

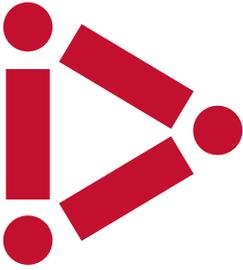
Integrated Innovation Institute Sample Course Descriptions 2021-2022

This document is a high-level overview of curriculum at the Integrated Innovation Institute and includes previous course descriptions per degree as well as courses shared across the Pittsburgh & Silicon Valley campuses. It is designed to complement the degree specific course plans. The course plan will note which courses are required or electives for each degree.

Semester-specific course descriptions will be released in advance of graduate student registration each semester.

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Master of Integrated Innovation for Products & Services *Pittsburgh Campus*

Fall

49-700, Engineering Design Thinking and Practice – 6 units

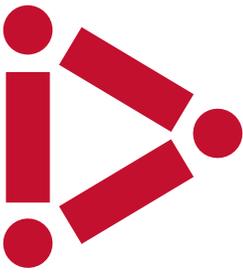
This course explores engineering design principles and philosophies, particularly from a mechanical engineering perspective. Through lectures and labs, students will learn the issues engineers must consider during design of commonly produced products. Topics include stress analysis and fracture, heat transfer, kinematics, and systems packaging. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-701, Visual Communication for Innovators – 6 units

This course will introduce students to concepts and approaches on how to communicate using various visualization tools and methods through a combination of mediums including sketching, whiteboards, PowerPoint, 3D mock-ups and videos. Through readings, mini-lectures, hands-on activities to practice and apply, students will learn how to breakdown complexity through the power of visualization...from capturing an idea or challenge to presenting your thoughts and creating a compelling story visually. Topics may include sketching fundamentals (thumbnails, perspective drawing, concept posters, mock-ups, and 3D visuals) and when to use them, charts/diagrams/maps to visualize complex processes and data, visual composition (color, balance, typography) for visual presentations, and storyboarding and video development for effective storytelling. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-702, Business Management Thinking and Practice – 6 units

This course introduces students to basic business management concepts and provides the basis for students to make connections to more in depth content as it appears later in more advanced classes. The course covers six basic functional business areas: accounting, finance, marketing, operations, strategy, and managing technology & innovation. In addition to covering theory and



applications, the course also uses a business simulation to help students to understand how the functional areas tie together. Students will work in teams in the class both for a collaboration experience and as a way of building connections between people with different educational background. About 50% of the work will be team assignments. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-703, Build Your New Career – 6 units

Whether you are T-Shaped, Comb-shaped, or a budding unicorn, this highly interactive course will help MIIPS students uncover the unique values they bring to prospective employers. Learn how to assess your abilities, identify career goals, self brand, and communicate effectively during your job search. The class will alternate between lecture/presentations and coaching by expert faculty, with students presenting materials for practice and critique in small group class discussions. By the end of the semester, students will be expected to have a career search plan in place and to participate in a portfolio/resume review with industry guests. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-704, iii Seminar Series – 0 units

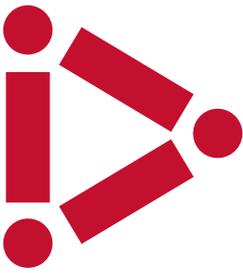
This recurring course meets regularly throughout the fall and spring semester, giving students exposure to a wide array of industry leaders in innovation and product development. Students can expect expert guests to offer a combination of talks, activities, advice, hands-on skill sessions, and general Q&A sessions to share their expertise

The seminar schedule for each semester is frequently updated and, depending on the guest, may require minor preparation for the session. This is a required course in the MIIPS degree program.

49-710, Product Design Thinking and Practice – 6 units

This course is an introduction to Product Design for those who have limited design practice and/or design thinking or who come from different fields of study and/or tangent fields such as Architecture and Communications. Through readings, mini-lectures, and a series of hands-on activities focused on practice challenges, students are exposed to core tenets of design thinking and practice.





The relationship between design, product development, and business is explored with group projects, discussions, and the analysis of artifacts and process. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-711, Special Topics: Industrial Design Practice– 6 units

This course is an elective follow on to the required Product Design Fundamentals course. The course gives students the opportunity to master the skills and techniques needed to visualize and represent product concepts efficiently. Building on the principles introduced in the required course, the emphasis is on the approach and techniques used to realize tangible products (research, sketching, model making, user testing, and presentation). Sharing resources and knowledge during the research phase, students work individually to solve the product design challenge presented by the instructor. Demonstrations and assigned exercises coupled with classroom critiques are used to practice and improve skills throughout the mini. Class meetings will be both in the assigned classroom and in the studio.

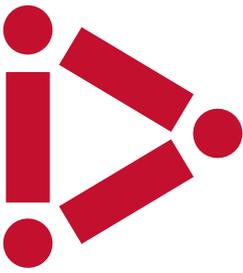
49-712 User Research: Theory, Methods, Practice– 6 units

This course guides students through determining the need for research, planning and executing several iterations of user engagements with different UX research methods, analysis of data and development of a report. The course is focused primarily on qualitative data, although some time is spent to source quantitative data and leverage a mixed approach. The course is a mix of lectures, discussions and activities in class as well as an independent project. Readings are provided in addition to a course handbook created by the instructor. This is a required course for the MIIPS degree program. All others must contact the instructor for permission.

49-713, Prototyping for the Internet of Things – 6 units

The Internet of Things, a once niche concept, has grown to be an integral part of the world around us. Consumer electronics, home appliances, industrial equipment, and a multitude of other everyday objects have been equipped with the full power of the internet. What were once highly specific and largely unaware objects, are now informed in ways that could only be imagined in the past. This course allows students to explore what it means for an object to be connected through hands-on prototyping. Students of all disciplines,





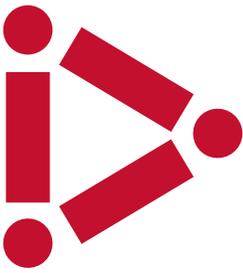
backgrounds, and levels of technical experience will be able to tangibly explore the technical media behind today's most popular connected technologies. Students will learn the limitations, affordances, and true power of the IoT and the technology that enables it. By the end of this course, students will have a comprehensive set of technical and conceptual tools that will enable them to create and develop future connected products, experiences, and ecosystems. This is a required course in the MIIPS degree program.

