

PERATIONS AND INFORMATION MANAGEMENT (WH) {OPIM}

L/R 101. Introduction to the Computer as an Analysis Tool. (C) Staff. There are no recitations or Lab sections for this course.

Computers have become an essential tool in nearly all organizations; no management student's education is complete without acquiring knowledge about using computers to solve management problems. OPIM 101 provides a solid foundation in both computers and modeling for use in subsequent courses at Wharton as well as for the students professional career. The course is intended to build student skill and comfort using the computer to solve problems, teach management software tools for course work and professional life, and provide an understanding of the role of computers in modern organizations. Topics include budgeting, analytical modeling, sensitivity analysis, database management, inventory control analysis, decision analysis, optimization, neural networks, genetic algorithms, and simulation.

The new course format incorporates all previous recitation material into lectures. The recitation or lab section has been replaced with an open laboratory policy that allows students to complete labs at their convenience. The open computing lab is staffed by OPIM 101 consultants during the day. Three weekly one hour lectures provide conceptual and analytical material as well as demonstrate skills using a computer that helps students to learn to solve problems using Microsoft Excel. Students complete six realistic cases playing the role of solving a problem for a client. Cases require model solutions using Microsoft Excel and an executive slide presentation of results and management recommendations using Microsoft Excel or Powerpoint. No prior background in either computers or operations and information management is expected.

210. Management Information Systems. (C) Staff.

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.

221. (ESE 522) Operations Strategy and Process Management. (C) Staff. Cross listed with ESE 522.

This course examines how organizations can develop and leverage excellence in process management. The first module focuses on operations strategy. In these classes, we examine what constitutes an operations strategy and how organizations can create value by managing complexity, uncertainty, and product development. In the second half of the course, we discuss recent developments in both manufacturing and service industries. Specifically, we examine initiatives in quality, lean manufacturing and enterprise-wide planning systems. The course is recommended for those interested in consulting or operations careers, as well as students with an engineering background who wish to develop a better understanding of managing production processes.

223. Service Operations Management. (C) Staff.

This course covers a mix of simple quantitative and qualitative models that should help you to better understand both the underlying economics and the difficulty of managing various service operations. The course covers the following topics: the design of service delivery systems, service quality and customer retention, capacity management, and demand management. The course uses a mix of lectures and case discussions. Example industries include airlines, fast food, hospitality, hospitals, retailing, retail financial services, and travel agencies.

261. (BPUB261, BPUB761, BPUB961, ESE 567, OPIM761) Risk Analysis and Environmental Management. (C) Staff. Crosslisted with OPIM 761, BPUB 261, 761, 961, and ESE 567. See description under OPIM 761.

290. Decision Processes. Prerequisite(s): STAT 101 or equivalent strongly recommended.

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.

291. (LGST206, MGMT291) Negotiations. (C) Staff.

Negotiation is the art and the science of creating good agreements. This course develops managerial negotiation skills by mixing lectures and practice, using cases and exercises in which students negotiate with each other. The cases cover a wide range of problems and settings: one-shot deals between individuals, repeated negotiations, negotiations over several issues, negotiations among several parties (both within and between organizations), and cross-cultural issues.

Performance in the cases accounts for nearly half the course grade. Students must also describe their experience and thoughts in a journal, and write a term paper.

292. (LGST292) Adv Topics Negotiation.

311. Business Computer Languages. (C) Staff.

The purpose of this course is to introduce students to the management and technical issues associated with developing computer programs for business and to provide students with a marketable skill. Although you will be using C++, Visual Studio.NET, and Microsoft's .NET Framework to develop computer programs and Web applications, this course is not so much a C++/.NET course as it is a course in the management issues attendant to realizing the potential of object-oriented programming languages and the promise of code reuse.

314. (OPIM662) Enabling Technologies. (C) Staff.

This course is about understanding emerging technology enablers with a goal of stimulating thinking on new applications for commerce. No prerequisite or technical background is assumed. The class is self-contained (mainly lecture-based) and will culminate in a class-driven identification of novel businesses that exploit these enablers.

