

# INSTITUTE FOR INTEGRATION OF MANAGEMENT AND ENGINEERING (IIME)

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## **IIME 400. Leadership Assessment and Development (LEAD). 3 Units.**

The goal of the course is to help students learn methods for assessing their knowledge, abilities, and values relevant to engineering and management, and for the acquiring of new professional knowledge and skills throughout their career. Recommended preparation: Senior status in engineering.

## **IIME 405. Project Management. 3 Units.**

Project Management is concerned with the management and control of a group of interrelated tasks required to be completed in an efficient and timely manner for the successful accomplishment of the objectives of the project. Since each project is usually unique in terms of task structure, risk characteristics and objectives, the management of projects is significantly different from the management of repetitive processes designed to produce a series of similar products or outputs. Large-scale projects are characterized by a significant commitment of organizational and economic resources coupled with a high degree of uncertainty. Thus, the objective of the course is to understand what are the main issues and problems in the management of projects and to have a thorough knowledge of the conceptual models and techniques available to deal with them. Recommended preparation: Senior status in engineering.

## **IIME 410. Accounting, Finance, and Engineering Economics. 3 Units.**

This class uses a combination of class lecture and discussion, in combination with problem-type and case-type assignments, to introduce you to key concepts and tools of financial economics. You are expected to use the resources at your disposal, such as the textbook or the accounting dictionary, to help you understand any unfamiliar concepts. Normally, each class will be divided into two sections. The first part of each class session will be devoted to discussions of selected problems and cases, with focus on the specific topics being covered. The second part of each class will be devoted to prepare you for the following session class assignments. Recommended preparation: Senior status in engineering.

## **IIME 411. New Venture Finance. 3 Units.**

This course explores the financing and financial management of entrepreneurial new ventures. The course will focus on issues of financial management of new ventures (forecasting cash flows, cash flow management, valuation, capital structure) and the various financial methods and mechanisms available to entrepreneurs (bootstrapping, angel investors, venture capitalists, IPOs). This course is highly complementary to the existing IIME 410 Finance course which only briefly covers venture finance.

## **IIME 413. Strategic Intelligence for Technology Commercialization. 3 Units.**

The accelerating rate at which major corporations are failing evidences the fact that longstanding assumptions regarding successful strategic planning are being challenged by the increasing rate of disruptive technological innovation. This course unpacks a toolbox of strategic planning methodologies to help students understand how to identify the core requirements of a durable business strategy from which investment (BAFI 460) and corporate risk management (MSFC 432) strategies would follow. The course focuses on the particular challenges faced by established corporations as opposed to entrepreneurial startups. It uses workshops to provide hands on experience in applying the tools to real world problems corporations are facing today.

## **IIME 415. Materials and Manufacturing Processes. 3 Units.**

A survey course on contemporary and modern materials and their processing, the course begins with a review of traditional materials, including metals, ceramics, plastics, and composites. The evolution of the materials will be traced from their beginnings as raw resources and precursors to finished products. Topics will emphasize modern manufacturing methods and materials. Traditional and modern tools for materials and process characterization will be an important part of the course. Special attention will be directed to examples of statistical methodology and information technology. Visits to local industries and presentations by participating companies will reinforce the information presented in the classroom. Recommended preparation: Senior status in engineering.

## **IIME 419. Entrepreneurship and The Good Life. 3 Units.**

Entrepreneurship and business ownership is how most wealth is created. Pursuing the "Good Life", when done effectively, leads to wealth and fulfillment. Wealth, like happiness & fulfillment, is not to be pursued directly, it ensues as a result of living a life of positive impact for others. We will explore two primary entrepreneurial strategies used to create value for others, Entrepreneurship Through Acquisition and Real Estate as attractive alternatives to Startups (traditionally equated with "entrepreneurship"). We will explore these topics with real entrepreneur guests who will share their experience and strategies with the class. This course employs an active learning approach, based on the belief that the best way to learn is through a progression of real world insights rather than a list of policies and practices delivered via long lectures. Offered as DESN 419 and IIME 419. Prereq: Enrolled in the Master of Engineering and Management program.