49-715, Special Topics: IoT Ecosystems – 6 units

IoT Ecosystems: Designing Intelligent, Interactive, Internet-enabled Spaces. Imagine a room with dozens of internet-enabled objects sensing, sharing and cooperating around data. It gets complex really fast. So how do we design ecologies of interacting objects that actually do useful things? We'll get hands-on with this question as part of this design-build course. Over 7-weeks, we'll collaboratively research, design and realize a interactive ecosystem of networked devices that solves a stakeholder-driven problem. We'll explore the opportunities to deliver rich, adaptive and connected experiences through existing internet of things products as well as new and emerging technologies. Students will be supported in this in this exploration by lectures, readings, design exercises, and guest speakers that introduce foundational theory, strategies, and precedents that inform the design of these complex ecologies.

49-716, Special Topics: Experience Innovation – 6 units

In this course, students spend the first half of the semester studying the nature of experience from a theoretical perspective. At the same time, students investigate and propose an experience-based project they plan to explore, in self-selected teams, for the rest of the semester. Service and experience design frameworks are used as a means to analyze current offerings as well as to propose innovative new human experiences. Students learn to speak articulately about offerings that are made up of systems of products, services and other components and may be working in familiar and unfamiliar forms such as events, spaces, activities, scripts, processes, and software. This course is intended for MIIPS Advanced Study students in their final semester; there are limited places for graduate students in other programs by instructor permission.



49-723, Special Topics: The Pricing of Products & Services – 6 units

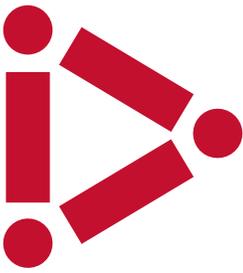
Why does it make so much sense for Uber's pricing to dynamically change? Why do automobile manufacturers (e.g. Tesla, Toyota) offer bundles of features in their "technology package" or "signature entertainment package", etc.? When setting prices for Prozac, why did Eli Lilly charge per pill instead of charging more for higher dosages? Determining the price of a product or service is one of the most important marketing decisions. It is also one of the least understood aspects of marketing. While many marketing activities are geared toward creating value for the customer, sound pricing decisions are the fundamental tool for businesses to capture the value they create. In today's competitive environment, even slight adjustments in pricing can lead to large financial gains or losses. This course covers multiple pricing strategies, tactics and their applications as well as some relevant aspects of consumer psychology.

49-725, Business Models and Strategy – 6 units

This course explores how strategy and business models intertwine to shape the nature and success of a business. Both aspects will be illuminated from various perspectives, e.g. corporate and entrepreneurial, for-profit and not-for-profit, products and services. Tools and methods will be introduced that allow a business to better understand and define itself and recognize its position in the market environment - the assessment phase. This heightened understanding allows the business to make decisions on how to deliver the expected value to customers and stakeholders and differentiate itself from competition - the implementation phase. Students will work individually and as teams to develop aspects of business strategy and business models for selected concepts. Students will present and discuss concepts in class and complete written task assignments. Focus will be on the selected texts as well as indicated supplemental reading material.

49-740, Integrated Product Development Methods – 6 units

This survey course will teach students methods and techniques to identify problems and opportunities, research people and work with findings, uncover needs and values, and ideate potential solutions that can be validated with users and meet articulated requirements. Students will learn this in relation to our framework for integrated innovation, with emphasis on understanding why certain methods are used, when, and how to combine them to achieve desired



outcomes. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-747, Innovation Mindset in Practice – 12 units

This course is for MIIPs advanced masters students to take their thinking to the next level and assimilate what they know within a topic they explore in the context of an integrated approach to innovation. From the first day of classes through their summer internships + more, MIIPS students have been challenged to embrace ambiguity, trust in a human-centered, evidence based process, and think as creatively as possible on multidisciplinary teams. They have added new skills to their toolkits and new perspectives for how to "see" the world differently.

The challenge in this intensive class is to apply critical thinking, an innovative mindset, disciplined research, and a thoughtful use of tools/methods to a topic of each student's choosing within the innovation realm. And equally important, be self-directed and demonstrate the ability to communicate about it to other practitioners in meaningful ways.

Spring

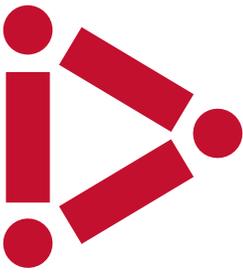
49-704, Integrated Innovation Seminar & Workshop Series – 0 units

This recurring course meets regularly throughout the fall and spring semester, giving students exposure to a wide array of industry leaders in innovation and product development. Students can expect expert guests to offer a combination of talks, activities, advice, hands-on skill sessions, and general Q&A sessions to share their expertise. The seminar schedule for each semester is frequently updated and, depending on the guest, may require minor preparation for the session. This is a required course in the MIIPS degree program.

49-714, Programming for Online Prototypes – 6 units

An introduction to rapidly prototyping web-based products and services. This 7-week experience will teach students the basics of web development for online services. Specifically, we'll focus on lightweight, minimal UI, microservices (e.g. bots, conversational interfaces, platform integrations, designing micro-





interactions, etc.) We'll introduce and examine these new web service trends and interactive experiences. Students will learn through instructor led workshops and hands-on experimentation. As an intro level course, no knowledge of programming is needed. By the end of the course, students will be able to design, prototype and deploy their own web-delivered services.

49-717, Special Topics: Digital Ethnography – 6 units

Students will study the basic principles of ethnography and then conduct a 6-week project as a participant observer in a digital setting. This course provides an opportunity to hone and refine skills from the User Research Methods course, and dive deeper into one method. You will plan the research, collect data, analyze and synthesize what was learned and present a research report that identifies not only what was observed but also interpret its meaning and make indications about opportunities to innovate with new offerings. Research topics will be provided, however you may propose a topic. Priority enrollment to III graduate students; students outside the III can register with the permission of the instructor.

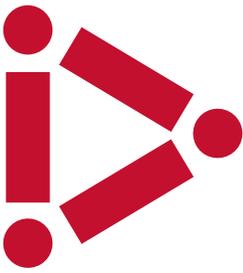
49-719, Internet of Things – In Depth – 6 units

Building on Designing for the Internet of Things, this elective will guide students in the development of a single IoT concept in greater depth. Before the course, students will propose a project they would like to focus on for seven weeks. Then, students will rapidly iterate through the lifecycle of developing a single project. They'll explore the implementation of their product in detail from technology to user experience. Regular guest talks from industry leaders will provide insight into developing market-ready, robust IoT products. Finally, students will engage in weekly critique and work sessions where they can seek instructor support in transforming their concept into tangible product. By the end of the course, students will have realized a refined prototype, along with a proposal for bringing their product to market.