The course will take a layered approach (from network infrastructure) to data infrastructure to applications infrastructure, or direct enablers of commerce) to first, understanding and then, thinking about technology enablers. Network infrastructure layers include fundamentals of wired and wireless infrastructure technologies such as protocols for networking, broadband technologies - for last (DSL, Cable etc) and other miles (advances in optical networking) and digital cellular communications. Data infrastructure layers include usage tracking technologies, search technologies and data mining. Direct application layers include personalization technologies (CRM), design technologies for content and exchanges, software renting enablers, application service provision, agents and security mechanisms. Finally some emerging technology enablers (such as bluetooth, biometrics and virtual reality) are identified and discussed.

315. Data Base Management Systems. (C) Staff.

Organizations continue to increase their reliance on computerized database management and information retrieval systems. Whether purchasing airplane tickets, managing retail merchandise, processing financial trades or simply sending email, data management defines the modern firm. This course aims to provide students with both a practical and theoretical introduction to the design, implementation, and use of such systems. Students are introduced to the fundamental concepts and principals of data management and gain practical experience by designing and deploying a working system. Throughout the course, case studies are used to illustrate theoretical concepts while acquainting students with innovative commercial uses of these systems.

316. (OPIM661) Systems Analysis, Design, and Implementation. (C) Staff.

At its surface this course introduces students to the management and technical issues associated with planning and designing large-scale computer systems. It does so in part as an elaboration of Fred Brooks's observation that "The technology, the surrounding organization, and the traditions of the craft conspire to define certain items of paperwork." But if that were our only goal, we would soon find ourselves mired in (and probably arguing about) the minutiae of how such paper items ought to be constructed - not a very helpful pedagogical exercise. So then, at a deeper level we seek to understand why the conspiracy endures, and why in spite of it, systems still take too long and cost too much to build as a systems project's team members struggle to understand one another across disparate discourse communities and world views, differences in experience and training, and over long periods of time. More than anything else, within the context of working with the main tools and techniques of systems analysis and design, this course treats communication, corroboration, and thinking within the boundaries of a technology-oriented project as its primary subjects.

SM 319. Advanced Decision Systems: Evolutionary Computation. (C) Staff.

Evolutionary computation is an exciting new technology that applies principles of evolution - such as natural selection, genetic recombination and mutation - to discover solutions to problems, adapt to the environment, and even make it possible for computers to program themselves. This seminar explores genetic algorithms, genetic programming, and classifier systems. It focuses on practical applications of this technology, including: discovering profitable investment strategies, formulating strategies for multilateral negotiations, managing a transcontinental pipeline, modeling decision processes of consumers, and multiobjective planning and scheduling of production. Students apply this technology to sample problems and work in groups on larger term projects of their own choice. Common Lisp is used for all projects, and is learned during the semester. To help students learn Lisp, we will discuss readings from the Lisp textbook and work through generic code written in Lisp for evolutionary computation.

321. Introduction to Management Science. (C) Staff.

Decision making is becoming increasingly quantitative; hence the use and abuse of quantitative techniques is an important concern of management. Emphasis in this course is placed on understanding the formulation, analysis, and implementation of management science tools for a broad range of managerial decision problems. Topics covered include mathematical programming, decision making under uncertainty, and simulation. This course is concerned with methodological issues relating to the design and control of operations.

325. Computer Simulation Models. (C) Staff. Prerequisite(s): OPIM 101 or equivalent.

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.

397. (OPIM697) Retail Supply Chain Management. See description under OPIM 697.

398. (OPIM698) Retail Supply Chains.

The course will examine how retailers understand their customers' preferences and respond with appropriate products through effective supply chain management. The course class sections will deal with the following major items: (1) linking finance and operations in retailing, (2) what assortment of products should a retailer carry in each store, (3) optimizing the inventory carried of each SKU in each store, (4) markdown pricing, (5) store execution and (6) supply chain design. In addition, we will consider a broad range of issues facing two retailers, Mothers Work, and Best Buy, when we are visited by current and past senior executives from these firms.