## **IIME 420. Information, Design and Systems. 3 Units.**

Everything about a business is designed, including the ways in which the organization uses information and the systems it uses to create and deliver its products and services, its supply chains, its ways of accounting for its use of resources, how it relates to its employees, industry and customers, and more. Understanding general principles that guide the design and use of systems, using systems effectively, and redesigning them to address changing circumstances are the foci of this course. This course will use readings, discussion, projects and occasional lectures to explore principles, methods, attitudes and tools that can be helpful to managers.

**IIME 424. Chief Executive Officer. 3 Units.**

This course will take the perspective of the CEO in deciding the actions that lead to sustainable competitive advantage. We will study decisions that span from starting a small business to expanding beyond the core using mergers and acquisitions. We will also study how CEOs decide to exit a market. The successful CEO not only has to design the strategy for success but has to also design an execution plan. As the organization grows the importance of delegation to the right subordinates becomes increasingly critical. The course material includes case studies, decision briefs and presentations (virtual and in person) by senior executives. Decision briefs are short notes that have the same information that the CEOs had when starting the business. You will develop the strategy based on these decision briefs and will compare your suggestions to what was actually done by both successful and unsuccessful CEOs. Offered as DESN 425 and IIME 424. Prereq: Enrolled in the Master of Engineering and Management program.

**IIME 425. Understanding People and Change in Organizations. 3 Units.**

This course is intended to help students assess events occurring in organizations from a behavioral and human resources perspective and to help them develop strategies for managing these events. The course applies knowledge from the fields of organizational behavior and human resource management to provide an understanding and the skills needed to be effective in organizations. The fields of Organizational Behavior and Human Resource Management are devoted to the study of how human beings act in organized settings and how organizations can affect human behavior through a variety of policies, practices, structures, and strategies. In today's environment, organizations are faced with high levels of international competition and an increasing pace of technological, market, and social changes. As an organizational member, you are expected to successfully operate within these increasingly complex demands as well as help create and guide change. The purpose of this course is to provide you with the framework and tools needed to analyze and operate in the changing organization. We will examine some of the features that characterize an emerging organizational form and contrast this to its traditional predecessor. The focus of the course will be on the skills you will need to operate in the "new" organization including skills for being a change agent working in entry level and early career managerial roles. Recommended preparation: Accredited Bachelor's in Engineering plus summer job experience. Prereq: Enrolled in the Master of Engineering and Management program.

**IIME 430. Product and Process Design, Development, and Delivery. 3 Units.**

An integrated approach to the teaching of the complex relationship of customer to designer and to manufacturer, this course will be taught by faculty from WSOM and CSE, with participation of corporate representatives sponsoring projects for the teams. The course will be built on a series of projects, each emphasizing different aspects of the product/process design experience, selected to provide exposure to a wide variety of entrepreneurial activities. The project activities are expected to promote the development of realistic activities of cross-functional teams. Prereq: Master of Engineering and Management students only.

**IIME 430A. Product Design and Development I. 3 Units.**

An integrated approach to the teaching of the complex relationship of customer to designer and to manufacturer, this course will be team taught by faculty from WSOM and CSE, with participation of corporate representatives sponsoring projects for the teams. The course will be built on a series of projects, each emphasizing different aspects of the product/process design experience, selected to provide exposure to a wide variety of entrepreneurial activities. The project activities are expected to promote the development of realistic activities of cross-functional teams. Recommended preparation: Accredited Bachelor's in Engineering plus summer job experience. Prereq: Enrolled in the Master of Engineering and Management program.

**IIME 432. Operations Research and Supply Chain Management. 3 Units.**

This course is an introduction to Operations Research, and then focusing on applying Operations Research tools to manage business and organizations' Supply Chain Operations. Operations Research (also called Management Science) is the discipline of applying advanced mathematical methods to help make better decisions. By using techniques such as mathematical modeling to analyze complex situations, Operations Research gives executives the power to make more effective decisions and build more productive systems based on considerations of all available options, careful predictions of outcomes and estimates of risk, and the latest decision tools and techniques. Operations Research solves problems that arise in every business function (e.g., operations, finance, marketing, accounting, HR), every economy sector (e.g., financial, healthcare, industrial goods, technology, utilities), and every business type (e.g., for-profit and non-profit, start-ups and Fortune 500 companies), even government.