49-720, Managing Products and Brands – 6 units

This course is an introduction to the product lifecycle and brand management strategies. Through interactive lectures, case discussions, and assignments, students will learn planning, development and marketing tools to address common challenges across various industries. This course will emphasize the importance of cross-functional leadership for product and brand managers





across aspects of marketing, engineering, accounting, and manufacturing. This is a required course in the MIIPS degree program

49-730, Designing for Manufacturing, Assembly and Sustainability– 6 units

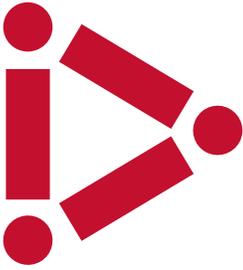
In this course we will explore the fundamentals of design for manufacturing, assembly, and sustainability. Through readings, lectures, in-class exercises, and industry tours, students will learn how innovators apply design and engineering principles to develop products that can be manufactured with cost, efficiency, performance, quality, and sustainability in mind. Topics include the linkage between customer needs and functional requirements, material, manufacturing, assembly and fabrication processes, design for cost, safety considerations, life cycle analysis (LCA), and eco-design strategies. The collaboration between design, engineering, and business is explored through group projects and discussions on the intersections of these disciplines. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-734, Special Topics: Designing Smart and Healthy Systems – 6 units

This course is designed to give students who took 49-733: Designing Smart Systems a chance to apply and grow their AI and data science skills in the context of a hands-on design and programming project in healthcare. The project focus will be on the appropriate use of interventions to increase patient engagement and medication adherence. In addition to the project, classes will survey a number of applications of AI and data science in health care and life sciences, with a focus on the unique challenges of using health care data and deploying smart systems for patients and clinicians. We will build on the machine learning concepts introduced in 49-733 with advanced work in behavioral economics, optimization, phenotype discovery and more. Prerequisites: Statistics, Python programming and 49-733 or equivalent experience.

49-741, Integrated Product Development Capstone – 12 units

During capstone, Interdisciplinary teams of MIIPS students from engineering, business, and design backgrounds use methods and innovative mindsets to research the needs, wants and desires of a market opportunity, define product specifications, conceptualize products to meet the users' needs and desires and refine the most promising concept. The result is a resolved form, functional design, and marketing plan delivered to a sponsor by the end of the semester.



The course also focuses on communicating about the work through multiple presentations and reports. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-726, Essential Skills for Leaders– 6 units

This course includes both the scholarship and the practice of leadership. The content includes an exploration of major theories in the evolving understanding of leadership, the skills associated with the practice of leadership, and the many areas leadership theories, skills and practice intersect. The process of this course includes reading and viewing content, class discussions, group exercises, and ongoing reflection on personal, interpersonal, contextual and cultural complexities. The structure of the course will be built, in part, around the six pillars of change: visionary pillar, engaging pillar, ethical pillar, reflective pillar, tactical pillar, technical pillar.

Master of Science for Software Management *Silicon Valley Campus*

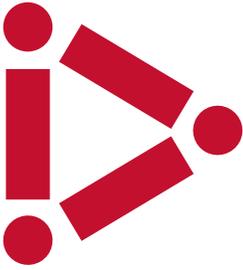
Fall

49-750, Software Product Definition – 12 units

Students develop and refine a compelling and realistic vision for a new product. They learn to understand user and customer needs, to document those needs, and to envision creative solutions.

After completing this course, students will be able to:

- Use contextual inquiry and work modeling techniques, including interviewing, to understand problems faced by individuals and organizations
- Define and apply personas, goals, and scenarios to envision a high quality user experience in a new system
- Define the 'whole product' required to provide a complete solution, systematically, from a customer's point of view
- Define a business vision that explains how product development will contribute to achieving the goals of the customers and end user



Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-751, Requirements Analysis – 12 units

Project teams analyze, document, and plan the management of functional, technical, and business requirements for a software system and then create a product release strategy.

After completing this course, students will be able to:

- Derive key functional, data, technical, and business requirements from scenarios
- Analyze and document functional and nonfunctional requirements for a software system
- Identify risks inherent in potential solutions
- Estimate market size and to evaluate competitive products and services
- Formulate the features for a minimum viable product and a road map for subsequent release
- Present analyses and plans to a management audience

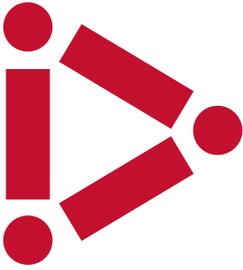
Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-752, Product Definition and Validation - 12 units

Students learn techniques for envisioning creative solutions to real problems. They develop and refine a compelling and realistic vision for a new product. They practice techniques to understand and validate user and customer needs, and to identify market opportunities. They analyze, document, and plan the management of functional, technical, and business requirements for a software system and then develop a product release strategy.

49-753, User-Centered Research Methods for Product Innovation – 12 units

Building great products and services begins with having a deep knowledge of the problem you are solving and the people for whom you are designing. From controlled lab studies to field research, a/b testing to participatory design, learn a host of Human-Computer Interaction research methods and analysis techniques to get you the right insights and on the path to crafting innovative ideas.



Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-760, Foundations of Software Management - 12 units

Students apply fundamental methods, models, and frameworks to assess real software companies from a variety of perspectives - marketing, strategy, finance, operations - to understand how businesses organize and make decisions. Working individually and in groups, students develop skills for managing teams and employee performance. Students practice personal leadership.

After completing this course students will be able to:

- Use contextual inquiry to understand user 'pain' and establish product goals
- Use the Goal-Question-Metric technique to establish strategic measures
- Characterize a software business in terms of markets and products
- Read and understand basic financial statements
- Assess a company's strategy in light of competitors, market and macro factors
- Make a presentation to an executive audience

49-761, Elements of Software Management - 12 units

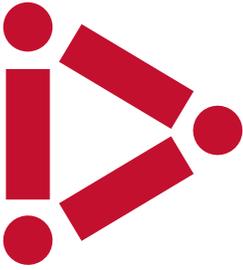
Through seminar discussions and individual investigation, students assess real software businesses from marketing, business strategy, financial, and overall business perspectives, applying fundamental methods, models, and frameworks.

After completing this course students will be able to:

- Characterize a software business in terms of markets and products
- Understand basic financial statements
- Assess a company's strategy in light of competitors, market and macro factors
- Make a presentation to an executive audience

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.





