WPI DEGREE REQUIREMENTS (Effective for students matriculating after August 1, 2007)

WPI’s academic requirements are specifically designed to develop an overall educational experience which meets the goals of the college. Each requirement plays a supporting role as follows:

- To provide intellectual breadth and a better understanding of themselves, their cultures and their heritage, every WPI student must complete a Humanities and Arts Requirement;
- To provide an understanding of the priorities of other sectors of society, develop the ability to communicate effectively with disparate groups, organize and derive solutions to complex problems, and gain an awareness of the interrelationships between technology and people, every WPI student must complete an Interactive Qualifying Project (IQP);
- To provide a capstone experience in the professional discipline, to develop creativity, instill self-confidence and enhance the ability to communicate ideas and synthesize fundamental concepts, every student must complete a Major Qualifying Project (MQP);
- To provide for learning through an academic program with fabric and course balance while encouraging individual student choices within that framework, every student must fulfill Distribution Requirements.

WPI TERMS AND CREDIT UNITS

The Bachelor degree from WPI normally is based upon a residency at WPI of 16 terms. WPI operates on a system with four seven-week terms, two in the autumn semester (Terms A and B) and two in the spring semester (Terms C and D). A summer session, Term E, is also available. The normal academic load for each term is defined as one unit of work, usually divided among three courses or projects. Thus, the usual credit unit for courses or independent study/projects is 1/3 unit. Qualifying Projects, defined on pages 38-39, require one full unit of activity which may be concentrated into a single term (especially if conducted off-campus) or spread throughout an academic year. The degree will be awarded upon completion of the following:

DEGREE REQUIREMENTS

1. The Humanities and Arts Requirement (See page 58)
   Qualification by overall evaluation of two units of work in the humanities and arts.

2. The Interactive Qualifying Project (See page 42)
   Successful completion of a qualifying project relating science and/or technology to society (the Interactive Qualifying Project, or IQP) representing at least one unit of credit in project or independent study work. The format of the documentation is to be in accordance with current WPI policy on such documentation.

An IQP shall address a topic relating science and/or technology to society. In this context, both “society” and “technology” should be construed as broadly as possible. Technology refers to the application of rational and efficient principles to a body of knowledge or to the control of space, matter and/or human beings. Thus, the IQP encompasses not only techniques of production embodied in tools and machines, but also advances in methods of social and economic organization, in managerial techniques, and in methods of analysis in science, mathematics, and engineering. Society refers not only to a grouping of individuals but also to the culture, values, laws, customs, and institutions shared by these individuals.

3. The Major Qualifying Project (See page 42)
   Successful completion of a qualifying project in the major area of study (the Major Qualifying Project, or MQP) representing at least one unit of credit in project or independent study work. The format of the documentation is to be in accordance with current WPI policy on such documentation.

4. Distribution Requirements (See page 29)
   Satisfaction of published academic activity distribution requirements in or relating to the major area of study. These requirements total no more than ten units (including the MQP) and are specified by general topical subject area, not by specific courses. Completion of distribution requirements will be certified by the appropriate departmental or Interdisciplinary and Global Studies Division (IGSD) Program Review Committee (PRC), upon recommendation by the student’s academic advisor. For students desiring designation of a major area for which a determination regarding distribution requirements has not previously been made and published, a faculty committee will be appointed by the department head or IGSD dean to review and approve the student’s program of study.

5. Social Sciences (See page 63)
   Completion of 2/3 unit of work in the social sciences, exclusive of qualifying project.

6. Residency Requirement
   A minimum of eight units must be completed satisfactorily in residence at WPI. (It is anticipated the normal residence at WPI will be 16 terms.)

7. Minimum Academic Credit
   The minimum academic credit required for the Bachelor degree is 15 units. Credit accumulated beyond the published distribution requirements shall be accomplished by the addition of “free elective” work.

