
Interdisciplinary Programs

GRADUATE PROGRAMS

Interdisciplinary programs promote intellectual growth and offer distinct challenges to conventional thinking. They address areas that are too broad or too complex to be dealt with adequately by a single academic discipline. Interdisciplinary programs are essential for the education of graduate students involved in Technogenesis projects, i.e., projects concerned with the nurturing of technology from concept to realization. It is also the case that some interesting scholarly areas involve the blending of two or more academic disciplines, e.g., management science juxtaposes operations research and business. Students interested in an interdisciplinary program at either the master's level or the Ph.D. level may proceed as follows:

- The student outlines in writing the program that he or she would like to undertake and submits it to the Dean of Graduate Studies.
- If the Dean Graduate Studies approves the program, an interdisciplinary advisory committee is appointed to study the program.
- If the committee accepts the program, the student and the committee prepare a Study Plan and submit it to the Dean of Graduate Studies for approval
- One member of the committee is appointed to be the student's Faculty Advisor and the committee performs the usual departmental functions.

In addition, Stevens offers a variety of specific interdisciplinary programs. These programs are described below.

Master of Science – Information Systems

The following tracks are designed to meet the increasing need for information technology professionals with both managerial and technical skills. These interdisciplinary programs involve the School of Technology Management and the Computer Science department. For complete description and additional information about the Master of Science – Information Systems program, please refer to the School of Technology Management section of the Catalog.

Computer Science Concentration
E-Commerce Technical Track
Information Security
Integrated Information Architecture Track
Quantitative Software Engineering Track
Systems Engineering Track
Telecommunications Management Track

Master of Science – Telecommunications Management

The School of Technology Management administers the interdisciplinary graduate program in Telecommunications Management. This program, which leads to a Master of Science degree, is offered jointly with the Department of Electrical and Computer Engineering. A four-course graduate program leading to a Graduate Certificate in

Telecommunications Management is also available. Please refer to the School of Technology Management section of this catalog for a complete description of this program and its courses.

Integrated Product Development

The increasing demand placed on the military and commercial sectors to improve the quality and reliability of engineering systems while cutting costs in a rapidly changing technological world are creating new challenges for industry and government personnel responsible for planning and leading multidisciplinary product development projects. The traditional disciplinary engineering programs do not address the skill set, competencies, and practices needed for integrated product development. The Charles V. Schaefer, Jr. School of Engineering, a leader in engineering education, is offering both graduate certificate and degree programs in Integrated Product Development that stress the design, manufacture, implementation, and life-cycle issues of engineering systems. The programs focus on innovative designs and methodologies, and on new materials and process technologies in new product development. The programs aim to provide an innovative view of the landscape of product development to practitioners from different engineering disciplines, to enhance their practice of engineering today and to position them for career growth in the global economy.

The Integrated Product Development degree is an integrated Master of Engineering degree program focusing on the integrated and multidisciplinary aspects of product development. The core courses emphasize the design, manufacture, implementation, and life-cycle issues of engineering systems. The remaining courses provide a disciplinary focus. The program embraces and balances qualitative as well as quantitative aspects, and utilizes state-of-the-art tools and methodologies. It aims to educate students in problem-solving methodologies, modeling, analysis, simulation, and technical management. The program trains engineers in relevant software applications and their productive deployment and integration in the workplace. A full description of this program can be found in the Mechanical Engineering department section.

Microelectronics and Photonics Science and Technology

The Physics and Engineering Physics, Electrical and Computer Engineering (EE) and Materials Engineering each offer a Master of Engineering degree with an interdisciplinary concentration in Microelectronics and Photonics Science and Technology. Students are required to take the departmental degree core courses and EE/Mt/PEP 507 Introduction to Microelectronics and Photonics. A full description of the program can be found in the Chemical, Biomedical and Materials Engineering department section.

Doctoral Program (Interdisciplinary)

Interdisciplinary programs, such as Integrated Product Development, may be arranged by the Dean of The Graduate School at the request of the student. To oversee and approve such a program, the Dean of The Graduate School, on the advice of faculty responsible for the programs involved, will designate a professor from each of the pertinent disciplinary areas to serve on a special advisory committee. The committee chairman will ordinarily be the professor who supervises research.

To earn a doctoral degree, a student needs to complete at least 90 credits of which there are usually 50 to 60 course credits and at least 30 thesis credits. The mix of cred-

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its will be decided upon by the student's principal advisor. Doctoral study plans typically include all core course subjects in concurrent engineering.