49-770, Metrics for Software Managers - 12 units

As members of a project team, students analyze and propose metrics initiatives for a fictional software organization with specific software management problems, aligning the initiatives with business and stakeholder goals.

After completing this course students will be able to:

- Define a metrics program at the software project level
- Define a metrics program for a product portfolio

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-774, Product Management - 12 units

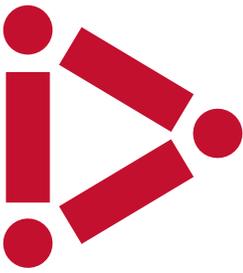
While Product Manager has been a key role in the high-tech industry for over 10 years, the Product Management training in this space was relatively limited. This course connects the knowledge and skills students learned from previous Software Management courses, and guides students to leverage this learning to position, design, develop, launch, measure, and grow products, particularly in the internet/software sectors. The course covers a product managers' role and the application of product ideation & positioning, feature design and documentation, product development process, go-to-market, measurement/optimization, and growth.

49-775, The First-Time Manager - 12 units

This course is intended for experienced software developers who have newly been given management responsibilities. The course addresses management styles, managing people (reviewing, mentoring, hiring, firing), managing teams (task assignments, collaboration, conflict resolution), managing schedules and deliverables, reporting to higher management, working with other groups in the organization, and communicating with clients and partners outside the organization.

49-786, Software Engineering Management - 12 units

In this course, you will learn the software engineering paradigms that are widely adopted in modern software industry. You will be introduced to the Software Development Life Cycles (SDLC) and its supporting process and tools in each stage. Through team based projects, you will gain firsthand experience on best



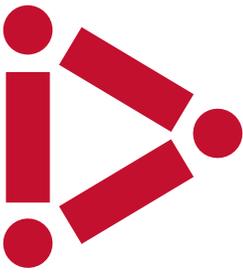
practices in the art of collaboration and software engineering management. In a high-performing team environment, you will be able to build cloud based mobile applications through iterative process of requirements definition, architecture design, implementation, integration, testing, measurement and deployment. If you have already taken 18-652, Foundations in Software Engineering, you are not eligible to register for this course.

49-787, Architecture & Programming Principles - 12 units

Software products are becoming increasingly large and complex, and the responsibility of Software Product Managers has extended beyond core product functionality into non-functional aspects like cloud platform selection, scale and reliability decisions, interoperability with other products, and future extensibility considerations. For this, they rely heavily on their development team to architect and design products that are reliable, scalable, flexible, cost-effective and "future-proof." They are surprised when the product fails to meet these expectations - discovered only when the rubber meets the road - often too late to make any fundamental changes. These failures may manifest themselves in the inability of a product to scale the next million users, to integrate with other software systems, to support an international user base, or to enable sales through channels. This course aims to get product managers technically savvy about the non-functional aspects of a software system, and enable them to be influential in the architecture and design phase of product development. It will review a variety of architectures archetypes and analyze them for relevance to specific business requirements. It will also review some well-known products and explore their architectural characteristics. Students will architect and implement a software product using the principles learned in the course. Most coding will be done in Python, JavaScript and HTML. This course is designed for students with some experience in programming but who need to get a handle on architecture-level technical concepts.

49-790 / 49-796 - Software Management Independent Study – Variable Units

Working with the faculty, realize that the faculty are most interested in Independent Study projects that further their own research goals. You may not be successful on your first inquiry, so please be patient. We want you to have a good Independent Study experience, so faculty are encouraged to say "no" if they don't have the cycles to mentor a project. Once you and the faculty have agreed



upon the independent study, send the independent study form to the director of your program.

49-791 - Software Management Capstone Project – Variable Units

Student teams continue work on their product or business idea. Student teams may refine or rework ideas, or continue to extend the work started in previous semesters. A plan, including milestones and deliverables, which is developed by the team must be submitted to and approved by the faculty advisor at the start of this course.

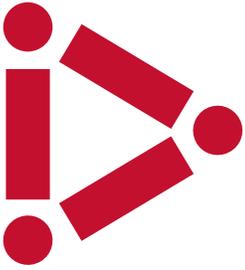
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49-792 - Software Management Practicum – Variable Units

The practicum involves application of the SM program concepts in an actual business environment. Acting as consultants to one or more customers, student teams must scope a project; develop a project plan and detailed statement of work. Practicum topics are typically proposed by outside companies, which are looking to work with our students, but there are other options available as well. Students must demonstrate all deliverables to the customer(s), whose assessment of the work is a major component of the grade. More than a simple internship, the practicum involves real responsibility, teamwork, accountability, and rigor.

49-794 - Software Management Industry Workshop – 3 units

This workshop continues the self-assessment started in the New Student Orientation for the MS-SM program, and continues with career exploration activities. Students who are searching for their first job or internship in the software industry and those who are seeking to make a career shift will benefit from this course. A discover of careers available in today's software industry will be conducted through student research and guest speakers (including alumni) who present a view into their typical workday. Students develop an understanding of the wide variety of companies operating in the software industry, and the various jobs available within these companies. Students also learn how they can apply their skills to non-software companies for whom software systems are a major aspect of business success. The outcomes for students include a personal brand statement that articulates skills valued by



employers, discovery of their work preferences and aptitudes, a list of target companies to engage, and a plan to develop the materials (e.g. resume, interview preparation) required to conduct a successful job or internship search based on their new awareness and understanding of specific opportunities they wish to pursue. This course prepares students for 39-699 Career and Professional Development for Engineering Masters Students.

49-808, ST: Integrated Innovation for Large-Scale Problems – 12 units

This studio course focuses on team-based innovation across design, business, and engineering with the potential for large-scale impact. Students will take on a complex social problem, and methodically come up with unexpected ideas and opportunities to tackle and solve it. The semester will consist of a series of three modules where students will research the problem in its current form as well as its future manifestation, formulate a desired future state for the problem, and develop viable interventions that lead to a desired future. Students will work both individually and collaboratively, and will learn and apply systems thinking, design thinking, and futures studies to propose appropriate products, services, and policies. Students will seek the support industry experts and community stakeholders in the problem space, and will learn to co-create approaches to solving a complex social problem.

