Integrated Innovation Institute
Spring 2018 Course Descriptions

Please review the course descriptions for our curriculum per degree and courses shared across the Pittsburgh & Silicon Valley campuses below.

This document is designed to complement the degree specific course plan handout. The course plan will note which courses are required or electives for each degree.

Course descriptions will be released in advance of graduate student registration each semester.

Master of Integrated Innovation for Products & Services
Pittsburgh Campus

49-704, Integrated Innovation Seminar & Workshop Series – 0 units
The Integrated Innovation Seminar & Workshop Series meets multiple times throughout the fall and spring semester. Seminars will focus on intellectual content from industry leaders in innovation and product development. Workshops will focus on skill building in key areas for integrated innovators. This course is a requirement of the Master of Integrated Innovation for Products & Services degree. The seminar & workshop schedule for each semester will be released on the first day of classes.

49-710, Visual Processes – 6 units
Students in the Integrated Innovation Institute learn about a variety of different ways we leverage visual communication techniques and approaches to communicate. We will cover the following:

• Industrial Design Sketching
• Information visualization & dashboards
- Graphic User interface design
- Executive Summary and Pitch Decks
- Visual Brand Language, Templates and Styling
- Visual Explanations
- Storyboarding and making simple videos

Guests from industry will join us with stories from their work each week, and weekly homework assignments will allow students to demonstrate their understanding of the technique and its application. This course is intended for MII-PS students; all other students by permission of the instructor.

49-713, Designing for the Internet of Things – 6 units
Thermostats, locks, power sockets, and lights are all being imbued with “smarts” making them increasingly aware and responsive to their environment and users. This course will chart the emergence of the now connected world to explore the possibilities for future products and connected spaces. This introductory, hands-on course invites students to creating connected products without any knowledge of programming, electronics or systems. Students will be introduced to interactive connected technologies through a series of hands on exercises, collaborative projects, in depth discussions, and instructor led tutorials. Topics explored will include awareness, real time sensing and communication, embedded intelligence, and designing experiences for the internet of things. By the end of this course, students will be familiar with the core skills, the considerations involved and design process required to build a connected system. Students will also apply this learning in collaborative groups to realize a prototype-connected product.

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.

49-732, Special Topics: Medical Device Innovation – 6 units
The increasing pace of medical discoveries and emerging technologies presents a unique and exciting time for medical devices. Medical devices range from biomaterials that stimulate the body to repair itself to drug eluting stints to robotic surgical systems. Because they seek to improve and prolong human health, there are unique requirements and challenges for medical device development compared to most other industries. This class will look at how medical device innovation is currently practiced as well as the drivers which govern it, such as the FDA, intellectual property, reimbursement, and funding. By the end of this course, students should be able to: (1) obtain a broad understanding of medical devices; (2) identify new product opportunities; (3) understand the drivers that affect medical device development; and (4) develop strategies to address those drivers within the overall medical device development plan.
49-733, Special Topics: Designing Smart Systems - 6 units
Driven by the combination of increased access to data, computational power, and improved algorithms, data science and artificial intelligence technologies have become mainstream. These technologies include machine learning, natural language and speech processing, expert systems, robotics, and vision. Historically, early programs applying these capabilities were designed to operate on their own, on very narrow tasks, based on pre-programmed knowledge. Today, we have the ability to design human-computer systems in which both humans and computers act intelligently, adapt to the world and learn from experience, improving their performance over time. How do we design such collaborative systems, taking advantage of the fundamentally different ways in which humans and computers act and learn? How do we build smart systems that achieve their intended goals, with a minimum of unintended side effects?

The mini-course will give students the opportunity to address such questions. After an introduction of some basic concepts and techniques in AI and data science (only a basic familiarity with statistics is assumed), the course illustrates both the potential and current limitations of these techniques with examples from a variety of applications. We spend some time on understanding the strengths and weaknesses of human decision-making and learning, specifically in combination with AI systems. Exercises will include close examination of the inputs and outputs of various technologies with the goal of learning to select appropriate technologies for a given problem and anticipate design implications. Each student will also complete a final project that takes a project from start to finish (framing the problem, choosing data sources, exploratory data analysis, basic modeling, communicating results).

49-741, Integrated Product Development Capstone - 12 units
The IPD course focuses on team-based integrated product development among engineering, business, and design disciplines. The semester course consists of four modules including identifying, understanding, conceptualizing and introducing a product opportunity. Interdisciplinary teams of students in engineering, business, and industrial design learn
methods 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. The course also focuses on communication of the project through multiple presentations and reports.

Master of Science for Software Management
Silicon Valley Campus

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).

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.

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.

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.
49-781, Data Analytics – 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.

49-788, Mobile Apps for the 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.

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.

Master of Science for Technology Ventures

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

49851, 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.

49852, 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.

Shared Courses: Integrated Innovation Institute
Distance Learning Options for Pittsburgh & Silicon Valley students
Please check the degree course plan to see how these courses are part of each specific degree.

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.

49-804, 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.

49857, Dynamic Global Teams – 6 units
Dynamic teamwork and collaboration is 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.