The course is highly recommended for students interested in careers in: (1) Retailing and retail supply chains, (2) Businesses like banking, consulting and information technology that provide services to retail firms, (3) Manufacturing companies that sell their products through retail firms. Even if you don't expect to work for a retailer, this course can be useful to you in two ways. First, because retailers are such dominant players in many supply chains today, it is important that the processes they follow be understood by manufacturers and distributors, or by the consultants and bankers that service retailers and their suppliers. Second, the problems retailers face (e.g., making data accessible, interpreting large amounts of data, reducing lead-times, eliciting the best efforts from employees, and so forth), are shared by firms in many other industries. It's easier to understand these issues through case studies in retailing because we all experience the industry as consumers and can readily relate to chronic problems such as stock outs and markdowns.

The course will be highly interactive, using case discussions in more than half of the classes and including senior retail executives in a number of the class sessions.

399. Supervised Study. (C) 1 c.u. By appointment.

Decision science majors read and report on a bibliography of works in their field of specialization provided by a faculty member.

415. (IPD 515, MEAM415, MEAM515) 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. The course is open to juniors and seniors in SEAS or Wharton.

469. Information Strategy and Economics. (C)

The course is devoted to the study of the strategic use of information and the related role of information technology. The topics of the course vary year to year, but generally include current issues in selling digital products, intermediation, and disintermediation, designing and competing in electronic markets, outsourcing, and technology project management. Heavy emphasis is placed on utilizing information economics to analyze new and existing businesses in information-intensive industries. Technology skills are not required, although a background in information technology management (equivalent to OPIM210), strategic management or managerial economics is helpful.

621. Decision Models and Uncertainty. (A)

631. Operations Management: Quality and Productivity. (B)

632. Operations Management: Supply Chain Management. (B)

651. Innovation, Problem Solving and Design. (M) Prerequisite(s): OPIM 621, 631.

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.

653. Mathematical Modeling and its Application in Finance. (C) Staff.

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 volatility of fixed-income markets since interest rate deregulation, the increased globalization of the financial markets, the proliferation of information technology, and so on. 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 swaps are discussed. 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 a strong interest in finance. Prospective students of this course should be comfortable with quantitative methods, such as basic statistics and the methodologies (mathematical programming and simulation) taught in OPIM 621 Management Science.

654. Product Design and Development. (B) Staff.

The course provides the student with a number of tools and concepts necessary for creating and managing product development processes. The course consists of two interwoven parts. First, it presents the basic steps that are necessary for moving from a "cool idea" to a product sufficiently mature to launch an entrepreneurial start-up. This includes cases, lectures, and exercises on topics like identifying customer needs, developing a product concept as well as effective prototyping strategies. The capstone of this first part is a real project in which student teams conceptualize and develop a new product or service up to the completion of a fully functional prototype.

Second, the course discusses a number of challenges related to product development as encountered by management consultants, members of cross-functional development teams as well as general managers. We will analyze several cases related to, among others, resource allocation in R&D organizations, organizational forms of product development teams, as well as managing development projects across large geographic distances.

655. (MKTG655) Operations, Marketing, and Design Integration. (B) Staff. Prerequisite(s): MKTG 621, MKTG 622, OPIM 631, OPIM 632. Crosslisted with MKTG 655.

This course covers topics that span marketing and operations management. Students will examine issues and decisions that require significant coordination between managers in marketing and operations. Topics include channel management, supply chain design, product variety management and service operations pricing and control.

656. (ESE 522) Operations Strategy. (C) Staff. Prerequisite(s): OPIM 621, OPIM 631, and OPIM 632 or equivalent. Crosslisted with ESE 522.

This course examines how organizations can develop and leverage excellence in process management. The first module focuses on operations strategy. In these classes, we examine what constitutes an operation strategy and how organizations can create value by managing complexity, uncertainty, and product development. In the second half of the course, we discuss recent developments in both manufacturing and service industries. Specifically, we examine initiatives in quality, lean manufacturing and enterprise-wide planning systems. The course is recommended for those interested in consulting or operations careers, as well as students with an engineering background who wish to develop a better understanding of managing production processes.

658. Service Operations Management. (C) Staff. Prerequisite(s): Courses in operations management, linear programming, probability and statistics.

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.

659. Advanced Topics in Quantitative Methods and Operations Management. (C) Staff. Prerequisite(s): OPIM 631 and OPIM 632.

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.