Doctoral students are also required to successfully complete two days of qualifying examinations. The first day will be devoted to the concentrated area of study and will cover topics studied in the core courses. The second day of examinations will be organized by the student's doctoral committee and will include selected topics from the student's focused area of concentration. The student, with guidance from the student's doctoral committee, will also present the thesis proposal and an oral defense of the thesis as per the guidelines published in the Graduate Student Handbook.

Interdisciplinary Ph.D. Program Involving Physics and Materials

An interdisciplinary Ph.D. program is jointly offered by the Department of Physics and Engineering Physics and the Materials Program in the Department of Chemical, Biochemical and Materials Engineering. This program aims to address the increasingly cross-cutting nature of doctoral research in these two traditional disciplines, particularly in the area of solid state electronics and photonics and in the area of plasma and thin-film technology. The interdisciplinary Ph.D. program aims to take advantage of the complementary educational offerings and research opportunities in these areas offered by both programs. Any student who wishes to enter this interdisciplinary program needs to obtain the consent of the two departments and the subsequent approval by the Dean of Graduate Studies. The student will follow a study plan designed by his/her faculty advisor(s). The student will be granted official candidacy in the program upon successful completion of the qualifying exam that will be administered according to the applicable guidelines of the Office of Graduate Studies. All policies of the Office of Graduate Studies that govern the credit and thesis requirements apply to students enrolled in this interdisciplinary program. Interested students should follow the normal graduate application procedures through the Dean of Graduate Studies.

Interdisciplinary Graduate Certificate Programs

Atmospheric and Environmental Science and Engineering (Interdisciplinary)

Pep 575 Fundamentals of Atmospheric Radiation and Climate
CE 691 Introduction to Dynamic Meteorology
ME 532/EN 506 Air Pollution Principles and Control
EN 550 Environmental Chemistry and Atmospheric Processes

Information Security

Mgt 645 Cyber Security Principles
Mgt 762 Enterprise Architecture for Information
CS 573 Fundamentals of Computer Security
CS 694 E-Business Security & Information Assurance

Integrated Product Development

IPD 601 Integrated Product Development I
IPD 602 Integrated Product Development II
IPD 611 Simulation and Modeling
IPD 612 Project Management and Organizational Design

Pharmaceutical Manufacturing Practices

The Graduate Certificate in Pharmaceutical Manufacturing Practices is an interdisciplinary School of Engineering certificate developed by the Department of Mechanical Engineering and the Department of Chemical, Biomedical and Materials Engineering. This certificate is intended to provide professionals with skills required to work in the pharmaceutical industry. The focus is on engineering aspects of manufacturing and the design of facilities for pharmaceutical manufacturing, within the framework of the regulatory requirements in the pharmaceutical industry.

The certificate is designed for technologists in primary manufacturers, including pharmaceutical, biotechnology, medical device, diagnostic, and cosmetic companies, as well as in related companies and organizations, including architect/engineer/construction firms, equipment manufacturers and suppliers, government agencies, and universities.

(Interdisciplinary between Mechanical Engineering and Chemical Engineering)

- PME 530 Introduction to Pharmaceutical Manufacturing
- PME 531 Process Safety Management (ChE Graduate Course)
- PME 535 Good Manufacturing Practice in Pharmaceutical Facilities Design
- PME 540 Validation and Regulatory Affairs in Pharmaceutical Manufacturing and *one* of the following electives:
 - PME 628 Pharmaceutical Finishing and Packaging Systems
 - PME 538 Chemical Technology Processes in API Manufacturing
 - PME 649 Design of Water, Steam, and CIP Utility Systems for Pharmaceutical Manufacturing (M.E Graduate Course)

Microelectronics

- EE/MT/PEP 507 Introduction to Microelectronics and Photonics
- EE/MT/PEP 561 Solid State Electronics I
- EE/MT/PEP 562 Solid State Electronics II
- CpE/MT/PEP 690 Introduction to VLSI Design

Microdevices and Microsystems

- EE/MT/PEP 507 Introduction to Microelectronics and Photonics
- EE/MT/PEP 595 Reliability and Failure of Solid State Devices
- EE/MT/PEP 596 Micro-Fabrication Techniques
- EE/MT/PEP 685 Physical Design of Wireless Systems

Any ONE elective in the three certificates above may be replaced with another within the Microelectronics and Photonics (MP) curriculum upon approval from the MP Program Director.

Photonics

- EE/MT/PEP 507 Introduction to Microelectronics and Photonics
- EE/MT/PEP 515 Photonics I
- EE/MT/PEP 516 Photonics II
- EE/MT/PEP 626 Optical Communication Systems

Credits earned in Graduate Certificate Programs may be used toward a master's degree.