Spring

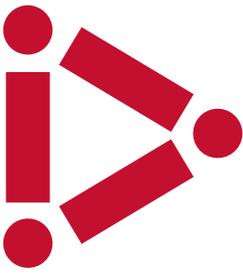
49-762, Software Product Strategy – 12 units

Students analyze market opportunities for a software product, evaluate its technical feasibility, then expand the product definition and create a product roadmap. Prerequisites: Admission to the Silicon Valley Software Management program and Requirements Analysis (49751).

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-763, The Business of Software – 12 units

The Business of Software course is focused on the processes and the economics of bringing software products and services to market, with an emphasis on



partnership and sales strategies. The previous course, Software Product Strategy (SPS), addressed the technical feasibility of implementing the product and the marketing strategy. BSW picks up where SPS leaves off, starting with teams creating a partnership plan and a sales strategy for their products. The final step involves the creation of budgets and revenue models for the proposed product as a way to determine the viability and business opportunity for the envisioned product. The course concludes with student presentations that recommend for or against continuing with product development.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-771, Process and Project Management – 12 units

Students define the optimal software development method for a given project, by identifying a set of Agile, Lean and/or disciplined practices suited for the project's specific needs. They also develop project's estimates and multilevel plans based on their recommended method. Prerequisites: Foundations of Software Engineering (18652) or Metrics for Software Managers (49770) or consent of instructor.

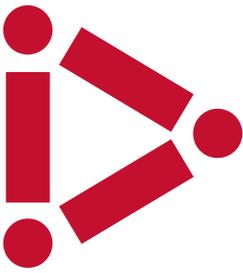
Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-780, Human Computer Interaction & User Experience - 12 units

This graduate level short course exposes Software Engineering and Management professionals to the field of Human Computer Interaction (HCI) and User Experience (UX). In the modern marketplace, the winners are those who enable real people to harness the power of technology innovations in delightful ways. Delighting customers through technology requires a strong foundation in HCI and a focus on UX. This course is primarily for those who come from a technical or business background but are interested in gaining relevant knowledge and basic skills in HCI/UX in an interactive, fast-paced, and engaging format.

The goals for the course are:

- To provide an overview across the breadth of HCI/UX disciplines to understand the relevant roles, responsibilities, processes, methodologies, concepts, tools, and deliverables expected of them.



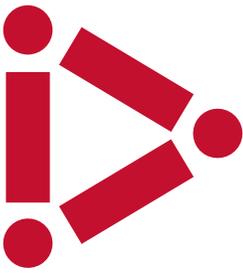
- Through increased knowledge and understanding, establish empathy with HCI/UX practitioners in order to establish productive working relationships.
- To provide a theoretical & practical foundation for the HCI & UX practice within modern product development.
- Understand the underlying history & theory through relevant readings, discussions, and presentations.
- Gain practical experience through team-based project work, presentations, and critique.
- Work together in cross-functional teams using a User-Centered Design (UCD) approach.
- To create a greater appreciation for the intellectual, emotional, and practical value of HCI & UX.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-781, Introduction to Machine Learning – 12 units

The landscape of software products has changed over the last decade with the advent of data science as an interdisciplinary field, and its broad and deep applicability has created opportunities for delivering interesting and innovative capabilities based on deep understanding of data. This course helps current and future product managers understand the distinction between data-driven and conventional products and learn to identify new product capabilities made possible by quantitative data analysis and modeling. Regular hands-on exercises will expose them to techniques for analyzing data, developing insights, building models, and turning the outcomes from models into end-user value. The course project will require students to go through the life cycle of a data-product and showcase their insight as a product feature. (Previously Data Analytics). Some class sessions in this course will be offered using a Flipped Classroom model where lectures will be distributed as videos for viewing offline, and class sessions are dedicated to clarifications, content review, and course assignments.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.



49-795, Special Topics: Introduction to Artificial Intelligence – 12 units

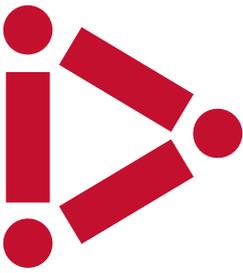
The principles and practices around artificial intelligence (AI) is increasingly critical to unlock the value of data, and transform business and ultimately human experience. It is so pervasive today that we use it daily probably without knowing it. This course will present students AI business case studies, the most popular AI techniques, algorithms, application recipes, best practices, and offer hands-on experience in implementing them to solve real-world problems. This course covers the spectrum of real-world AI implementations from natural language processing, speech recognition, facial recognition, landmark detection, and social network analysis to technical depth of popular algorithms, neural network backpropagation methods, probabilistic and non-probabilistic methods. Students will accumulate firsthand experience on Google and Microsoft AI platforms, AI model design and training. This course is designed with the easy-to-follow approach by showing the step-by-step implementation of the core technologies. It presents recipes in major use cases to offer students a leap start on building AI solutions. With the willing-to-learn attitude, students with either technical or business background will succeed in this course.

49-790 / 49-796 - Software Management Independent Study – Variable Units

Working with the faculty, realize that the faculty are most interested in Independent Study projects that further their own research goals. You may not be successful on your first inquiry, so please be patient. We want you to have a good Independent Study experience, so faculty are encouraged to say "no" if they don't have the cycles to mentor a project. Once you and the faculty have agreed upon the independent study, send the independent study form to the director of your program.

49-807, Exponential Innovation – 12 units

This semester course explores the new paradigms of innovation and competitiveness. This disruption is happening because technologies such as computing, sensors, artificial intelligence, and 3D printing are advancing exponentially and converging. For more than 100 years, the processing power of computers has doubled every 18 months. Now it has come to the point where our smartphones are more powerful than yesterday's supercomputers were. Faster computers are now being used to design faster computers; and computers and the information technology that they enable are absorbing other fields. In order to thrive in today's era of exponentially advancing



technologies, students will need to understand the pace of change and learn to take advantage of the upheaval it will bring. Innovation has globalized; business models and technology developed in one country can easily be exported to another there are massive opportunities for small groups of people to create an outsized positive impact on the world. This class teaches students how to watch for convergence and disruption and to think like the startups that are building the future of nearly every industry. The class combines lectures, discussions, group activities, and guest speakers to teach students this exciting rapid change to technology.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

Summer

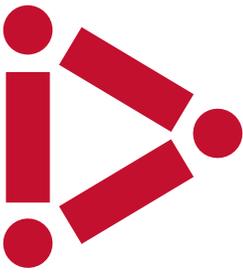
49-766, Agile Marketing for High Tech Innovation – 12 units

Agile Marketing for High-Tech Innovations will cover how to formulate marketing strategies that lead to successful products. It will include how marketing strategies are adapted for high tech innovations and products including addressing strategic market planning, functional expectations and tactical considerations when using marketing tools. Topics include: strategic market planning, market orientation, types of alliances needed for moving from innovation to product acceptance, understanding high-tech customers, product distribution options, technology/product management considerations for marketing effectively, pricing, marketing communications, breakthrough versus incremental innovation marketing and measuring marketing effectiveness.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-767, Organizational Behavior for High Tech Knowledge Industry – 12 units

Using innovative conceptual frameworks, students learn the fundamentals of organizational behavior as it relates to the unique challenges of high tech enterprises, concluding with a team project focused on a specific organizational problem for a selected company.



Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-768, Special Topics: Finance for Entrepreneurial Ventures – 12 units

The course seeks to blend finance and economics to help entrepreneurs to understand the relationship between venture finance and evaluation of business risk. It starts with a workshop on the accounting tools that are necessary for entrepreneurs to make a business case for their software start-ups. In the process students will acquire a range of business understanding and skills necessary to build a new company and plan for equity participation for founders, employees, and venture capitalists. The workshop on accounting fundamentals, is followed by some introductory finance, and then students work through the process of converting operating, human resource, capital, and marketing plans into a set of financial projections that enables a start-up to be valued and funded. Students will learn:

- How early stage startups reduce uncertainty about the viability of their ventures by experimentation, planning, and decide under what conditions scaling early may be beneficial;
- Understand the sources of finance for entrepreneurial activity and their role in maximizing gain while controlling personal risk;
- How to put together a financial plan and pitch for their Start-Up in a professional manner.

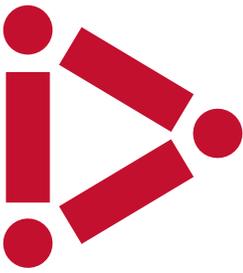
Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-772, Managing Software Professionals – 12 units

Students, working individually and in teams, develop skills for reviewing and managing employee performance, making hiring and firing decisions, and creating a productive work environment to support a distributed software development project. Communication styles, conflict resolution and negotiation skills are incorporated.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.





49-782, Open Source Software – 12 units

Open source software has become mainstream. This elective course addresses issues related to development, evaluation, use, and governance of open source software. Among other things, students will learn about the history of open source software, how to contribute to open source projects, and how to manage its use within an enterprise. Students can work on technically-oriented or business-oriented projects. Team projects will be supplemented by recommended readings and presentations by invited outside speakers.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-783, Introduction to Cloud Computing – 12 units

This class is designed to familiarize you with the state of the art in cloud computing and big data analysis. This course is suitable for both students on a technical track (engineering, science) as well as those on a management track who are passionate about big data powered products. You will study basic types of clouds, widely-used cloud computing systems and their strength and weakness, core concepts and technologies on distributed data storage, distributed processes and services, security practices, popular Big Data Analysis algorithms and machine learning use cases on cloud. You will acquire deeper understanding via both case studies from industry big players as well as a project-based hands-on application build and deployment on cloud (no technical pre-requisite). After completing the course students will be able to:

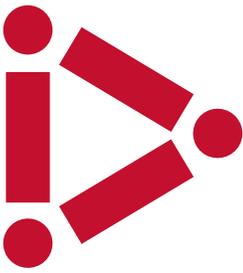
- Build a basic product on two well-known cloud systems
- Make architectural decisions on choosing the right cloud type, core technologies and services
- Make business decisions on cloud vendors and the right level of investment on cloud
- Critique some current industry cloud-based solutions

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-788, Introduction to IoT (Internet of Things) – 12 units

This course provides an overview of Internet of Things (IoT), especially focusing on software layer of building mobile applications to capture and process data





generated by IoT devices and providing analytical insights. Students will access health and fitness information, motion data, explore home automation technologies and beyond. Through this course, students will understand and appreciate why information technology is entering the era of digital transformation from pure Internet to IoT.

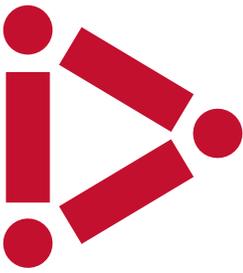
Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-789, Special Topics: Architecture Principles for Product Managers – 12 units

Software products are becoming increasingly large and complex, and the responsibility of Software Product Managers has extended beyond core product functionality into non-functional aspects like cloud platform selection, scale and reliability decisions, interoperability with other products, and future extensibility considerations. For this, they rely heavily on their development team to architect and design products that are reliable, scalable, flexible, cost-effective and "future-proof." They are surprised when the product fails to meet these expectations - discovered only when the rubber meets the road - often too late to make any fundamental changes. These failures may manifest themselves in the inability of a product to scale the next million users, to integrate with other software systems, to support an international user base or to be sold through channels. This course aims to get product managers technically savvy about the non-functional aspects of a software system, and enable them to be influential in the architectural and design phase of product development. It will review a variety of architectures archetypes and analyze them for relevance to specific business requirements. It will also review some well-known products and explore their architectural characteristics. As part of the course, students will conceptually architect a product and debate its pros and cons. This course is designed for students who have some experience with product management and can relate to the challenges addressed in it. No experience with coding is necessary.

Note: Optional Distance Education Section is available for MSSM Remote Part-Time students. Remote students still attend class synchronously.

49-790 / 49-796 - Software Management Independent Study – Variable Units



Working with the faculty, realize that the faculty are most interested in Independent Study projects that further their own research goals. You may not be successful on your first inquiry, so please be patient. We want you to have a good Independent Study experience, so faculty are encouraged to say "no" if they don't have the cycles to mentor a project. Once you and the faculty have agreed upon the independent study, send the independent study form to the director of your program.

49-793 - Practical Training in Software Management – 3 units

This course is for SM students who are pursuing an internship. Internships work is conducted on-site at local software companies. Special permission is required to be enrolled in this course, therefore, eligible students should contact the program director.

Master of Science for Technology Ventures

Silicon Valley Campus

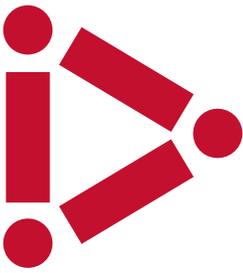
Fall

49-853, Product Management – 6 units

The course covers a product managers role in the application of product ideation and positioning, feature design and documentation, product development process, go-to-market, measurement/optimization, and growth. The course begins with a brief overview of the product management role, and then goes step by step into managing the process of building a product. In each class, students are required to discuss the reading materials, participate in the discussion sessions, and dive into in-class practices. The course will explore the Product Managers role and responsibilities across the product life cycle; techniques to understand and validate customer needs and product success; application of the knowledge and skills needed to research, position, design, develop, launch, optimize, and grow products; new product development and delivery methodologies and their impact on product and customer; and the key attributes of a successful Product Manager (PM) through direct dialogue with Silicon Valley PMs.