660. (ESE 508) Information Systems for Managers. (B) Staff. Crosslisted with ESE 508.

The advances achieved in information technologies and systems (IT&S) -- primarily computing and communications systems -- have been, and will continue to be extraordinary. Consequently, the scope and practical import of IT&S can hardly be overestimated. "Management Information Systems (MIS) is the practice of using computer and communication systems to solve problems in organizations. This course is designed to provide the essential skills and technology-based insights needed in order to manage effective problem solving with information technologies and systems (IT&S), and to extract the most value from an actual or potential information system."

The course is organized around several "hands on" cases or projects, through which students teams become familiar with important information technologies, including databases and the Internet.

Students completing this course will have mastered a basic understanding of information technology, the fundamentals of the use of information technology in business, and essential information technology survival skills.

661. (OPIM316) Systems Analysis, Design, and Implementation. (C) Staff. Description under OPIM 316.

662. (OPIM314) Enabling Technologies. (A)

Technology is a vital input to the process of wealth creation in a networked economy. This course is about understanding emerging technology enablers with the goal of stimulating thought on new applications for commerce. The class is a comprehensive overview of various emerging technologies and culminates in a class-driven identification of new and 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.

664. Database and Information Management Systems. (C) Staff.

Data and information are critical to the modern organization. Whether used in knowledge management, business intelligence, enterprise resource planning (ERP), product design, marketing, personalization and other aspects of managing customer relationships (CRM), the underlying principles of data management are the same. This course aims to provide a practical introduction to the fundamental principles. Examples and exercises will cover the relational database tools at the core of ERP, CRM, and on-line exchanges and portals. However, the course will also use the same basic foundations to consider emerging technologies and standards such as XML, ebXML, UDDI, etc.

665. Operations Management in Health Care. Faculty.

In an era where health care systems around the world face rapidly rising costs and quality issues, organizations large and small are looking into the operational side of health care for solutions. Likewise, the abundance of unfulfilled needs in the health care marketplace has led to an array of technology ventures with innovative new products and services. In this course, we apply the tools of operations management to analyze the health care value chain. The course consists of four modules: (1) the management of productivity, quality, and variability by care providers, (2) capacity and investment decisions under uncertainty confronting pharmaceuticals, (3) the design of health insurance by health plans and the determination of health benefits by employers, and (4) business ideas and operations models from

the intersection of academic research and technology ventures. Students will learn from case discussions, hands-on decision tools, and several distinguished speakers and alumni from Stanford Hospital & Clinics, Merck, U.S. Naval Academy, and Deloitte Consulting. No prior exposure to the health care industry is assumed. The course prepares students for several career paths including consulting, operations management, and health care administration and is open to both first- and second-year MBA students.

666. Information: Industry Structure and Competitive Strategy. (C) Staff.

This course is in the tradition of Operations courses as exercises in the systematic understanding of complex systems, rather than in the tools and techniques for understanding aspects of those systems. It draws upon the most recent experience in the impact of information technology upon diverse industries, ranging from securities trading to consumer packaged goods retailing. It integrates that experience with relevant theory to develop an approach to information-based strategies generally, including resurgent interest in strategies for Commerce. It is not a tools and techniques course; likewise it is not a technology or an implementation course. It provides a focused and modern complement to strategic planning.

The increase in consumer informedness is changing consumer behavior in a wide range of situations. Customers find the least expensive alternative in categories of little importance to them, while finding the perfect match with their wants and needs, cravings and longings, in categories they find salient. Online trust is a strong determinant of shopping behavior and will continue to be. Likewise, the increase in information available to firms, and the increasing variety of strategies available for the use of information - from dynamic repricing to online distribution, from labor productivity enhancements to labor arbitrage and outsourcing - requires a dramatic revision of managerial mental models of their competitive options. Revising mental models and enhancing mental agility are both essential to executive leadership, rather than mere conservation and management, in today's environment of rapid and discontinuous change in the competitive environment.

