciences we often use the word "explanation" as if (a) we know what we mean by it, and (b) we mean the same thing that other people do. In this course we will critically examine these assumptions and their consequences for scientific progress. In part 1 of the course we will examine how, in practice, researchers invoke at least three logically and conceptually distinct meanings of "explanation," identification of causal mechanisms; ability to predict (account for variance in) some outcome; and ability to make subjective sense of something. In part 2 we will examine how and when these different meanings are invoked across a variety of domains, focusing on social science, history, business, and machine learning, and will explore how conflation of these distinct concepts may have created confusion about the goals of science and how we evaluate its progress. Finally, in part 3 we will discuss some related topics such as null hypothesis testing and the replication crisis. We will also discuss specific practices that could help researchers clarify exactly what they mean when they claim to have "explained" something, and how adoption of such practices may help social science be more useful and relevant to society.
Taught by: Duncan Watts
Also Offered As: CIS 798, COMM 898
Activity: Lecture
1.0 Course Unit

OIDD 955 Research Seminar in Information Systems
This course provides an overview of some of the key Information Systems literature from the perspective of Information Strategy and Economics (ISE) and Information Decision Technologies (IDT). This course is intended to provide an introduction for first year OIDD doctoral students, as well as other Wharton doctoral students, to important core research topics and methods in ISE and IDT in order for students to do research in the field of Information Systems. While it is intended as a "first course" for OPIM doctoral students in ISE and IDT, it may also be useful for students who are engaged in research or plan to perform information technology related research in other disciplines.
Activity: Lecture
1.0 Course Unit

OIDD 960 Research Seminar in Information Technology - Economic Perspectives
Explores economic issues related to information technology, with emphasis on research on organizational or strategic settings. The course will follow a seminar format, with dynamically assigned readings and strong student contribution during class sessions (both as participant and, for one class, as moderator.)
Course usually offered in fall term
Activity: Lecture
1.0 Course Unit

OIDD 961 Research Seminar in Information: Strategy, Systems and Economics
This is the advanced doctoral-level research research in information strategy and economics that builds on the foundations developed in OPIM960. Much of the content will be focused on current research areas in information strategy such as the information and organizational economics, information technology and firm performance, search cost and pricing, information and incentives, coordination costs and the boundary of the firm, and the economics of information goods (including pricing and intellectual property protection). In addition, promising empirical approaches such as the use of intelligent agents for data collection or clickstream data analysis will be discussed.
Activity: Lecture
1.0 Course Unit

OIDD 965 Research Seminar in Information Systems
This course provides an overview of some of the key Information Systems literature from the perspective of Information Strategy and Economics (ISE) and Information Decision Technologies (IDT). This course is intended to provide an introduction for first year OIDD doctoral students, as well as other Wharton doctoral students, to important core research topics and methods in ISE and IDT in order for students to do research in the field of Information Systems. While it is intended as a "first course" for OPIM doctoral students in ISE and IDT, it may also be useful for students who are engaged in research or plan to perform information technology related research in other disciplines.
Activity: Lecture
1.0 Course Unit

OIDD 992 Conflict Mgmt Seminar
This seminar exposes students to the central issues in conflict management research. This course covers both analytic and behavioral perspectives of conflict management, and describes how the field has developed. Through discussions of theory and empirical research, the course aims to develop a foundation for understanding the extant literature and how common methodological tools have shaped the types of questions conflict management scholars have investigated - and neglected.
Course usually offered in spring term
Activity: Lecture
1.0 Course Unit