8. Physical Education (See page 174)
   Qualification in physical education shall be established by completing 1/3 unit of course work (four PE classes) or its equivalent. Such an equivalent, for example, may be participation in club or varsity sports.
In brief, the BS is intended for the student desiring, after four years of study, to begin a career as a design engineer, scientist, or manager, or to enter graduate school. The BA is for the student desiring a career or further degree in a technologically-dependent field where lesser knowledge of engineering or science is useful, complemented by a substantial and coherent liberal studies component.

The differences at WPI between the Bachelor of Science and Bachelor of Arts degrees are not enormous in terms of academic requirements. At WPI, both degrees have the same entrance requirements and the same general graduation requirements. The BS requires more study in the field of the major; the BA, a broader distribution of learning between the major and other, related fields. The differences between the two degrees have more to do, in many ways, with the career and life goals, both immediate and long term, of the student making the choice of degrees.

WPI is the only technological university to offer both the BS and the BA degrees. We initiated the BA in 2006 in order to provide students with an option to pursue a program of study with more choices in the humanities, arts, social sciences and management than is typically available with the BS. We believe achieving a BA at WPI can offer a student a broad “liberal” education appropriate to our increasingly technologically-dependent world. Because WPI is a technological university, a BA from WPI includes more opportunities for the study of science or engineering at a more advanced level than at a liberal arts university. A BA from WPI will also enable students to live and work with students pursuing the BS, enriching opportunities for students pursuing either degree to become managers and leaders in technological innovation and entrepreneurship.

Further to assist students and their families in selecting between these two degree options at WPI, we offer the following guidelines.

**REASONS FOR SELECTING THE BS OPTION**

If your career interest is in design or research where a strong base in engineering and/or science is essential, you probably wish to take a BS degree.

If your primary goal after receiving your undergraduate degree is entry-level professional employment in engineering, science, or management, the BS option is for you.

If you are reasonably certain you will go on to further study in the field of your degree after graduation, in either a master’s or doctoral program, specializing in the field of your interest at the level of the BS is appropriate.

**Career options.** The WPI BS prepares students for careers in:

- engineering—biomedical, chemical, civil, electrical and computer, environmental, industrial, manufacturing, mechanical;
- the sciences—computer science, chemistry and biochemistry, mathematical sciences, physics;
- management (especially in high-tech areas)
- social sciences and policy studies—(especially in system dynamics, law and policy affecting high-tech industries).

**REASONS FOR SELECTING THE BA OPTION**

If you have not focused yet on a specific career field, but know you want an undergraduate program with broad options and a concentration in science or engineering, the BA may be the degree for you.

If you want to learn to apply the problem-solving methods of engineering and/or science to broad problems involving both science & technology and social needs & values, consider the BA.

If your primary goal after receiving you undergraduate degree is entry-level employment in a field where some depth in science or engineering is needed, along with broadening skills of communications and human & cultural interactions, the BA degree may be your best bet.

If you are looking for a traditional liberal arts education adapted to contemporary culture, the BA degree will provide opportunities to pursue both the traditional breadth study in the humanities, arts, and social sciences along with specific pre-professional study in engineering, science, or management.
At WPI, students, with the aid of their advisors, structure their own academic programs within the guidelines of the program distribution requirements. Thus, examples of specific programs presented in this catalog do not have to be followed literally. There can be as many different individual programs as there are students, provided the distribution requirements designated for that program are followed.

An undergraduate program should avoid premature over-specialization. Students must obtain a firm, rigorous understanding of the fundamental concepts of their disciplines. An acquaintance with an aspect of state-of-the-art technology is often best achieved through the MQP. Concentrating too soon on changing technological specialities will deprive students of the broad background necessary to educate themselves in new areas as they emerge. Students in engineering, for example, must obtain a firm grounding in mathematics and science, as well as the engineering sciences. Some study in at least one other area of engineering outside the major field is highly valuable for professional practice.

The IQP should be integrated carefully with your overall program, especially the social science requirements. Establish your plans early to take advantage of exciting opportunities WPI offers, at home or abroad. (IQP and exchange opportunities are discussed annually in the fall.) Information on programs can come from many sources: advisors, other faculty, other students, professionals in the field. As soon as possible in the first year, students will discuss their academic goals with their advisor and plan a general academic program for their entire residence at WPI. If changes in details or even major goals occur, students can integrate them into a cohesive educational pattern which can maximize WPI’s unique program. As students mature, their confidence about making decisions for their own education will grow, too. Indeed, accepting responsibility for program planning is a major and exciting educational effort. Students consult with their advisors, but the final responsibility for program construction remains with each student.

