Graduate Degree Programs

WPI offers graduate study leading to the master of science, master of engineering, master of mathematics for educators, master of business administration, and the doctor of philosophy degrees. Please see chart on page 10 for details.

The number of courses offered each year may be limited in some disciplines; however, the schedule of courses over a period of time generally allows a student taking three or four courses per semester to complete the course requirements in about two years. Students taking two courses per semester complete the course requirements for the master of science or engineering degrees in about three years, or the master of business administration degree in about four years.

Questions relating to these programs should be referred to the discipline department heads or the Graduate Admissions Office.

Master of Science (M.S.) Degree Programs
Available, on a full-time and part-time basis, in the following disciplines:
• Applied Mathematics
• Applied Statistics
• Biomedical Engineering
• Chemical Engineering
• Chemistry and Biochemistry
• Civil and Environmental Engineering
• Computer Science
• Construction Project Management
• Electrical and Computer Engineering
• Financial Mathematics
• Fire Protection Engineering
• Industrial Mathematics
• Marketing and Technological Innovations
• Manufacturing Engineering
• Materials Science and Engineering
• Mathematical Sciences
• Mechanical Engineering
• Operations and Information Technology
• Physics

Master’s Programs
Available only on a full-time basis in:
• Biology
• Biotechnology

• Chemical Engineering
• Master of Engineering (M.E.) Programs Offered in:
  • Biomedical Engineering
  • Civil and Environmental Engineering

Master of Business Administration (M.B.A.) Program
Provides students with strategies for the successful application of technology to complex business environments. The degree requirements are described in this catalog and in a separate brochure available from the Department of Management at 508-831-5218.

Master of Mathematics for Educators (M.M.E.) Program
In response to the national need to prepare junior and senior high school students with imaginative mathematics teaching, WPI offers a specific part-time graduate program, the master of mathematics for educators, for teachers of mathematics. This program allows junior high, high school and community college teachers an opportunity to obtain a master’s degree in a content-based program at a time convenient to practicing teachers. Taught by professors of mathematics at WPI, the program is designed to permit the teachers to learn from professors’ research interests and includes an understanding of current developments in the field. Scholarship aid, which covers approximately 40% of the cost of tuition, is available to qualified participants.

The Doctor of Philosophy (Ph.D.) Program
Available in biomedical science, mathematical sciences and all of the disciplines outlined previously except management programs, mathematics for educators, financial mathematics and industrial mathematics.

Interdisciplinary Doctoral Programs
New fields of research and study that combine traditional fields in innovative ways are constantly evolving. In response to this, WPI encourages formation of interdisciplinary doctoral programs to meet new professional needs or the special interests of particular students. Such programs are initiated by groups of at least three full-time faculty members who share a common interest in a cross-disciplinary field. A sponsoring group submits to the Committee on Graduate Studies and Research (CGSR) a proposal for an interdisciplinary degree, together with the details of a program of study and the credentials of the members of the group. At least one member of the group must be from a department or program currently authorized toward the doctorate.

If the CGSR approves the proposal, the sponsoring group serves in place of a department in establishing specific degree requirements beyond those of the Institute, in advising, in preparing and conducting examinations, and in certifying fulfillment of degree requirements.

WPI and Clark University pioneered in developing a graduate biomedical engineering program, jointly administered by the two institutions. More recently, WPI, Clark, the University of Massachusetts Medical School and the Worcester Foundation for Biomedical Research have joined to offer a doctoral program in research in biomedical science.

Graduate and Advanced Certificate Programs

Keeping pace with technological advancement today is a full-time job. At WPI, our innovative graduate level certificate programs are uniquely equipped to help you update your understanding with new concepts and insights, without a major commitment of time and money. WPI offers two certificate program options for individuals wishing to pursue graduate course work, with the benefit of academic advising and without committing to a full degree program, the Graduate Certificate and the Advanced Certificate. Upon completion of the required course work, students are awarded a Certificate of Graduate Study or a Certificate of Advanced Graduate Study in their particular program of study (e.g., Certificate of Graduate Study in Management with a specialization in Information Technology). Course credits may be applied to a graduate degree if the student is admitted to a degree program at a later date.

Graduate Certificate Program
The Graduate Certificate Programs (GCP) at WPI provide an opportunity for students holding undergraduate degrees to continue their study in an advanced area. A B.S. or B.A. degree is the general requirement. However, some departments look for specific backgrounds when making admission decisions. This program requires students to complete four to six thematically related courses in their area of interest. Each student’s program of
study must be approved by the academic advisor.

