Master of Integrated Innovation for Products & Services (9 months)
2015-2016 Course Descriptions

Fall 2015 – 60 units

**Fundamental Courses**
*(Two of the three courses below are required)*

**Engineering Design Fundamentals 49-700** – 6 units
Engineering Design Fundamentals will teach the basic principles and philosophies of engineering design (with emphasis on mechanical engineering). Topics include stress analysis and fracture, heat transfer, kinematics, and systems packaging. Students will learn the issues engineers must consider during design of commonly produced products. Class includes lectures and labs.

**Industrial Design Fundamentals in Context 49-701** - 6 units
IDF in Context introduces non-design students of the MIIPS program to the placement of products in the marketplace. Through lectures, discussions and assignments students will gain an understanding of the evolution of products in preparation to conceive of products in the IDF in Practice course.

**Business Fundamentals 49-702** – 6 units
The purpose of the class is to introduce basic business management concepts and to provide the motivations to make these topics more relevant as they appear in later more advanced classes. We will cover six basic functional business areas: accounting, finance, marketing, operations, strategy, and managing technology & innovation. In addition to covering theory and applications, the course will use a business simulation to help students to understand how the functional areas tie together.

**Required Courses**

**IPD Methods 49-740** – 6 units
This course is an introduction to the Integrated Product Development (IPD) methods and the curriculum in the MII-PS program. This mini will cover methods for the first three phases of the IPD method: Identifying opportunities for new products and services; understanding those opportunities including stakeholder research and product value propositions, as well as competitive analysis; and conceptualizing opportunity solutions that meet the value proposition. This course will combine lecture, project and team skills.
Design For Manufacture 49-730 – 6 units
This course reviews manufacturing processes, the upstream implications on the overall design process (Design for Manufacture), and the downstream effects on assembly and recyclability, robustness and quality, platform design, maintenance and safety, economics and costing, and lean manufacturing. The class will study basic fundamentals in each of these areas and how they affect design decisions. This course is offered as first of two sequenced courses, 49-731, Design for the Environment is offered in Mini 2.

Design for the Environment 49-731 – 6 units
This course explores environmental issues and the necessary consideration on the design and manufacture of sustainable products. Life cycle analysis and other impact measures are explored to guide practical DfE approaches. A major project, that includes sustainability and manufacturing, ties together concepts from design for the environment and design for manufacturing (covered in the course DFM). This course is offered as the second of two sequenced courses, 49-730, Design for Manufacture is offered in Mini 1.

Career Planning for Integrated Innovators 49-703 – 6 units
This highly interactive class will work to assist students in uncovering abilities and identifying goals towards a career in product design/development. It will also look at ways to communicate the unique values MIIPS students have and align them with employer expectations. Students will then integrate those things into a career search plan. The class will alternate between lecture/presentations and coaching by experts and students presenting materials for practice and critique during class sessions.

Integrated Innovation Seminar & Workshop Series 49-704 – 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.

**Visual Processes 49-710 – 6 units
Most drawing courses help to build skills around rendering the already seen or giving new visual form to the not-yet-seen. This is a course that focuses on giving visible form to the non-visible: processes, systems, actions, and relationships.
**Advanced Visual Processes 49-711 – 6 units**
The course will cover principles, tools and strategies for representing and contextualizing products with people and in environments. Short exercises will compliment a longer project assignment that is intended to begin with basic representations and advance students quickly to more sophisticated representations using analog drawing approaches. Select digital tools, along with low fidelity desktop modeling, will occasionally be used in support of visualization goals. This course expects that you can demonstrate a good level of basic drawing at the start.

**User Research Methods 49-712 – 6 units**
User Research Methods will teach the basic methods of user research, including one-on-one interviewing and ethnographic techniques. The course will cover research planning, field research, and the analysis of research findings. Although the course will focus on qualitative and primary research, the benefits of quantitative and secondary research will also be addressed. The course includes lectures and discussions, along with readings and research assignments.

**Students will be placed into either Visual Processes or Advanced Visual Processes based on previous sketching and drawing experience.**

**One of the following Entrepreneurship Courses**

**Commercializing IP 49-800 – 12 Units**
CIT and the Integrated Innovation Institute will be offering a new unique 2-semester sequence in Innovation and Entrepreneurship. 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.

**Innovation & Entrepreneurship I 49-802 – 6 units**
Students learn practical recipes for creating “super flexible” high-tech entrepreneurial start-ups and innovative ventures in established corporations, with an emphasis on continuous adaptation to dynamic realities.
Spring 2016 – 48 units

Integrated Product Development 49-741 – 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.

The Leadership Challenge 49-804 – 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.