Through courses and independent studies in the first two years, students should sample, explore, and learn the basic concepts of the disciplines necessary to their academic goals. This exploration and sampling will provide, first, a base of knowledge to build upon for further learning; and second, an insight into their basic interests for educational development.

In the latter portion of the academic program, students have the opportunity as they mature to explore, in some depth, specific areas within their disciplinary interests. These experiences should develop ability in self-learning and should involve a significant scholarly effort. Students should strive to learn how to educate themselves from a base of fundamental concepts so that they can develop in new intellectual areas throughout their lifetime.

**PROFESSIONALLY ACCREDITED PROGRAMS**

WPI is accredited as an institution by the New England Association of Schools and Colleges. In addition, a number of major areas are accredited within their specific disciplines. Seven majors at WPI are accredited by the Engineering Accreditation Commission of ABET. These majors are biomedical engineering, civil engineering, chemical engineering, electrical and computer engineering, industrial engineering, mechanical engineering, and manufacturing engineering. Computer Science is accredited by the Computing Accreditation Commission of ABET. Please note that some departments bearing those particular names may also grant designated majors through their programs that are not ABET accredited (e.g., Sanitary Engineering). The titles of majors are carried on the students’ transcripts and have a bearing on engineering licensing and other professional activities.

Programs other than biomedical engineering, civil engineering, chemical engineering, computer science, electrical and computer engineering, industrial engineering, mechanical engineering, and manufacturing engineering are not ABET accredited.

The program distribution requirements reflect the ABET guidelines for these programs; see pages 29-37 for a review of these guidelines.

Projects and courses carry the same credit weight in establishing all distribution levels. Establishing some engineering breadth and technical literacy outside one’s own field is an important element in establishing a versatile background for an unknown future.

The Chemistry and Biochemistry Department and its program at WPI are approved by the American Chemical Society for a major in chemistry. Those chemistry majors who complete a program satisfying the guidelines established by the American Chemical Society are certified to that organization as having received an undergraduate professional education in chemistry.

The undergraduate and graduate business offerings in the Department of Management are accredited by AACSB International, the Association to Advance Collegiate Schools of Business. AACSB International is a not-for-profit organization consisting of more than 900 educational organizations and corporations. Its mission is excellence in management education in colleges and universities. Headquartered in St. Louis, AACSB International is the premier accrediting agency and service organization for business schools.
As a student, you have the responsibility of choosing your own program of studies. Your advisor can inform you of available academic alternatives. While your advisor will be willing to suggest specific study programs, he or she will not insist that you follow a particular course of study. By the end of the first semester, you and your advisor should agree upon a tentative four-year academic plan.

A successful advising program is based on a cooperative and understanding relationship between student and advisor. Consult your advisor regularly. Drop in and tell your advisor how the term is going. If you add or drop a course, you should notify your advisor. Many advisors post office hours during which they are available for conversation. If you cannot find your advisor in his or her office, leave a note with the appropriate departmental secretary, indicating your wish to make an appointment; in that note, indicate several times when you could meet with your advisor and also indicate the means by which you can be contacted. Above all, do not hesitate to call or e-mail your advisor on campus, to ask questions, or to arrange for an appointment.

**FIRST-YEAR ADVISING (PRE DECLARATION OF MAJOR)**

Under WPI’s Insights Program, first year students are advised by a small number of faculty academic advisors who make a real commitment to working with groups of students, usually in their residence halls. New students are assigned an Insight advisor who advises a group of 25 to 30 students. These advisors represent all the departments and programs at WPI, and in many cases are the senior faculty members and the most experienced advisors. At WPI, first year advising is much more about mentoring students and much less about course scheduling. Each group is also assigned a peer advisor whose main role is to assist the academic advisor. At the end of the first semester, in December, students officially declare their majors and are assigned an advisor from the department of the declared major.