49-854, Business Models and Strategy – 6 units





This course is about the development of executable strategies for entrepreneurial efforts. In order for entrepreneurs to be successful, the ability to create a business model and roadmap for execution is essential. Strategy is about making decisions and having alternatives for courses of actions. This course will focus on effective approaches and measures in order to make things happen under tight time and financial considerations. The course will explore how to apply the tools of strategy and business models in order to deliver new business creation. Topics include applying an evaluation process for the validity of a business concept, understanding the drivers for a strategic roadmap for new business execution, using a toolkit to shape a strategy with scenarios for choices of action, identifying the key measures of success. Through teams, students will form specific approaches for selected new business concepts and share them in class discussions.

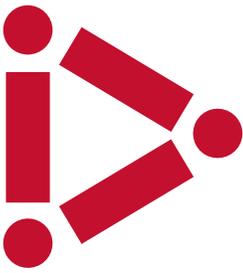
49-855, Venture Governance, 6 units

The goal of the course is to teach founders of a high-tech startup venture the requirements and process to be a director and how to manage their Board of Directors and Advisory Boards. The boardroom is where the governance of the venture occurs. The course will propose frameworks for understanding the complex dynamics among directors, executives, investors and shareholders. The key elements of the work boards do include: strategic reviews, selecting, evaluating and compensating CEOs and other senior executives, company re-organizations, new director selection, managing top executive succession and dealing with various corporate crises. The role of the Boards is crucial in the value creation phase of a technology ventures trajectory. Conceptual frameworks will be taught to effectively manage this crucial aspect of a venture governance in real time. This course will cover the following topics: board participation and voting rights, Board of Directors responsibilities and liabilities, advisory board mentoring duties and shareholding vesting, managing Board of Directors, Directors and Officers Insurance and Compensation of Board Members, Board of Directors role during venture scaling, fundraising, firing hiring CEOs and company officers, board members role during the Merger and Acquisitions transaction and during IPOs, and joining other boards.

49-856, Legal Issues in New Venture Creation, 6 units

A critical part of creating a new venture is to provide the legal structure for both compliance and to prepare the venture for future success. For start-ups the legal





profile of the company sets up the framework for growth. The course will cover basic legal requirements of incorporation, and additional options that need to be determined by the founders including equity distribution, board structure, employee stock option vesting, triggers for contingencies such as firing or acquisition and other issues. Another critical legal issue for both startups and established enterprises surrounds protecting intellectual property to immunize the company's strategic advantage as it gains velocity in the global market and encounters competition. Students will learn about various Intellectual Property tools and strategies to protect their product innovations and to understand the competitive marketplace, both in the US and globally.

49-881, Start Up Creation in Practice – 12 units

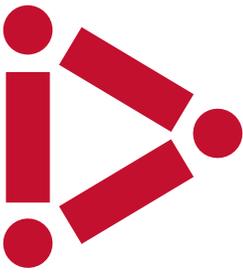
For MSTV students with the goal of creating a new start up as they are enrolled in the MSTV degree, they have the option of using up to 24 units of their electives in the practice of creating a new venture (12 units per semester). Similar to an independent study, but focused specifically on new venture creation, students will work on developing their technology-focused idea into a potentially viable company through this course. Students can work individually or through a team with other MSTV students. Each student (team) must have an approved faculty advisor.

Spring

Pittsburgh Campus

49-850, Grand Challenge Innovation – 12 units

This course presents a formal process for innovation. The method is applied to solve hard societal problems. Innovators and entrepreneurs have an opportunity to solve very hard problems required in the twenty first century. This course teaches students how to apply emerging technologies to solve grand challenges through a physical system. Students will learn to identify the grand challenge as an opportunity for new products, understand that opportunity and requirements for a successful solution, conceptualization of product solutions based on those requirements, and proof of concept. Priority will be given to students in the Master of Science in Technology Ventures degree



Silicon Valley Campus

49-804, The Leadership Challenge – 6 units

This course studies the emerging contexts for leadership - key attributes and skills, key development points, and key actions. Leadership will be discussed in changing contexts such as agile/lean environments, emerging technology such as mobility, big data, and global issues. Other topics include decision making under uncertainty, leadership and followership, acting as a connector in an ecosystem. A leader is someone who will take you somewhere that you didn't think you could go; what does this mean for teams, businesses and you personally? There will be key readings, case studies, and a retrospective.

49-851, Financial Fundamentals for New Ventures – 6 units

This course will aid high tech teams in their financing decisions for startup considerations and entrepreneurial management. The course will review the basics of financials such as the balance sheet, the P&L and a cash flow statement. It will then address the creation of pro forma financials to support financing for new business ventures. This will include the development of business management understanding, the relationship between venture finance and business risk evaluation, and the process of valuing of the opportunity. Teams will create a venture pitch for their startup.

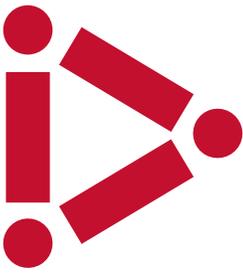
49-852, Agile Marketing for New Ventures – 6 units

This course will cover how to formulate marketing strategies that lead to successful products. It will include how marketing strategies are adapted for high tech innovations and products including addressing strategic market planning, functional expectations and tactical considerations. Topics include: strategic market planning, positioning, types of alliances needed for moving from innovation to product acceptance, breakthrough versus incremental innovation marketing, and measuring marketing effectiveness.

49-857, Dynamic Global Teams – 6 units

Dynamic teamwork and collaboration are a critical success factor and a major source of competitive advantage and frustration for companies worldwide. Many startups have engineering teams based in low-cost parts of the world. Established companies have disturbed teams working in R&D and Engineering in





different geographies. Mobile and remote communication technologies have transformed the global business landscape. Super-flexible teams drive and execute entrepreneurship and innovation. This course will focus on profiles of dynamic collaborative teams, what it takes to balance different priorities, create trust and alignment, interact with diverse stakeholders, and perform under time pressures and resource constraints, all under complex, fast-moving and unpredictable global markets. This course will study critical success factors in driving innovation and explore how super-flexibility enables rapid, real-time adaptation. The course will describe practical action steps for organizing and managing super-flexible teams, study and apply fundamental findings in cognitive psychology that support adaptability and creativity of teams, introduce methods for training cross-functional teams to excel at innovation, and learn how to use practical tools and techniques that can turn ideas into action.