Biomedical Engineering
(Undergraduate degree in engineering or science preferred.)
- Medical Instrumentation and Devices

Civil and Environmental Engineering
(Undergraduate degree in civil engineering or another acceptable field preferred.)
- Construction Project Management
- Environmental Engineering
- Master Builder
- Materials/Transportation
- Structural Engineering
- Geotechnical Engineering

Computer Science
(Undergraduate degree in computer science or computer engineering preferred; students with other backgrounds may need to take CS 507 or CS 501 as bridge courses into the program.)
- Artificial Intelligence
- Computer and Communications Networks
- Computer Systems
- Database Design
- Graphics/Image Processing/Visualization
- Programming Languages
- Software Engineering and Interface Design

Electrical and Computer Engineering
(Undergraduate degree in electrical or computer engineering preferred.)
- Computational Fields
- Computer and Communications Networks
- Computer Science
- Computer and Communications Networks

Fire Protection Engineering
(Undergraduate degree in science or engineering preferred.)

Mathematical Sciences
(Knowledge of differential equations equivalent to that provided by an introductory college course required for the Industrial Mathematics Certificate Program; knowledge of statistics equivalent to that provided by an introductory college statistics course required for the Industrial Statistics Certificate Program.)
- Industrial Mathematics
- Industrial Statistics

Management
(Undergraduate degree in science, engineering or management preferred; individuals holding bachelor’s degree in other disciplines with relevant work experience also considered.)
- E-Commerce
- Information Technology

- Technology Marketing
- Management of Technology
- Customized Certificate of Management

Manufacturing Engineering
(Undergraduate degree in engineering, mathematics or computer science preferred.)

Materials Science and Engineering
(Undergraduate degree in engineering, chemistry, physics or mathematics preferred.)

Advanced Certificate Programs
The Advanced Certificate Programs (ACP) provide master’s degree holders with an opportunity to continue their studies in advanced topics in the disciplines in which they hold their graduate degree or that are closely related to their master’s degree fields. The programs consist of a set of five courses—none of which were included in the student’s formal master’s program of study. The courses may include either a depth or a breadth option. Each participating department identifies one or more guideline programs; however, each student’s program of study may be customized to satisfy the student’s unique needs. The program of study is reviewed and approved by an academic advisor who is assigned upon the student’s acceptance to the program.

Individuals may also apply for program admission to departments closely related to their master’s degree fields. The departmental Graduate Committee will review such applications on a case-by-case basis to determine the applicant’s eligibility. Individuals applying under this scenario would follow the same admission procedures as individuals applying who do not hold a WPI master’s degree. Advanced certificates, with just a few areas of possible specialization listed, are available in:

Civil and Environmental Engineering
- Waste Minimization and Management
- Building Regulatory Integration in Construction Management
- Computer Based Support Systems for Construction Management

Computer Science
- Advanced Computer Systems
- Advanced Computer Science
- Artificial Intelligence Data and Knowledge
- Data and Knowledge Based Systems
- Compilers and Languages
- Image Science

Electrical and Computer Engineering
- Computational Fields
- Computer and Communications Networks
- Advanced Computer Systems

Fire Protection Engineering
- Mechanical Engineering
  - Computational Mechanics
  - Fluid Mechanics
  - Stress Analysis
  - Vibrations and Controls
  - Manufacturing Engineering
  - Materials Science and Engineering

Advanced Certificate Programs
Additional specializations may be developed in consultation with an academic advisor.

General Information

Application Process
The application to these programs requires submitting to the Graduate Admissions Office an official application form, official copies of transcripts for all college course work completed, and a $60 application fee (waived for WPI alumni). Management certificate applicants must also submit three letters of recommendation and GMAT/GRE scores. International students may apply to these programs. However, for WPI to issue the Form I-20 for a student visa, international students must be registered for a minimum of 9 credits during their first semester and must complete their program within one academic year.

Registration Procedures
Graduate and Advanced Certificate Program students register at the same time, follow the same registration procedures and participate in the same classes.

Tuition and Fees
Tuition and fees for GCP and ACP students are the same as for all other WPI graduate students on a per-credit-hour basis. Tuition for 2001-2002 Academic Year is $752 per credit hour.

Academic Policies
Academic policies follow the same guidelines as those established for degree-seeking graduate students, with the following exception: if after completing 9 credits, a certificate program student’s grade point average falls below 2.5, he/she will be withdrawn from the program unless the academic department intervenes.

Program Planning
Students will be assigned faculty advisors and will be required to complete a plan of study. The plan of study must be approved and signed by the academic advisor before the end of the student’s first semester in the program. Copies of the plan will be maintained by the student, the academic advisor and the department. Students may initiate written requests to the advisor, via the program modification form, to modify the program of study. Copies of approved program modification(s) should be retained by the student, the academic advisor and the department.