The ability to target profitable market segments and to identify individual customers is reducing the value of scale-based operations and the strategic advantage of large firms with existing market share. The ability to monitor the performance of units abroad is leading to greater reliance upon outsourcing, benefiting many service industries and once again reducing the advantage of many large firms. At the same time, the impact of information technology on the transparency and efficiency of securities markets is destroying the profits of entire segments of financial services. All aspects of the firm-production, service, sales, marketing, and strategy - will be affected. Clearly, some firms will win and others will lose; nearly all will have to change. And yet, fundamental laws of economics have not been repealed. How can previous economic theory, and previous experience with rapid technological change, provide insights for the development of strategy in an increasingly digital age?

667. Business Transformation. (C) Staff. Prerequisite(s): OPIM 666 or permission of instructor is required.

This course is a direct sequel to OPIM 666 and it addresses strategic problem solving in the context of business transformation engagements. The course is intended to prepare students for leadership roles in dynamic and rapidly evolving industries, and for careers in strategic consulting. I view this as the most exciting and rewarding aspect of strategic planning and strategic consulting. In order to perform strategic transformation, either as a member of the firm's executive team or as an external strategy consultant, it is necessary to address the following questions: (1) Understanding the future: What has changed and what will change in the business environment of the firm? Why is it going to be necessary to engage in strategic change? What information will be required to function effectively? (2) Future capability assessment: What will the firm need to do in order to compete in this new environment? What specific actions will be required? What information will be required to function effectively? (3) Current activities audit: What does the firm do now? What changes will be necessary? What information is currently available? (4) Leadership challenges: Who will be adversely affected by those changes? Who will resist making them? Who will be unable to implement them for other reasons? How can you facilitate difficult change?

(5) Information infrastructure: How will information endowment determine competitive positioning? What information systems will be required for the firm and its partners? What information capability will be possessed by customers and competitors? (6) Getting started: Determine your value proposition and your pricing.

Thus, while this is a course in Information Strategy and Economics, and while information endowment is central to our strategic analyses, information systems and technology together represent only one of the issues that must be addressed in order to complete strategic business transformation.

668. Telecommunications Technology and Competitive Strategy. (B) Staff.

Telecommunications technology is changing rapidly, with profound implications for quality of everyday life and the competitive position of firms in all industries. Regulators, sociologists, executives and even those responsible for planning for firms in the telecommunications industry as yet poorly understand these changes.

This course presents a broad summary of telecommunications including the basics of analog and digital media, long-haul and local data communications technology, and the emerging structure of telephony. It addresses the implications for competitive strategy, both within and outside the telecommunications industry.

This course is recommended for students in strategic management, especially those with an interest in high technology firms, and for students with an interest in the communications industry. No background in technology is

required, though an understanding of technology-driven competitive strategy is helpful. Students completing this course will have acquired a basic understanding of the competitive implications of modern telecommunications technology and the implications of this technology for the future structure of commerce.

669. Advanced Topics in Information Strategy. (B) Staff.

The capstone course for the MBA major "Information Strategy, Systems, & Economics," OPIM 669 covers essential topics in information strategy - such as pricing of information goods; competing in electronic markets; market transparency and search issues; information-intensive strategies; IT outsourcing; and software project management - that have high impact on 21st-century business but are not typically covered in other Wharton courses.

670. Special topics in Information Systems: Simulation and Dynamic Competitive Strategy. (M)

This course introduces tools and techniques for modeling dynamic competitive strategies - strategies that evolve over time as you and competitors take actions in response to each other and to changes in the competitive environment. This goes beyond case discussions and approximates the rigor of theoretical or game theoretical analyses, even for problems for which no traditional analytical solutions exist. Students of the course will learn to model business environments and design simulators with the goal of gaining insight and designing policies for strategy implementation. Students will develop understanding of the timing and sequencing of the actions required, as well as understanding how to modify strategies on the fly based on changing conditions or objectives. Students are introduced to state of the art software for general purpose business modeling and simulation.

672. (OPIM410) Decision Support Systems. (C) Staff. Crosslisted with OPIM410.

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.

673. GLOBAL SUPPLY CHAIN MGMT.

676. Electronic Markets: Structures, Market Mechanisms and IT Enabled Strategies. Prerequisite(s): MGEC 621 is recommended.