Designing for the Internet of Things 49-713 – 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.
Product and Brand Management 49-720 – 6 units
In this course, you will progress through a series of roles, from product assistant to group product manager/marketing VP, that give you the opportunity to experience what it is like to do product and brand management. Through interactive lecture, case discussions and assignments, you will learn how to make strategic and tactical decisions, and to deal with market and internal situations that typically face product managers. The course will have an emphasis on consumer marketing, but will also address aspects of business-to-business marketing in preparing you to manage products and brand value.

Enterprise Innovation 49-801 – 12 units
This course explores how all types of enterprises are being reinvented by innovations in software. This disruptive transformation is underway as software and IT systems migrate from administrative to revenue generating functions interfacing with customers and enabling task-based collaboration among all employees. Many firms are reaching a critical inflection point where these innovations are colliding with their legacy systems and a fundamental metamorphosis is taking place. The combined impacts of social, cloud, big data, sensors and mobile technologies are revolutionizing the way a firm functions. Software is the critical innovation mechanism; it is transforming how they interact with customers and ecosystem partners, the way teams collaborate and communicate, how they access and distribute information, and how they co-ordinate and control key activities. The role of the CIO is pivotal as firms seek to constantly innovate and adapt to changing realities. Flexibility, versatility and the capacity to quickly adapt to new market opportunities and technological breakthroughs have become the critical innovation challenges.

Tailoring with Electives

Students can complete 24 units of approved elective credit within the MII-PS degree. These courses must be relevant to the product development process, must be approved by your advisor, and be at the graduate level to count toward your QPA. Below is a sample of electives offered during the 2014-2015 academic year. Elective offerings vary from year to year and a complete pre-approved list will be provided during student advising appointments each semester.

Example: 2014-2015 Electives

Human Computer Interaction
- 05-630, Programming Usable Interfaces
- 05-688, Small Group Study in HCI
- 05-839, The Data Pipeline: Collecting and Using Data for Interactive Systems
- 05-863, Introduction to Human Computer Interaction for Technology Executives
- 05-899, Special Topics: Mobile Service Innovation
Business/Management/Entrepreneurship
  • 45-805, Entrepreneurial High Growth Companies
  • 45-833, New Product Management
  • 45-836, Consumer Behavior
  • 45-843, Organizational Power & Influence
  • 45-872, Technology Strategy
  • 45-960, Sustainable Operations
  • 46-832, Marketing Research

Design
  • 51-732, Mapping & Diagramming
  • 51-748, Cardboard Modeling I (Special Topics for 2014-2015)
  • 51-752, Cardboard Modeling II (Special Topics for 2014-2015)
  • 51-796, Design Ethos & Action
  • 51-856, Visualization in Design
  • 51-884, Creating in Social Complexity

Social Innovation/Public Policy
  • 90-845, Social Innovation Incubator
  • 94-801, Acting for Management
  • 94-811, Strategy Development
  • 94-813, Project Management
  • 94-858, Communicating Complexity

Pre-Approved Electives
Please note that this list not complete and that there is no guarantee a student will be able to secure a spot in these courses. A complete pre-approved elective list will be provided during fall term orientation and spring term academic advising appointments each year.

Courses must be relevant to the product development process and must be approved by the advisor.

Also note that some courses are offered in the Fall or Spring and some are offered in both and that some course schedules may conflict with the schedule of a required MII-PS course. For the most up to date information about these courses and others offered across the CMU campus, please visit the CMU Schedule of Classes website.
MII-PS Advanced Degree Additional Courses (16 months)

Summer 2016 – 3 units

Integrated Innovation Institute Internship/Practica 49-748 – 3 units
This course is for students in the MIIPS – 16 month program who are pursuing an internship. Internships work can be conducted on-site with a company or thru sponsored projects at the Integrated Innovation Institute. At the end of the summer, students will submit a paper reflecting on their internship experience and how it relates to the MII-PS curriculum. Special permission is required to be enrolled in this course. This course is only offered during the summer. The internship is a required part of the MIIPS 16 month program

Fall 2016 – 36 units

Integrated Innovation Institute Masters Essay 49-747 – 12 units
This course is required in the final fall semester of the MIIPS 16-month program. The masters essay will 1) assimilate the teachings of the program and the summer internship, 2) allow the student to put the context of the program in perspective with respect to the literature, 3) expose applications or extensions of the program teachings in the context of an application or field of study. A written masters essay and public presentation will be required. Each student will be assigned faculty advisor for the essay course.

Example Masters Essays:
• How does the IPD method align with the teachings of Herb Simon on the Science of Design?
• How does service and physical product design differ or align?
• What is the difference in innovation between a start up and an established company?
• How can policy on innovation trickle down to innovation practice?

Tailoring with Electives

Students can complete an additional 24 units of approved elective unit within the MII-PS Advanced Study degree. These courses must be relevant to the product development process, must be approved by your advisor, and be at the graduate level to count toward your QPA.

See example electives listed under the 9 month curriculum.