Completion Time Limit
Certificate program students will have four years from the date of matriculation to complete the program. International students may apply to these programs. However, for WPI to issue the required student visa, international students must be registered for a minimum of 9 credits during their first semester and must complete their program within one academic year.

Transfer of Credits
Up to 6 credits of course work taken at WPI may be transferred into the program. Students who wish to apply credits earned in the GCP or the ACP to a subsequent master’s or Ph.D. program at WPI must make formal application to the degree-granting department. Admission to the GCP or ACP does not guarantee admission to any subsequent WPI degree-granting program.

Program Completion
Satisfactory completion requires a cumulative grade point average of 3.0 or better (A=4.0), with grades of C or better in all courses completed in the program. Upon satisfactory completion of the program, students will receive a certificate of graduate study or advanced graduate study in the chosen discipline. Should students later apply to the M.S. degree or Ph.D. program and be accepted, the GCP and ACP courses will be considered for transfer toward the degree requirements.

Combined Bachelor’s/ Master’s Program
The Combined Bachelor’s/Master’s Program is a unitary program leading a student to a bachelor of science degree and to a master of business administration, master of engineering, or master of science degree. The purpose of the Combined Bachelor’s/Master’s Program is to give WPI undergraduates an opportunity to earn a bachelor’s and a master’s degree from WPI concurrently in less time than would be required if the student were to complete work on the bachelor’s degree before beginning work on the master’s degree. To gain the full benefit of this program, a student should apply for the Combined Program well before the bachelor’s degree is completed. Application at the beginning of the junior year is recommended.

For the master of science and master of engineering degrees, the Combined Program typically allows a student to complete requirements for both degrees in about one more year of full-time study than would be required to earn the bachelor’s degree. With careful planning, a student can obtain a similar reduction in the amount of time required to earn an M.B.A.

Undergraduate students may apply up to four courses to the master’s degree, with prior written approval from professors and the academic department. The M.S. portion of the program must be completed as a full-time student. See page 19 for more details.

Advanced Study for Nondegree Students
For those who do not want to commit themselves to a degree program but who wish to enroll in a single course or a limited number of courses in a specialized field, WPI provides the opportunity to participate in graduate level courses on an ad hoc basis. When registering for courses as a nondegree student, grading may be either conventional (A,B,C) or Pass/Fail. Pass/Fail grading must be elected at the time of registration, and courses taken on the Pass/Fail basis are not transferable to any master’s degree program. The maximum number of courses that may be taken as a nondegree student is four, with the following exceptions:

- three-course maximum in biomedical engineering, computer science, and electrical and computer engineering;
- two-course maximum in Management.

Intercollege Studies and the Consortium
The Colleges of Worcester Consortium was established in 1967. In the Consortium, 20,000 students of eight four-year colleges with graduate programs, two two-year schools, a medical school and a veterinary school have access to all the educational benefits of these institutions as well as nine other specialized institutions in the area. The Consortium members and associates whose facilities and programs have been particularly useful to WPI students are Assumption College, Clark University, College of the Holy Cross, Tufts School of Veterinary Medicine, University of Massachusetts Medical School, Worcester Foundation for Biomedical Research and Worcester State College. Cross-registration in programs and the use of special laboratory facilities are encouraged. The Consortium operates a free bus service for transporting students between the colleges. Schedule for services can be found in the Gordon Library.

Continuing and Professional Education at WPI
Through the Department of Continuing and Professional Education, WPI delivers over 300 noncredit, nondegree programs annually to executives, managers and technical professionals. More than 61,000 men and women have attended these programs during the past 21 years. Today’s programs focus on areas of critical importance to business and industry: hands-on information technology training programs, seminars and workshops in such areas as manufacturing, quality improvement, geometric dimensioning and tolerancing, project management and management development; and customized corporate training programs.

Adult learners can enroll in just a single program or participate in a professional development certificate program in any of the areas listed above.

WPI’s continuing and professional education programs are delivered on the Worcester campus and at branch campuses in Waltham and Southborough, Massachusetts; at selected public facilities throughout Massachusetts; and at corporate sites. Branch campuses are open over 70 hours a week. These campuses provide full-service facilities including state-of-the-art computer labs with T-1 Internet access.

To learn more about WPI’s continuing and professional education, visit www.wpi.edu/+CE or call 508-831-5517.

School of Industrial
Management (SIM)

The connection between technology and business management has never been more powerful than it is today. Technological advances have changed the very nature of business by creating and eliminating markets, altering communication patterns and setting new rules about the flow of information.