**UPPERCLASS ADVISING**

During December or January of the first year, most first-year students wish to be assigned to a new advisor in their major areas of study. Forms to change advisors can be obtained from the office of the Director of Academic Advising at any time during the academic year.

The determination of an appropriate four-year program requires considerable thought and information. Not only your advisor but also departmental consultants, the Projects Office, and the consultants in the Humanities and Arts Department can provide you with assistance in planning for both qualifying projects and a Sufficiency area.

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**MAJOR AREAS OF STUDY**

Guidelines for the construction of the most common major programs are given alphabetically by area in the “Department and Program Descriptions” section beginning on page 67. The exact program of study for any student, however, is developed by the student with the aid of an advisor.

All of the majors below, with the exception of Liberal Arts and Engineering, are awarded with the B.S. degree. Some programs are listed that are developed through the departments indicated in parentheses. In the past, WPI has graduated students in the following fields, but this list should not be interpreted as necessarily putting any restriction on a student’s “major.”

**Actuarial Mathematics (MA)**

**Aerospace Engineering (ME)**

**Biochemistry (CBC)(certified by the American Chemical Society)**

**Biology/Biotechnology (BB)**

**Concentrations in:**
- Bioprocess
- Cell and Molecular Biology and Genetics
- Computational Biology
- Ecology and Environmental Biology
- Organismal Biology

**Biomedical Engineering (BME)(accredited by ABET)**

**Specializations in:**
- Biomaterials
- Biomechanics
- Biomedical Imaging
- Biosensors and Bioinstrumentation
- Tissue Engineering

**Chemical Engineering (CHE)(accredited by ABET)**

**Concentrations in:**
- Biochemical
- Biomedical
- Environmental
- Materials

**Chemistry (CBC)(certified by the American Chemical Society)**

**Concentrations in:**
- Medicinal Chemistry
- Specializations in:
  - Computational Chemistry and Molecular Modeling
  - Gene Regulation
  - Ion Transport
  - Materials
  - Medicinal Chemistry
  - Membrane Proteins
  - Molecular Spectroscopy
Nanoscale Design
Natural Products Synthesis
Plant-Virus Biochemistry
Photochemistry
Photophysics
Sensors
Supramolecular Chemistry
Civil Engineering (CEE)(accredited by ABET)
Subareas in:
  Structural and Geotechnical Engineering
  Environmental Engineering
  Transportation Engineering
  Urban and Environmental Planning
  Construction Engineering and Project Management
Concentration in:
  Environmental
Computer Science (CS)(accredited by ABET)
Computers with Applications (CS)
Economic Science (SSPS)
Concentrations in:
  Sustainable Economic Development
  Computational Economics
Electrical and Computer Engineering (ECE)(accredited by ABET)
Subdisciplines in:
  Robotics
  Power Systems Engineering
  RF Circuits and Microwaves
  Aerospace and Control Systems
  Communications and Signal Analysis
  Biomedical Engineering
  Analog Microelectronics
  Computer Engineering
Engineering Physics (PH)
Environmental Engineering (CS; ECE; ME)
Environmental Policy and Development (SSPS)
Humanities and Arts (HU)
Concentrations in:
  American Studies
  Environmental Studies
  Humanities Studies of Science and Technology
Industrial Engineering (MG)
Interactive Media and Game Development (HU; CS)
Interdisciplinary (by arrangement)(IGSD)
International Studies (IGSD)
Liberal Arts and Engineering (B.A. degree)(HU)
Management (MG)(accredited by AACSB)
Management Engineering (MG)(accredited by AACSB)
Concentrations in:
  Operations Management
  Biomedical Engineering
  Civil Engineering
  Electrical and Computer Engineering
  Mechanical Engineering
  Manufacturing Engineering
Management Information Systems (MG)(accredited by AACSB)
Manufacturing Engineering (ME)(accredited by ABET)
Mathematical Sciences (MA)
Subareas in:
  Algebraic and Discrete Mathematics
  Computational and Applied Analysis
  Operations Research
  Probability and Statistics
Mechanical Engineering (ME)(accredited by ABET)
Concentrations in:
  Aerospace Engineering
  Biomechanical Engineering
  Mechanical Mechanics
  Mechanical Design
  Manufacturing
  Materials Science and Engineering
  Thermal-Fluid Engineering
Physics (PH)
Professional Writing (IGSD)
Psychological Science (SSPS)
Society, Technology and Policy (SSPS)
System Dynamics (SSPS)

Programs for students interested in medicine, law or pre-college education can be readily developed from many of the above majors.

