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.

Master of science degree programs are available, on a full-time and part-time basis, in the following disciplines:
- applied mathematics
- applied statistics
- biomedical/clinical engineering
- chemistry and biochemistry
- civil and environmental engineering
- computer science
- electrical and computer engineering
- fire protection engineering
- management
- manufacturing engineering
- materials science and engineering
- mathematical sciences
- mechanical engineering
- physics

Master’s programs in biology, biotechnology and chemical engineering are available only on a full-time basis.

Master of engineering programs are offered in:
- biomedical/clinical engineering
- civil and environmental engineering
- manufacturing engineering
- mechanical engineering

Master of Business Administration (M.B.A.) programs provide 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 Management Department at 508-831-5218.

Master of Business Administration (M.B.A.) programs provide 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 Management Department at 508-831-5218.

Master of Mathematics for Educators
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 percent of the cost of tuition, is available to qualified participants.

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.

The doctor of philosophy (Ph.D.) is available in biomedical science and all of the disciplines outlined previously except management and mathematics for educators.

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 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 Certificate Program
The Graduate Certificate Program (GCP) at WPI provides 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/Clinical 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

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.)
GRADUATE DEGREES AND CERTIFICATES

• 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 Systems
• 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.)
• 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.)

Additional concentrations may be developed in consultation with an academic advisor.

Advanced Certificate Program
The Advanced Certificate Program (ACP) provides master’s degree holders with the 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 program consists 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 a 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

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

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 $50 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 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.

Registration Procedures
Graduate and Advanced Certificate Program students register with WPI’s evening graduate students, follow the same registration procedures, and participate in the same classes as all other graduate students.

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 2000-2001 Academic Year is $703 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 quality 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 4 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.

Advanced Study for Non-Degree 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 non-degree 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 non-degree student is four with the following exceptions: 3 course maximum in Biomedical Engineering, Computer Science, and Electrical and Computer Engineering; 2 course maximum in Management.

Intercollegiate 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 graduate 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 courses 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.

Non-Credit Continuing Professional Education Programs
WPI offers a wide range of non-credit courses and certificate programs to help technical professionals and managers update their knowledge and skills.

For more information on WPI’s Non-Credit Continuing Professional Education Programs call the Continuing Education Office at 508-831-5517.

School of Industrial Management
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. The changes grow more dramatic each year.

SIM has the unique ability to combine technology based courses with management courses to offer customized certificate programs for industry. Drawing more than 50 years of experience, SIM offers challenging, technology-orientated 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 (SIM), 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:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
</tr>
<tr>
<td>C</td>
<td>Pass</td>
</tr>
<tr>
<td>D</td>
<td>Unacceptable for graduate credit</td>
</tr>
<tr>
<td>F</td>
<td>Fail</td>
</tr>
<tr>
<td>AU</td>
<td>Audit</td>
</tr>
<tr>
<td>NC</td>
<td>No credit (only for thesis work); will not be recorded on transcript</td>
</tr>
<tr>
<td>P</td>
<td>Pass; unacceptable for graduate credit</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete; transition grade only; becomes grade of F if not changed by instructor within 12 months</td>
</tr>
<tr>
<td>W</td>
<td>Withdrawal</td>
</tr>
<tr>
<td>SP</td>
<td>Satisfactory progress; continuing registration in thesis/dissertation/directed research</td>
</tr>
<tr>
<td>CR</td>
<td>Credit for work at another institution</td>
</tr>
<tr>
<td>UP</td>
<td>Unsatisfactory progress; this grade remains on the file transcript</td>
</tr>
</tbody>
</table>

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 (QPA) grade point average above 2.75 to be considered making satisfactory progress.

If a student’s overall QPA 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 QPA 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 QPA of any student falls below 2.5, the student is removed from the program unless the department graduate committee intervenes.

Quality Point Average
Grades are assigned the following quality points: A = 4.0, B = 3.0, C = 2.0, D = 1.0 and F = 0.0. The Quality Point Average (QPA) is calculated as the sum of the products of the quality points and credit hours for each registered activity divided by the total number of credit hours for all registered activities. If a student takes the same course more than once, the course enters the QPA only once, the most recent grade received for the course being used in the average.

A student’s overall QPA 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 QPA. A student’s program QPA 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 QPA.

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 QPA. Only registered activities in which the student receives grades of AU, NC, P, I, W, SP or UP are not included in either QPA.

Changing of Grades
Once a course is completed, a student wishing to change a grade to withdraw, change an audit to a grade, or change a grade to an audit must petition the Committee on Graduate Studies and Research (CGSR) to affect 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.

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 of 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 registration for additional academic credit. The plan of study must reflect all current courses that will be applicable towards the student’s degree. Courses that are no longer current must be removed from the Plan of Study. The department will determine which courses are current.