**IIME 435. Enterprise Resource Planning in the Supply Chain. 3 Units.**

Enterprise resource planning is the dominant system by which companies translate the needs from their customers into the detailed plans that the company must perform to meet the customer needs, and the resulting support the company will need from its suppliers. As such, it is a central player in the process of supply chain management. In this course, we study both the quantitative and qualitative concepts and techniques to help manage a company's operations to perform these important translation and planning tasks in order to help the company be successful. The quantitative analysis will be supported by microcomputer software available in the Weatherhead computer lab. Student teams complete a series of integrated case studies from the same company to vividly see the relationships between various planning and control activities. A major emphasis during the course is the design of processes and procedures (algorithms) for solving very complex (wicked) problems as a part of both class discussions and while working on case studies, as well as critiquing the designs so as to clearly understand their limitations.

**IIME 440. Six Sigma and Quality Management. 3 Units.**

The Six Sigma process is the standard for quality improvement in organizations around the globe. In this course, we study the details of the five steps in the Six Sigma process: DEFINE, MEASURE, ANALYZE, IMPROVE, and CONTROL (DMAIC). We introduce the concept of sustainability into the criteria to use to evaluate proposed solutions during the Six Sigma process. Many tools, concepts, and processes that are often an integral part of Six Sigma projects in companies are included in the course content. They range from the very basic tools of quality (such as cause-and-effect diagrams for brainstorming) to complete processes (such as benchmarking, quality function deployment, failure mode and effects analysis-FMEA). Statistical concepts that are central to Six Sigma including statistical process control and introduction design of experiments are also included. Once the Six Sigma process and its various components are understood, we study quality management including quality control, quality planning, quality improvement, strategic quality management, and quality strategy. Students meeting the required standards of performance will earn a Green Belt Certification in Six Sigma and Quality Management from the Weatherhead School of Management. Prereq: Enrolled in the Master of Engineering and Management program.

**IIME 446. Models of Health Care Systems. 1.5 Unit.**

This course is for professionals who will pursue their careers in, or associated with, the health care industry; and therefore, need to understand the structure, operations and decision influences in the health care delivery system. The course is intended to develop competence and confidence in the participant's ability to understand and operate in the industry. the largest and, perhaps, the most complex in the United States. It is applicable to the private and public, profit and not-for-profit sectors. In this course students are introduced to: the different systems of care delivery; their organization and operations; their markets and the nature of the demand for their services; and the dynamics of their interoperation among themselves and with other entities in the industry (e.g., payors/insurers, regulators and accreditors, technology and pharmaceuticals suppliers). Offered as HSMC 446 and IIME 446.

**IIME 447. Regulatory Affairs for the Biosciences. 1.5 Unit.**

This mini-course introduces students to the Food and Drug Administration (FDA) and the laws and regulations it enforces. A scientific regulatory agency with far reaching enforcement authority, FDA is the most powerful consumer protection agency in the world. This course will familiarize students with FDA's mission, philosophy and organizational structure, as well as policy and procedure it uses to ensure the safety and effectiveness of the food, drugs, biologics, cosmetics, medical devices and radiation-emitting products it regulates. Recommended preparation: Enrollment in the MEM Biomedical Entrepreneurship Track. Offered as BIOS 447, HSMC 447, and IIME 447.

**IIME 450. Engineering Entrepreneurship. 3 Units.**

Entrepreneurship is an area of importance to business leaders, educators, politicians, and individual members of the society. It is a driver of economic development and wealth creation in organizational units ranging in size from the individual company to entire nations. Technology-based entrepreneurship is particularly important to economic development due to its impact on productivity (innovations in action) and its potential for exponential growth. This course will emphasize and explore a variety of issues related to innovation and entrepreneurship, demonstrating that there are not many "absolute truths," but there are numerous best practices. Successful students will conclude this course with new knowledge about opportunity analysis and insight on entrepreneurship & innovation, as well as having demonstrated measurable improvement in their critical thinking skills. This course is one-semester version of a course taught alternatively as a two-semester course. Recent growth in CWRU curricula centered on entrepreneurship and related subjects enables students to specialize in, say, wealth creation, leadership, and finance topics once included under the broader two-semester umbrella. The current Fall version of the course culminates with student projects and presentations on opportunity analysis.