Interdisciplinary (individually-designed) majors (ID) may also be developed under the B.S. or B.A. degree; see Interdisciplinary Programs, page 134.

WPI undergraduate diplomas designate “Bachelor of Science” or “Bachelor of Arts” as appropriate. The transcript will list the student’s major. If a Minor or Concentration was completed, this will also be included on the transcript.

The number of majors associated with a single WPI Bachelor of Science degree is limited to two.
DEFINITION:
A Minor is a thematically-related set of academic activities leading to a degree designation in addition to but separate from that granted by the Major. A Minor should be available to students of any Major, with the exception of a Minor which overlaps with a Major area to such an extent that it is not sufficiently distinct from that Major. The Committee on Academic Operations (CAO) is responsible for the review of proposed Minor Programs and decisions regarding allowed Major/Minor combinations.

RULES:
1. A Minor requires completion of two or more units of thematically related activity. The concluding 1/3 unit of the Minor must be a capstone experience that marks completion of the Minor.
2. It is expected that Minor requirements will be structured so that all acceptable Major/Minor combinations can be accommodated within a normal 16 term framework.
3. A Minor may include any portion of the academic program, excluding the MQP and the final Type 5 IS/P of the Sufficiency. Academic activities used in satisfying the regular degree requirements may be double-counted toward meeting all but one unit of the Minor requirements, subject to the following restrictions:

a. The first unit of double-counted work may include at most 1/3 unit of the IQP, 3/3 units of the Sufficiency (excluding the final Type 5 IS/P), or a combination thereof.

b. At least one unit of the Minor, including the capstone activity, must be free elective choices.
4. The Program Review Committee for a Minor area will consist of faculty members designated by the sponsoring faculty members.
5. A Minor area must be proposed by a sponsoring group of faculty and must be defined by the purpose of achieving an educational goal beyond those apparent or implicit in the regular degree requirements. Student-initiated Minor Programs must be developed with the approval of a sponsoring group of faculty advisors. Each Minor Program must be reviewed by CAO for its individual merit.
6. Concentrations and minors are additional degree designations. Any credit earned for an additional degree designation must not overlap with credit earned for another additional degree designation by more than one unit. Also, no credit-bearing activity may be triple-counted towards degree designations or degree requirements. Listings of Concentrations may be found in the “Department and Program Descriptions” section beginning on page 67.
An option for some students who wish to broaden their WPI experience is the completion of two distinct majors through the double major option. The choice to pursue a double major should be made early in a student’s career. The limit on the number of majors that a student may complete per degree is two.

For double majors, the diploma may list both majors (in order of preference by the student), either major, or no major as indicated by the student.

The following modifications are made to the degree requirements for students who elect to pursue a double major:

1. THE SUFFICIENCY.
   If a major requires the completion of a humanities and arts sufficiency, satisfactory completion of an MQP in Humanities & Arts or International Studies shall satisfy the humanities and arts sufficiency requirement.
   If a major requires completion of a technical sufficiency, satisfactory completion of an MQP in a science, engineering, or mathematics discipline shall satisfy the technical sufficiency requirement.

2. THE INTERACTIVE QUALIFYING PROJECT.
   If one of the majors of a double major is in Social Science and Policy Studies, a single project bearing at least one unit credit may be used to satisfy both the MQP requirement for the SSPPS major and the IQP requirement. In order to be used to satisfy both requirements, the combined social science MQP and IQP must meet the goals of both projects. It must be interactive in nature involving an aspect of technology, and must also be an application of social science knowledge and analytical techniques. In order to select a single project that satisfies both the goals of the MQP and the goals of the IQP, the decision to pursue a social science double major needs to be made fairly early in the student’s career.

