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# IPD

INTEGRATED PRODUCT DESIGN

*UNIVERSITY OF PENNSYLVANIA*

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## **Guidelines for Graduate Study**

**September 2009**

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School of Engineering and Applied Science  
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***\*Theses guidelines are subject to change.***

The University of Pennsylvania's Integrated Product Design program is intended to cultivate design professionals that possess both a breadth of knowledge and a depth of expertise in a specialty, in order to effectively bridge the domains of technology, manufacturing, business, aesthetics, and human-product interaction. The guiding philosophy of the program is not only to teach students to create products, but to understand and address the social, environmental and experiential contexts of those products, so that product design can be harnessed as a force for the greater good.

The program builds the skills to investigate, imagine, conceptualize and model wide range of products and their complementary business models. The program draws on the strengths of three internationally recognized schools within the University: the School of Engineering & Applied Science, the Wharton School, and the School of Design.

The graduate courses that make up the program are intended to create an interdisciplinary point of view, and are taught by professors from all three schools. Studio classes accompany classroom studies, providing creative and analytical approaches, and shifting students between rigorous, technical and explorative processes in the development of both experiential and theoretical knowledge. Collaborative team projects and student-driven independent projects complement the core courses to give students both a solid grasp of the fundamentals and a deep understanding of the nuances of these fields.

The information presented in these Guidelines is not exhaustive; students should also obtain information from the Penn Engineering website: <http://www.seas.upenn.edu/graduate/handbook/index.php>

More information, updated periodically, on the IPD program is also available on the website, [www.me.upenn.edu/ipd](http://www.me.upenn.edu/ipd). Reading all of the rules and procedures is essential in order to be familiar with various degree requirements and the plentiful opportunities that are available.

These guidelines together with the information presented on the above listed websites will answer most of your questions. Advice and answers to questions not covered in these sources may be obtained from the Director<sup>1</sup>, Associate Director<sup>2</sup>, or Graduate Program Coordinator<sup>3</sup>, or through one of your advisors.

## **2. PROGRAM ADVISING**

There are two areas of advising within the IPD program, master's program academic progress advising and thesis specific advising. The first person with whom a new student will have contact will be the Director, Associate Director or Graduate Program Coordinator of the IPD program. These people will be responsible for monitoring the student's academic plan and progress during the IPD Master's program. In addition, during the first or at latest second semester of thesis work, each team or individual pursuing a thesis project will be responsible for selecting an additional three thesis committee members, one primary, and two secondary to join the Director and Associate Director in overseeing the team or individual's thesis. Normally, one advisor each will be chosen from the School of Engineering and Applied Science, the School of Design and from the Wharton School. In certain cases, though, one of the secondary advisors may come either from another area of Penn pertinent to the project pursued, or from outside the university. Choices of advisors must be approved by the Director. These five individuals will form the "thesis advisory committee" on the particular individual or group thesis project.

## **3. DEGREE REQUIREMENTS**

To achieve a Master of Science in Engineering, Integrated Product Design, the MSE requirements consist of a total of ten courses, including three sequential credits of Master's level Thesis Project work, seven of which must be from within the School of Engineering and Applied Science. Since this program is cross-disciplinary, students who do not have the requisite background in the three areas, engineering, design arts, and marketing/finance, may need to enroll in additional background courses in these areas.

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Background courses must be taken for a grade and a grade of “B” or better must be achieved to satisfy the background requirement.

**Background Courses** (0-3 CUs or proficiency shown)

Engineering Basics:

MEAM 101 Introduction to CAD/CAM,  
MEAM 150 Fundamentals of Mechanical Prototyping  
or comparable approved by the Director

Design Art Basics:

IPD 403 / ARCH 403 Design Fundamentals  
or comparable approved by the Director

Marketing/Finance Basics:

MKTG 101 Introduction to Marketing  
or comparable approved by the Director

**Core Courses** (2 CUs)

IPD 511 Creative Thinking & Functional Iteration in Design (1 CU)  
IPD 515 (MEAM 515/OPIM 515) Product Design (1 CU)

**Breadth** (1 CU in each in engineering, design, and business)

Engineering Breadth:

MEAM 510 Design of Mechatronic Systems (1 CU)  
IPD 514 Design for Manufacturability (MEAM 514) (1 CU)  
or comparable approved by the Director

Design Arts Breadth:

IPD 526 Furniture Design (ARCH 726) (1 CU),  
IPD 527 Industrial Design (ARCH 727) (1 CU),  
IPD 528 Industrial Design II (ARCH 728) (1 CU),  
IPD 532 Architectural Surface Effects (ARCH 632) (1 CU)  
IPD 544 Digital fabrication in architecture (ARCH 744) (1 CU)  
or comparable approved by the Director

Business Breadth:

EAS 545 Engineering Entrepreneurship I (1 CU)  
MKTG 756 Marketing Research (1 CU)  
MKTG 776 Applied Probability Models in Marketing (1 CU)  
OPIM 662 Enabling Technologies (1 CU)  
OPIM 656 Operations Strategy and Process Management (1 CU)  
or comparable approved by the Director

**Depth** (1 CU) An additional course in one of the three breadth areas above, designating the field the student chosen to concentrate.