49-881, Start Up Creation in Practice – 12 units

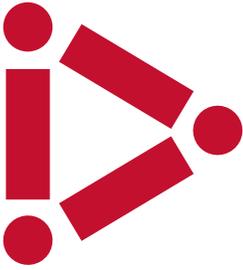
For MSTV students with the goal of creating a new start up as they are enrolled in the MSTV degree, they have the option of using up to 24 units of their electives in the practice of creating a new venture (12 units per semester). Similar to an independent study, but focused specifically on new venture creation, students will work on developing their technology-focused idea into a potentially viable company through this course. Students can work individually or through a team with other MSTV students. Each student (team) must have an approved faculty advisor.

49-882, Special Topics: Emerging Technology: Artificial Intelligence (AI)

– 6 units

Artificial Intelligence (AI) is a collection of multiple technologies that enable machines to sense, comprehend and act, and learn, either on their own or to augment human activities. AI has introduced new sources of growth, changing how work is done and reinforcing the role of people to drive growth in business. It is one of the hottest technologies that students may encounter in their future jobs. The course leverages the knowledge, experience, and network of the faculty, provides students with the fundamental knowledge, analytical skills, and strategic thinking needed to assess a job opportunity, analyze an application, and discover the business opportunities in the AI applied sectors.

49-883, Special Topics: Emerging Technology: Blockchain – 6 units



A blockchain is a decentralized, distributed and public digital ledger that is used to record transactions across many computers so that the record cannot be altered retroactively without the alteration of all subsequent blocks and the consensus of the network. Blockchain technology is one of the hottest technologies that students may encounter in their future jobs. The course leverages the knowledge, experience, and network of the faculty, provides students with the fundamental knowledge, analytical skills, and strategic thinking needed to assess a job opportunity, analyze an application, and discover the business opportunities in the blockchain-applied sectors.

Shared Courses Across Degrees

Please check the degree course plan to see how these courses are part of each specific degree.

Fall

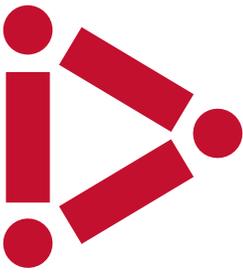
49-733, Designing Smart Systems – 6 units

This course is an introduction to artificial intelligence and data science, with a focus on the needs of product designers. It covers a variety of technologies including machine learning, natural language understanding, and image processing, as well as implications of the technologies for human-computer collaboration, and for society in general. The class includes hands-on exercises in building systems, but does not emphasize programming. At the conclusion of the class, students will be able to recognize when AI and data science techniques are (or are not) applicable to a given problem and will have completed a group project designing an AI application. This is a required course in the MIIPS degree program. All other students must contact the instructor for permission.

49-800, Commercializing Intellectual Property – 12 units

The course focuses on the innovation of products based on emerging technologies that are ready for technology transfer, but have not moved past the “research lab”. The course will follow a rigorous product innovation process that begins with identifying opportunities for products using these technologies, understanding the needs of the potential customer and other stakeholders, and developing concepts that illustrate the potential product. The course will





include understanding new technologies, extensive customer research, product innovation methods, and initial business execution planning that includes market definition and execution planning. The results of this course may follow into 96-809, Enterprise Innovation, in the spring term, to further develop the concept and execution plan into a viable market opportunity. For this year, technologies will be based on CMU research ready for tech transfer.

49-802, Innovation & Entrepreneurship – 12 units

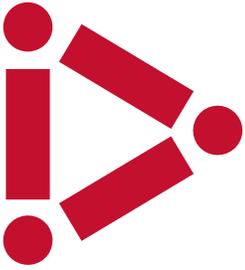
This course focuses on entrepreneurship and innovation from the vantage point of high-tech companies in Silicon Valley. We will explore these topics in the context of the Creation Phase - focusing on founding a new start-up and raising seed funding; and the Scaling Phase - focusing on growing a venture where startups typically undergo B, and C rounds of funding; We will examine common mistakes and misconceptions in starting a new entrepreneurial business, and meet entrepreneurs, angel investors, and venture capitalists from Silicon Valley to learn, first hand, the challenges of conceiving, creating, and growing a new venture.

In the second part of the IE course, our focus will be on the Consolidation Phase, when growing ventures evolve into established global corporations. We will examine critical pain points facing this group of companies, the impact of organizational complexity, the challenge of managing a multi-business enterprise, and expanding the global footprint. This is the phase when technology companies find it more challenging to innovate and often shift their growth focus to searching for acquisitions. Invited guests will share their experiences and lessons learned, and give us a first-hand perspective on realities facing this critical group of innovative companies.

Spring

49-801, Enterprise Innovation – 12 units

This course explores how business enterprises are being re-invented for today's digital era. Many firms are approaching a critical inflection point. The combined impacts of technology and globalization have revolutionized the way we operate. Software is transforming the way companies innovate; how they interact with customers and ecosystem partners, the way they collaborate and communicate,



how they access and distribute information, and how they co-ordinate and control. Traditional approaches that assume "stability" have given way to "dynamic" recipes. The new imperative is to swiftly navigate changing realities. Flexibility, versatility and the capacity to quickly adapt to evolving situations have become the critical challenges. The course is based on the new edition of Prof. Evans' book "Super-Flexibility for Knowledge Enterprises" (co-authored with Prof. Bahrami from Haas School of Business, UC Berkeley). Specifically, we will focus on the new rules of "super-flexibility" needed for continuous recalibration and adaptation.

49-884, Special Topics: Internet of Things (IoT) Leadership – 6 units

IoT is dramatically enhancing our lives by automating non-value-added activities previously performed by humans; and by significantly improving our work and living environments through the combination of smart hardware and AI applications. All aspects of modern life will eventually be affected by IoT. Given the novel combination of innovation, technologies, processes, and commercialization opportunities for IoT, product managers and engineers can benefit from comprehensive knowledge of what it takes to conceive, develop, and commercialize these solutions. Given IoT's impact on society, it is essential to learn and appreciate what has already been deployed in various industries as examples of what is possible and serve as inspiration and learning.

Updated July 21, 2021