3. THE MAJOR QUALIFYING PROJECT.
   At least one separate and distinct major qualifying project of at least one unit of work must be completed for each major.

4. DISTRIBUTION REQUIREMENTS.
   The distribution requirements for each major must be met, but requirements common to both majors only need to be satisfied once. Students pursuing multiple majors, concentrations, and/or minors should also consult the rule on Credit Overlap for Degree Designations and Requirements (page 254). The requirements for each individual major must be completed and certified by the Program Review Committee of the department offering that major.

   Some departments offer more than one major. A degree may not include more than one major course of study from the same department unless provided for in the list of exceptions below.

   Exceptions:
   • A student may major in Industrial Engineering and also in either Management, Management Engineering, or Management Information Systems.
   • A student may major in Chemistry and also in Biochemistry.
   • If a student wishes to complete two Interdisciplinary (Individually-Designed) Major Programs, the double major must be proposed in a single Educational Program Proposal which must be approved by the student’s Program Advisory Committee for each major. The Committees shall ensure that the majors are substantially non-overlapping.

OTHER PROVISIONS.
   If a student’s double major includes an Interdisciplinary (Individually-Designed) Major Program, the double major must be described in the Educational Program Proposal for the Interdisciplinary Major.

   See page 132 for the requirements of a double major involving Humanities and Arts.
The distribution requirements for students who have matriculated before August 1, 2007 (if different from the requirements printed below) are listed in the individual program descriptions beginning on page 67.

The normal period of residency at WPI is 16 terms. In addition to the WPI requirements applicable to all students (see page 22), distribution requirements apply to 10 units of study in specific areas as listed on the following pages:

### AEROSPACE ENGINEERING

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematical and Basic Sciences (Notes 1, 2 and 3)</td>
<td>4</td>
</tr>
<tr>
<td>2. Engineering Science and Design (Includes MQP) (Notes 4, 5, 6, 7, 8)</td>
<td>6</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Must include a minimum of 5/3 units of mathematics including differential and integral calculus, and differential equations.
2. Must include a minimum of 3/3 units in physics including introductory electricity and magnetism, and intermediate mechanics.
3. Must include 2/3 units in chemistry including topics in thermodynamics.
5. Must include 4/3 units in Materials and Structures, with topics in Materials Science, Stress Analysis, and Aerospace Structures.
6. Must include 4/3 units in Dynamics and Control with topics in Orbital Mechanics, Control Theory, Guidance, Navigation, Communications, and Aircraft or Spacecraft Dynamics and Control.
7. Must include 1/3 units in Aerospace Systems Design that integrates either aeronautical or astronautical engineering topics.
8. Must include 1/3 Unit of Capstone Design Experience.

### ACTUARIAL MATHEMATICS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics (including MQP) (Notes 1-6)</td>
<td>7</td>
</tr>
<tr>
<td>2. Management (Note 7)</td>
<td>4/3</td>
</tr>
<tr>
<td>3. Additional courses or independent studies (except MS, PE courses, and other degree requirements) from any area (Note 8)</td>
<td>5/3</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Must include MA 3831 and MA 3832, or their equivalents, at least one of MA 3257, MA 3457, or equivalent, and at least one of MA 3631, MA 4632, or equivalent.
2. Must include two of the following: MA 2073, MA 2271, MA 2273, MA 2431, or MA 2631, or their equivalents.
3. Must include three of the following: MA 3211, MA 3212, MA 4213, or MA 4214, or their equivalents.
4. May not include independent studies directed toward Society of Actuaries exams.
5. May not include either MA 2201 or MA 2210.
6. May not include both MA 2631 and MA 2621.
7. Must include ACC 2101 and FIN 2200 or their equivalents.
8. Must include 2/3 units of computer science.