**Elective** (1 CU) One additional graduate level course in engineering, design, or business or independent study or another area pertinent to the individual’s specific area of interest or study.

IPD 699 **Integrated Product Design Seminar** (0 CU; 2 semesters)

IPD 799 **Thesis Project** (3 CUs)

- \* If a course is cross-listed students must register for the IPD section when available.
- \*\* Prior to the fall of 2008 ARCH 727 / MEAM 512 Design Arts Basics was a background course and could not be taken for credit in fulfillment of the degree requirements.
- \*\*\* Any deviation from the above must be approved by the Director.

#### **4. ATTENDANCE AT DEPARTMENTAL SEMINARS AND THESIS PRESENTATIONS**

The attendance of all full-time graduate students at IPD seminars is mandatory. There are many good reasons why students should attend departmental seminars even when the seminars are not directly linked to their areas of research. For example:

- o The seminar provides an opportunity to learn about the state-of-the-art companies, designs, technologies, ideas, etc.
- o The seminar provides an opportunity for the student to get acquainted with people from other institutions and companies and get an inside view of their culture and ideas. On more than one occasion, during job interviews, interviewers have been known to mention a visit to Penn and delivering a seminar.
- o The seminars are meaningful simply to learn what new and interesting things are going on in the world.
- o The seminars are an excellent opportunity to get together as a department. It is hoped that a full attendance at these seminars will help create departmental spirit and cohesiveness.

##### Seminar Course

The seminar course has been established so that students are recognized for their seminar attendance as well as to encourage students to attend. There are no quizzes, tests, or homeworks. The course is graded S/U. In order to obtain a satisfactory (S) grade, the student must attend the IPD seminars. In order to obtain their degree, MSE students are required to accumulate 2 seminar course credits (IPD 699). Under special circumstances, e.g., in a case of a conflict with a course offering, the student may waive the seminar requirement for the particular semester by petitioning to the Director. Part-time students are exempted from the mandatory overall seminar attendance requirement although they are strongly encouraged to attend all possible seminars.

#### **5. GENERAL INFORMATION**

##### Registration:

All students enrolled in a degree program are required to be continuously registered. Three courses per semester (including studio project research, such as IPD 799 Thesis Project and independent studies) is considered to be a normal full-time load for all students. Students in the IPD MSE program may take up to five courses in a semester if they are in excellent academic standing (with a G.P.A. of 3.5 or better). Approval from the program Director is necessary if the student wants to take more than four courses in their first semester. Students must always consult with the Director if a deviation from the normal load is desired or being contemplated. Part-time students usually take one or, at most, two courses per semester.

Students must complete an advisor's sign-off form. This form may be found in Appendix A and should be submitted to the Director or Associate Director of the IPD program prior to registering for courses.

##### Leaves of Absence:

Continuous registration as a graduate student is required unless a formal leave of absence is granted by the Dean of the student's school. A student who has reached dissertation tuition status will not be granted a leave of absence, except for military duty, medical reasons, or when a student receives a grant for dissertation research abroad and the grant does not include funds to pay home institution fees. A student not on dissertation status who desires a leave of absence must submit a request to the Director and to the Graduate Division Office.

### Obsolescence:

The maximum time allowed for the completion of all MSE requirements is seven years. Course units that are older than seven years may not be counted toward the degree requirements.

### Changes in Course Program:

Students may add or drop courses without penalty during a semester if it is done by the deadline listed in the current graduate bulletin. The Director or Associate Director must be informed of the student's decision beforehand and must receive his/her approval.

### Grades, Credits, and Academic Standing:

The grading system is as follows: A (4.0), Excellent; B (3.0), Good; C (2.0), Fair; D (1.0), Poor; F (0.0), Failure. A course in which an F was obtained must be taken again; however, the F will remain on the student's transcript. Courses for which a passing grade was obtained cannot be retaken for credit. An incomplete (I) or a no report (NR) are temporary notations and students are allowed a period of one semester to clear them from their transcripts. Failure to clear an "incomplete" or "no report" within the allotted time will result in an automatic grade of F. *No students will be permitted to graduate if there are any Incomplete, Unsatisfactory, or No Report notations on their records.*

MSE Students in the School of Engineering are expected to maintain at least a B- average (2.7) in their work. A student whose record falls below a B- average will be put on academic probation and may be required to withdraw; graduation requires a minimum of a B- average.