This course deals with Electronic Markets and Market structures and the strategic uses of information within the firm. The course consists of four related modules on the design and functioning of Business to Business markets, use of technology to source services from global providers - i.e., outsourcing of business processes (as opposed to IT), the use of strategic technological platforms such as CRM and Web Services and the technology-enabled precision pricing techniques. Further, students are exposed to strategy formulation and execution in an online market where they compete both against each other and against (electronic) agents. This course is recommended for students interested in a career in consulting, strategic management and to students interested in information technology related professions. The course will be delivered through a mix of lectures, case discussions and hands-on trading in virtual markets using different market mechanisms. The course Web cafe will be used for discussions and responses from instructor and TA. We do not assume or require any specific technical knowledge.

Workings of electronic markets and market mechanisms and how IT can enable the formulation of new strategies and empower firms to define new markets in ways that were not possible until recently. This is an advanced elective that covers several essential topics in information strategy - IT and market structure, impact of IT on knowledge-intensive products and services and creating hybrid markets that span multiple channels. Students will compete in simulated electronic markets, using different market mechanisms and formulate information-based strategies. Students will also study how IT has enabled the globalization of services through the outsourcing of processes (BPO) and how quasi market structures which combine elements of organization and markets are emerging in knowledge-intensive service industries.

690. (MGMT690) Managerial Decision Making. (C) Staff. Crosslisted with MGMT 690.

Making decisions, from the trivial to the fundamental, is part of everyday life of every manager and investor. For the last 30 years psychologists - and more recently also economists - have studied how people process information and make decisions. This research program has provided an insightful understanding how people's decisions deviate from "optimal" ones, and the consequences of such biases in financial and personal terms. This course is devoted to understanding the nature, causes, and managerial implications of these limitations.

The material from this course provides useful insights that will likely improve the student's decision making skills in many different domains.

691. (LGST806, MGMT691) Negotiations. (C) Staff. Prerequisite(s): STAT 601, OPIM 621. Crosslisted with LGST 806, MGMT 691.

Negotiation is the art and science of creating good agreements. This course develops managerial negotiation skills by mixing lectures and practice, using cases and exercises in which students negotiate with each other. The cases cover a wide range of problems and settings: one-shot deals between individuals, repeated negotiations, negotiations over several issues, negotiations among several parties (both within and between organizations), and cross-cultural issues. Performance in the negotiation's cases accounts for a significant portion of the course grade. OPIM 691 sections differ from LGST 806 and MGMT 691 sections in that OPIM 691 covers theoretical aspects of negotiation (including psychological theories of judgmental mistakes negotiators make) in a bit more depth, and covers fewer legal and dispute resolution issues. Students can take only one of the three courses.

697. (OPIM397) Retail Supply Chain Management. (C)

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.

698. (OPIM398) Value Networks. (M) Staff.

This is a project-based course run in a seminar format to explore current trends and opportunities for integration and coordination in IT-enabled value-chain networks. The curriculum is structured around a live case; students will work in teams to synthesize data from the live case and evaluate possible operational strategies and IT enablers in the context of a real, on-going business restructuring decision. Students will review a set of operations strategies affecting production, fulfillment, procurement product design, and support that may prove relevant e.g. Postponement, Mass Customization, Customer Service Differentiation, Buyer/Supplier Coordination. We also consider functionality that underlies relevant information technologies like Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM), e.g. data integration, information quality, and security. Finally, we invite different vendors into the class to provide students with the opportunity to compare and contrast state-of-the-art IT and Operations Management solutions.

761. (BPUB261, BPUB761, BPUB961, ESE 567, OPIM261) Risk Analysis and Environmental Management. (C) Staff. Cross listed with OPIM 261, BPUB 261, 761, 961, and ESE 567.

This course introduces students to the complexities of making decisions about threats to human health and the environment when people's perceptions of risks and their decision making processes differ from expert views. Recognizing the limitations of individuals in processing information the course explores the role of techniques such as decision analysis, cost-benefit analysis, risk assessment and risk perception in structuring risk-management decisions. We will also examine policy tools such as risk communication, incentive systems, third party inspection, insurance and regulation in different problem contexts. A course project will enable students to apply the concepts discussed in the course to a concrete problem.

762. Environmental Sustainability and Value Creation. (C) Staff. MBA mini elective. This course is one of the set of mini-elective courses satisfying the core requirement.