### BIOCHEMISTRY

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics and Physics (Note 1)</td>
<td>2</td>
</tr>
<tr>
<td>2. Chemistry and Biochemistry (Note 2)</td>
<td>4</td>
</tr>
<tr>
<td>3. Biology (Note 3)</td>
<td>1 2/3</td>
</tr>
<tr>
<td>4. Chemistry and Biochemistry / Biology Laboratory (Note 4)</td>
<td>1</td>
</tr>
<tr>
<td>5. Other Natural or Computer Science (Note 5)</td>
<td>1/3</td>
</tr>
<tr>
<td>6. MQP</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTES:**
1. The mathematics in MA 1021-MA 1024 or the equivalent is recommended. The physics in PH 1110-PH 1120 or equivalent is recommended.
2. These four units must include one unit of organic, one unit of biochemistry, and 1/3 unit each of physical (3000 level or higher) and inorganic chemistry (3000 level or higher).
3. These 1 2/3 units must include 1/3 unit of cell biology, 1/3 unit of genetics, and 2/3 unit of advanced work (3000 level or higher).
4. This unit must include a minimum of 1/3 unit in Chemistry and Biochemistry, and a minimum of 1/3 unit in Biology.
5. Any course in the natural sciences (not used to satisfy another requirement) or in computer science may be used to satisfy this requirement.

### BIOLOGY/BIOTECHNOLOGY

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematical Sciences, Physics, Computer Science, Engineering (Note 1)</td>
<td>5/3</td>
</tr>
<tr>
<td>2. Chemistry</td>
<td>5/3</td>
</tr>
<tr>
<td>3. Biology &amp; Biotechnology (Note 2)</td>
<td>10/3</td>
</tr>
<tr>
<td>4. Laboratory experience (Note 3)</td>
<td>4/3</td>
</tr>
<tr>
<td>5. Related courses (Note 4)</td>
<td>3/3</td>
</tr>
<tr>
<td>6. MQP</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTES:**
1. BB 3040 may count toward this requirement.
2. Biology & Biotechnology coursework must include 2/3 units at the 1000 level, 4/3 units at the 2000 level, and 4/3 units at the 3000/4000 level, of which at least 1/3 unit must be at the 4000 level. BB 1001 and BB 1002 may not count toward the major requirement. At least 2/3 unit of Biology & Biotechnology coursework must be taken from each of three major divisions of biology (below). The 2/3 unit for each division may include courses from any level (1000-4000).
3. Chosen from BB 2000/3000 Laboratories or CH 4150 and 417X Experimental Biochemistry Laboratories. Must include at least 1/2 unit of course work at the 2000 level.
4. Chosen from the Related Courses List or additional BB 3000/4000 level courses.

### BIOLOGY/BIOTECHNOLOGY WITH A CONCENTRATION (Note 1)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematical Science, Physics, Computer Science, Engineering (Note 2)</td>
<td>5/3</td>
</tr>
<tr>
<td>2. Chemistry</td>
<td>5/3</td>
</tr>
<tr>
<td>3. BB 1000/2000-level (Note 3)</td>
<td>4/3</td>
</tr>
<tr>
<td>4. BB Laboratory Experience (Note 4)</td>
<td>4/3</td>
</tr>
<tr>
<td>5. BB 3000/4000-level (Note 5)</td>
<td>5/3</td>
</tr>
<tr>
<td>6. Related Courses (Note 6)</td>
<td>4/3</td>
</tr>
<tr>
<td>7. MQP</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Students pursuing a Concentration must fulfill all requirements for that Concentration. No course may count in more than one category, including university and departmental distribution requirements.
**CHEMISTRY**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics and Physics (Note 1)</td>
<td>2 1/3</td>
</tr>
<tr>
<td>2. Chemistry (Note 2)</td>
<td>4</td>
</tr>
<tr>
<td>3. Additional Science/Engineering (Note 3)</td>
<td>3 2/3</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Must include differential and integral calculus and at least 2/3 units of physics.
2. Must be above the level of general chemistry (2000 level or higher). These 4 units must include courses in experimental chemistry (either 4/3 unit or 3/3 unit), inorganic chemistry (1/3 unit), organic chemistry (3/3 unit), physical chemistry (3/3 unit), and biochemistry (either 1/3 unit or 2/3 unit, depending on the number of experimental chemistry courses taken). At least 2/3 units must be at or higher than the 4000 level.
3. Distributed among the MQP, the natural and physical sciences, computer science, mathematics, and engineering (and including general chemistry, CH 1010-1040).