SIM has the unique ability to combine technology-based courses with management courses to offer customized certificate programs for industry. Drawing from more than 50 years of experience, SIM offers challenging, technology-oriented business programs that give its graduates a distinct edge in the high-tech management marketplace.

SIM professors are experts in all aspects of technology management: running high-tech firms; converting technological innovations into commercial products, services and organizations; and integrating technology into existing organizations.

The school of industrial management, designed for students who are sponsored by their employers, offers a four-year curriculum that leads to a certificate of completion and advanced certificate option.

Call 508-831-5208 for more information.

Grading System/ Academic Standards

Grading System

In order to assess progress throughout the graduate program, grades are assigned to the student’s performance in course, project and thesis work. Academic achievement is based on the following grading system:

- **A** Excellent
- **B** Good
- **C** Pass
- **D** Unacceptable for graduate credit
- **F** Fail
- **AU** Audit
- **NC** No credit (only for thesis work); will not be recorded on transcript
- **P** Pass; unacceptable for graduate credit
- **I** Incomplete; transition grade only; becomes grade of F if not changed by instructor within 12 months
- **W** Withdrawal
- **SP** Satisfactory progress; continuing registration in thesis/dissertation/

**CR** Credit for work at another institution

**UP** Unsatisfactory progress; this grade remains on the file transcript

Academic Standards

Students must maintain high academic standards in all their program activities. After completion of 12 credit hours, all students must maintain an overall grade point average (GPA) above 2.75 to be considered as making satisfactory progress.

If a student’s overall GPA falls to 2.75 or below, the student and advisor are notified by the Registrar that the student is not making satisfactory progress.

If the overall GPA of any student falls below 2.65, the Registrar will inform the student that all future registrations will be given grades only on a pass/fail basis unless the department Graduate Committee intervenes.

If the overall GPA of any student falls below 2.5, the student is removed from the program unless the department Graduate Committee intervenes.

**Grade Point Average (GPA)**

Grades are assigned the following grade points:

- A = 4.0
- B = 3.0
- C = 2.0
- D = 1.0
- F = 0.0

The grade point average is calculated as the sum of the products of the grade points and credit hours for each registered activity (including courses, independent studies, directed research, thesis research and dissertation research) in the average, divided by the total number of credit hours for all registered activities in the average. If a student takes the same course more than once, the course enters the GPA only once, the most recent grade received for the course being used in the average.

A student’s overall GPA is calculated on the basis of all registered activities taken while enrolled as a graduate student at WPI. WPI graduate courses taken before a student had status as a degree-seeking graduate student are included in the overall GPA. A student’s program GPA is calculated on the basis of those WPI courses listed by the student on the student’s application for Graduation form. The transcript will report the overall GPA.

Courses transferred from elsewhere for graduate credit (for which a grade of CR is recorded on the WPI transcript), and courses taken to satisfy undergraduate degree requirements or to remove deficiencies in undergraduate preparation, are not included in either GPA. Registered activities in which the student receives grades of AU, NC, P, I, W, SP or UP are not included in either GPA.

Only registered activities in which a grade of A, B, C or CR was obtained may be used to satisfy courses or credit requirements for a graduate degree.

Changing of Grades

Once a course is completed, a student wishing to change a grade to a withdrawal, change an audit to a grade or change a grade to an audit must petition the Committee on Graduate Studies and Research (CGSR) to effect the change. The petition must include the instructor’s approval. Only under exceptional circumstances will such requests be approved.

Advising/Plan of Study

Newly admitted students will be advised of available courses that will be acceptable to their program of study prior to registration, to encourage and facilitate preregistration.

Newly admitted full-time graduate students will be assigned an academic advisor at the time they are accepted and pay a tuition deposit. Part-time graduate students will be assigned an advisor at the time of their admission to degree-seeking status.

An Advisor of Record for M.S. thesis or Ph.D. dissertation research must:

- be a tenured/tenure-track WPI faculty member and hold a dual or collaborative appointment in the degree-granting department,
- or

be a Professor of Practice with an appointment in the degree-granting department.

In some cases, the Advisor of Record and the Thesis Advisor will be different people. In these cases, a Thesis Advisor or Dissertation Advisor not from the department granting the graduate degree MUST BE APPROVED BY A MAJORITY OF THE FULL-TIME TENURED AND TENURE-TRACK DEPARTMENT FACULTY.

After consultation with and approval by the advisor, each admitted student must file a formal plan of study with the department within the first semester if full-time, and within the first year if part-time. Program changes are implemented by advisor and student. Copies of the revised plan of study will be maintained in department files.

Three years after the initial filing of the plan of study and in three-year intervals thereafter, a revised plan of study must be filed with the Projects and Registrar’s Office prior to regis-