This course approaches environmental issues from the standpoint of business. It emphasizes the trends in corporate practices and uses case studies to examine the interactions between the environment and the firm. 'Sustainable Development' and the role of regulatory agencies and NGOs are also highlighted. This course has four objectives: to increase environmental literacy; to ask questions about environmental issues as managers carry out their traditional business functions; to recognize environmental concerns as competitive opportunities; to teach students to think strategically and act entrepreneurially on environmental issues.

898. Advanced Topics. (M)

900. (PSYC608) Foundations of Decision Processes. (C) Staff. Prerequisite(s): STAT 510 or 550.

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.

SM 904. Experimental Economics. (M) Staff. Prerequisite(s): OPIM900 or permission of the instructor.

Many theories in economics can be tested usefully in experiments in which researchers control parameters that are uncontrolled in natural settings. This course presents the theory of the experimental method and validity along with several examples of experimental testing: simple competitive equilibrium, intertemporal competitive equilibrium, asset markets, futures markets, bargaining models, tournaments, reputation-building in repeated games, etc.

SM 906. Proseminar in Operations and Information Management. (M) Staff.

910. (ESE 504) Concepts of Math Programming. (A) Staff. Crosslisted w/ ESE 504.

Introduction to mathematical programming for PhD students who would like to be intelligent and sophisticated consumers of mathematical programming theory but do not plan to specialize in this area. Integer and nonlinear programming are covered, including the fundamentals of each area together with a sense of the state-of-the-art and expected directions of future progress.

913. Advanced Linear Programming. (M) Prerequisite(s): OPIM 910 or equivalent.

In-depth study of the theory and algorithms related to the solution of linear programming problems. Optimality conditions, duality and sensitivity analysis. Primal and dual simplex methods. Interior point methods. Large-scale optimization. Dantzig-Wolfe decomposition.

914. Advanced Non-Linear Programming. (M) Staff. Prerequisite(s): OPIM910 or equivalent.

Convex sets and functions. Tangent cones. Polar cones. Optimality conditions and duality theory. Methods for unconstrained and constrained optimization. Interior and exterior penalty methods. Lagrangean and augmented Lagrangean methods.

915. Advanced Graph Theory. (M) Staff.

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.

916. Advanced Integer Programming. (M) Staff. Prerequisite(s): OPIM 910 or equivalent.

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.

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.

930. Stochastic Models. (C) Staff. Prerequisite(s): STAT510 or 550 or equivalent.

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.

931. (STAT901) Stochastic Processes II. (M) Staff. Prerequisite(s): OPIM930. Crosslisted with STAT 901.

Extension of the material presented in OPIM930 to include Markov decision processes, queueing theory, stochastic modeling and optimization.

932. Queuing Theory. (M) Staff. Prerequisite(s): OPIM 930 or equivalent.

Discrete-state stochastic processes: Markov chains, Markov processes, birth-death processes; M/M/I queue and variants; M/G/I queue and G/M/n queues; priority queues: preemptive and non-preemptive; Networks of queues; jackson networks, BMCP networks, Kelly networks; Little's formula; Dynamic optimization of queues.

934. Dynamic Programming and Stochastic Models. (M) Staff.

Reviews the theoretical foundations of dynamic programming, stochastic control, and Markov decision processes. Applications in the area of production and inventory, finance, and marketing will be explored. Course requirements include homework, exercises and a research paper.

940. Operations Management. (C) Staff. Crosslisted with ESE 620.

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.

941. Distribution Systems Seminar. (B) Staff. Prerequisite(s): OPIM940.

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.

943. Retail Operations.

950. Perspectives on Information Systems. (C) Staff.

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.

SM 951. Seminar on Logic Modeling. (M) Staff. Prerequisite(s): Permission of the instructor and some prior knowledge of logic or Prolog.

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.

SM 952. Computational Game Theory. (M) Staff. Prerequisite(s): Permission of instructor and knowledge of logic and Prolog or Lisp.

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.

960. Research Seminar in Information Technology - Economic Perspectives. (A)

Explores economic issues related to information technology, with emphasis on research in 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.)

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.