## **6. INDEPENDENT STUDY**

Independent study courses (IPD 799) are important vehicles to accommodate special interests of the students which are not served through the regular courses. They create opportunities for miniprojects and a mentoring relationship between the student and the faculty. IPD 799 can only be counted towards the elective requirement and must be a topic independent of your thesis work.

Since independent studies are less structured than regular courses and typically do not come with strict deadlines, occasionally students tend to fall behind in their work. There is also the possibility of miscommunication between the student and the faculty on the objectives, extent, scope, and the grading method for the independent study. The purpose of this policy is to set the rules for an independent study with the objectives of maintaining academic rigor and minimizing any potential for miscommunication.

An independent study course should require effort comparable to that of a regular course, about 9 hours a week or a total of 126 hours per semester. The student should meet the faculty member administering the independent study (the advisor) on a regular basis, at least once a week. It is the student's responsibility to schedule these weekly meetings. Past experience indicates that failure to maintain regular contact with the student's advisor can lead to a less than satisfactory performance in the independent study course. In the absence of regular contact, the student stands the risk of not being focused leading to an impression of dereliction. The key to a successful independent study is a steady effort throughout the semester. The student should not expect to be able to cram a semester's work into a few days of intensive work at the end of the semester.

Prior to the beginning of the semester in which the student contemplates taking the independent study, the student and his/her advisor should develop a brief document. The first paragraph of the document should describe the objectives, scope, and content of the independent study. The second paragraph should state how the independent study will be evaluated and how the student will be graded. The document should be signed by both the student and his/her advisor, and it should be submitted to the program Director for approval before the beginning of the semester.

At the conclusion of the independent study, the student should prepare a brief report specifying what material was covered during the independent study, those objectives that were met and those that were not. In the event that objectives were not met, a clear explanation should be provided as to why such

objectives were not met. This document should also be signed by the student and his/her advisor, and it will be included in the student's file.

It is the student's responsibility to make sure that these guidelines are followed. Failure to follow these guidelines may result in the student not receiving credit for the independent study.

## **7. POLICY ON TRANSFER OF CREDIT UNITS EARNED IN OTHER INSTITUTIONS**

MSE students may obtain credit for up to two courses taken at another institution. These courses are referred to as transfer courses. Transfer courses must be graduate level courses in which at least a B grade has been earned. Transfer credit will only be considered for courses taken prior to matriculation in the graduate program in the Department of Mechanical Engineering and Applied Mechanics. To obtain credit for courses taken at other institutions, the following procedure must be followed:

For each transfer course, obtain information about the, e.g. course description, syllabus, homeworks and/or exams and the title of the textbook prescribed for the course.

Identify a professor who teaches a similar course at Penn. If a similar course is not offered at Penn, identify a professor whose areas of expertise are in the general area of the course to be transferred. The professor should certify that the course is of similar level to a graduate course offered at Penn or, if a similar course is not offered at Penn, that the course qualifies for Penn students to take at the graduate level if it were offered here.

Submit a petition on a standard form (<http://www.seas.upenn.edu/forms/documents/gtransfer-credit.pdf>) to the program Director. Attach to the petition a copy of the transcript, the professor's certification, and documents and information noted on the standard form.

## **8. MASTER'S THESIS PROJECT**

The Thesis Project is a 3CU project expected to be achieved in 3 consecutive semesters. Students will register for one credit unit of IPD 799 each semester they are working on the thesis project.

The project is an opportunity to manifest a synthesis of art, business and technology and to push the envelope of design possibility in the context of user need and market forces. The project will involve the development of a product from concept, user need, marketing analysis and design implementation to prototype and feasibility testing.

The thesis project is ultimately supervised by a self- or group-chosen primary thesis advisor and two secondary advisors along with the Associate Director and Director of the IPD program. Attendance and participation in thesis seminars, discussions and student presentations in addition to all design thinking and prototyping work will be part of the thesis project grade.

During the first semester of work, students will be advised by the Associate Director and Director, and will explore two to three potential thesis topic areas individually. The goal of this exploration is for the individual student to explore the parameters and possibilities within each area. Near the end of the first semester, all students should be determining whether some of the ideas researched that semester could become team projects for the two remaining semesters. By the beginning of the second semester, students will determine what teams will be formed around promising thesis topics, and what individuals would prefer to pursue individual thesis topics.