**IIME 470. Independent Projects. 3 Units.**

This course is designed for students wishing to expand experiential learning opportunities at the interface of engineering and management. Preferred focus areas in entrepreneurship and opportunity assessment, product design and development, and manufacturing planning and management. Project ideas along with milestone, deliverables, and potential corporate clients need to be arranged in advance.

**IIME 472. BioDesign. 3 Units.**

Medical device innovations that would have been considered science fiction a decade ago are already producing new standards of patient care. Innovation leading to lower cost of care, minimally invasive procedures and shorter recovery times is equally important to healthcare business leaders, educators, clinicians, and policy-makers. Innovation is a driver of regional economic development and wealth creation in organizational units ranging in size from the start-up to the Fortune 500 companies. In a broader context, the pace of translational research leading to product and service innovation is highly interdisciplinary, thus, new products and services result from team efforts, marked by a systematic, structured approach to bringing new medical technologies to market and impacting patient care. In this course we examine medical technology innovations in the context of (A) addressing unmet clinical needs, (B) the process of inventing new medical devices and instruments, and (C) subsequent implementation of these advances in patient care. In short, the student learns the process of "identify, invent, implement" in the field of BioDesign. Offered as EBME 472, IIME 472 and SYBB 472.

**IIME 473. Fundamentals of Clinical Information Systems. 3 Units.**

Technology has played a significant role in the evolution of medical science and treatment. While we often think about progress in terms of the practical application of, say, imaging to the diagnosis and monitoring of disease, technology is increasingly expected to improve the organization and delivery of healthcare services, too. Information technology plays a key role in the transformation of administrative support systems (finance and administration), clinical information systems (information to support patient care), and decision support systems (managerial decision-making). This introductory graduate course provides the student with the opportunity to gain insight and situational experience with clinical information systems (CIS). Often considered synonymous with electronic medical records, the "art" of CIS more fundamentally examines the effective use of data and information technology to assist in the migration away from paper-based systems and improve organizational performance. In this course we examine clinical information systems in the context of (A) operational and strategic information needs, (B) information technology and analytic tools for workflow design, and (C) subsequent implementation of clinical information systems in patient care. Legal and ethical issues are explored. The student learns the process of "plan, design, implement" through hands-on applications to select CIS problems, while at the same time gaining insights and understanding of the impacts placed on patients and health care providers. Offered as EBME 473, IIME 473 and SYBB 421.

**IIME 475. Technology Marketing Strategy. 3 Units.**

High technology products and services are unique in the levels of ambiguity and risk that challenge a manager's ability to craft a marketing strategy. Understanding the customer, reading market trends, creating a compelling vision of value, and launching marketing programs (already foreboding tasks in traditional marketing situations) have a heightened sense of uncertainty in the context of high technology platforms such as nanotechnology and regulated medical devices. This course draws on contemporary ideas in literature by thought leaders in technology marketing. We work through several marketing models and methods in practice today to assist students synthesize and build appropriate conceptual and managerial frameworks for technology marketing practice.

**IIME 476. Applied Statistics for Decision Support in Data Science. 3 Units.**

In this intense summer application-oriented course, the goal is to bridge traditional statistical tools with the R language to prepare beginning graduate students for further study in data science. Managerial decision support involves the collection, analysis, and interpretation of data for understanding uncertainty and risk in decision-making; quite simply, decision support requires statistics! The "R" language plays a significant role facilitating the building of statistical and data science models and approaches to visualizing data and making predictions to support decisions, but absent a foundational knowledge in probability and statistics the impact of the tools and their use may not be fully realized. The course is project-based to provide direct application of probability and statistics to the extraction of knowledge from data. Prereq: Graduate level standing.