At the beginning of the second semester of research, students must obtain three thesis advisor. The students should then submit a written proposal to these three advisors and the Director and Associate Director, outlining their thesis project objectives, scope and content. The proposal should typically contain a statement of the objective of the work, a pertinent state-of-the-art review, the scope of the studies performed so far and envisioned, and an outline of the theorized final deliverables. The advisors

will evaluate the proposal and make recommendations on how it can be improved. It is not unusual for this document to be discussed and revised early in the second semester. It is the student's or team's responsibility to seek a consultation from the members of the thesis advisory committee during the second and third semesters of research. These consultation sessions are intended to be helpful in discussing the student's thesis project proposal and to ensure that the interdisciplinary requirement all areas of this program are fulfilled. It is additionally the student's or team's responsibility to organize for all three of their thesis advisors to attend one of the weekly thesis seminar discussion together.

At the end of the second semester of research and analysis, students will present envisioned final design directions and detail development for their final thesis project.

At the end of the students' third semester of research a public presentation of the work is then made. All studio thesis projects must be publishable by the University and the contents cannot be restricted from dissemination to the community at large by the candidate's place of employment or the sponsoring agency, government, or any person. Any computer source code which constitutes a portion of the thesis (with the exception of readily-available commercial software) must be available to the University for pedagogical purposes. It is the responsibility of the student to insure that the above requirements are duly considered in the planning and execution of the research program and in the presentation of the final document.

## **9. SUBMATRICULATION**

Outstanding undergraduate students at the university may submatriculate in the MSE degree program and take graduate-level courses as electives during their senior year. After fulfilling the requirements of both programs, the student will receive a B.S.E. and a MSE degree. Undergraduates at the University of Pennsylvania may double-count up to three graduate level courses taken while enrolled as a submatriculant towards both the undergraduate and the graduate degree. If thesis work is begun before the end of the senior year, the MSE degree may be completed in two extra semesters of study. In order to complete both degrees in only five years, students can consider:

- Taking the background courses during the undergraduate program.
- Take two extra graduate-level courses (cannot be counted towards the B.S.E. degree) during the undergraduate program.

Applications to the program must be completed by the March 1 deadline and before the end of the junior year. Submatriculation applications are available via the Penn Engineering website.

## **10. DUAL DEGREE PROGRAMS**

Students may enroll in a dual degree program and receive an MSE degree in Integrated Product Design and any of the other disciplines in the Engineering School such as Electrical and Systems Engineering, Bioengineering, Computer Science, Chemical and Biomolecular Engineering, and Materials Science Engineering. The dual degree program requires the completion of at least 17 courses (not including background courses) and satisfaction of the MSE requirements of each department in which the student wishes to major. This program typically requires four semesters to complete. To enroll in this program, the student must complete an application form, list the course plan for both programs and obtain the approval from the Director/Graduate Group Chairman of each department. Applications for this program are available in the Academic Programs Office in 111 Towne Building.

A dual degree is also offered with the School of Design (Architecture). Please contact the School of Design about the requirements for this dual degree.

## **11. SUMMER STUDIES**

There are several possibilities for scholarly activities by graduate students at the University during the

summer, including:

- Independent study or master's thesis project (IPD 899 or IPD 799) with an instructor willing to act as a supervisor during the summer.
- Course work outside SEAS, as well as a limited number of regular courses occasionally offered by some SEAS departments. The Director must approve summer school courses.

## **12. RECORDS**

The official graduate student records are kept in 111 Towne Building; transcripts can be viewed on Penn InTouch at <https://sentry.isc.upenn.edu/intouch>. Graduate students are encouraged to periodically check the accuracy of their records and to bring any discrepancies to the attention of the Director.

**APPENDIX A**

**Program Advisor Sign-Off Form**  
**INTEGRATED PRODUCT DESIGN**  
Mechanical Engineering and Applied Mechanics  
School of Engineering and applied Science  
University of Pennsylvania

To the Student: This form **must** be filled out by ALL IPD graduate students in order to register for courses for next semester. Please complete and return this signed form to the MEAM main office.

Today's Date: \_\_\_\_\_ For the Term: \_\_\_\_\_

Student Name: \_\_\_\_\_

Email address: \_\_\_\_\_ / Tel Num: \_\_\_\_\_

Academic Advisor: \_\_\_\_\_

Thesis Committee Members

\_\_\_\_\_  
Primary                                      Secondary                                      Secondary

Comments (Background Course Requirements)

Business                       Design Arts                       Engineering

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PROGRAM ADVISOR SIGN-OFF:**

\_\_\_\_ I have met with the above student; please clear this student to register for next semester.

\_\_\_\_\_  
Student's Signature                                      Date

\_\_\_\_\_  
Director or Associate Director's Signature                                      Date