**CHEMICAL ENGINEERING**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics and Basic Science (Notes 1, 2)</td>
<td>4</td>
</tr>
<tr>
<td>2. Engineering Science and Design (Notes 3, 4)</td>
<td>6</td>
</tr>
<tr>
<td>3. Advanced Chemistry (Note 5)</td>
<td>2</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Must include differential and integral calculus and differential equations.
2. Must include 2 courses in physics.
3. Must include 1 unit of MQP, 1/3 unit of capstone design experience (e.g., CHE 4404), and at least 1/3 unit of engineering study outside the major. Courses used to satisfy this requirement must be at the 2000-level or above, with the exception of CHE 1011.
4. Must include at least 4 units from the following list of core chemical engineering courses: CHE 2011, CHE 2012, CHE 2013, CHE 2014, ES 3004, ES 3005, ES 3002, CHE 3201, CHE 3501, CHE 4401, CHE 4402, CHE 4403, CHE 4404, CHE 4405.
5. All CH courses qualify except CHE 1010, CHE 1020, and CH 1030 which are basic science. Up to 1 unit of Advanced Chemistry may be double counted as both Advanced Chemistry and Basic Science. One course of Advanced Natural Science (2000 level and above BB, PH, GE) may be substituted for one Advanced Chemistry course.

**COMPUTER SCIENCE**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computer Science (including the MQP) (Notes 1, 2)</td>
<td>6</td>
</tr>
<tr>
<td>2. Mathematics (Notes 2, 3, 5)</td>
<td>7/3</td>
</tr>
<tr>
<td>3. Basic Science and/or Engineering Science (Notes 2, 4)</td>
<td>5/3</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Must include 1/3 unit from each of the following areas: Systems (CS 3013, CS 4513, CS 4514, CS 4515), Theory and Languages (CS 3133, CS 4123, CS 4533), Design (CS 3041, CS 3431, CS 3733, CS 4233), and Social Implications of Computing (CS 3043, STS 2208, GOV/ID 2314). (If STS 2208 or GOV/ID 2314 is used to satisfy this requirement, it does not count as part of the 6 units of CS.)
c. At least 5/3 units of the Computer Science requirement must consist of 4000-level courses. These units can also be met by WPI graduate CS courses, with the exception of CS 501 and CS 507.
d. Only one of CS 1101 and CS 1102 may count towards the computer science requirement. Only one of CS 2301 and CS 2303 may count towards the computer science requirement.

2. A cross-listed course may be counted toward only one of areas 1, 2, 3, above.
3. Must include at least 1/3 unit from each of the following areas: Probability (MA 2621, MA 2631) and Statistics (MA 2611, MA 2612).
4. Courses satisfying the science requirement must come from the BB, BME, CE, CH, CHE, ECE, ES, GE, ME, PH disciplines. At least three courses must come from BB, CH, GE, PH, where at least two courses are from one of these disciplines.
5. At most four 1000-level Mathematics courses may be counted towards this requirement.

**COMPUTERS WITH APPLICATIONS**

<table>
<thead>
<tr>
<th>Minimum Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computer Science (including the MQP) (Notes 1, 2)</td>
<td>16/3</td>
</tr>
<tr>
<td>2. Mathematics (Note 2)</td>
<td>7/3</td>
</tr>
<tr>
<td>3. Basic Science (Notes 2, 3)</td>
<td>2/3</td>
</tr>
<tr>
<td>4. Application Area (Notes 2, 4)</td>
<td>5/3</td>
</tr>
</tbody>
</table>

**NOTES:**

1. a. Only CS 1101, CS 1102 and computer science courses at the 2000-level or higher will count towards the computer science requirement. CS 2118 will not count towards the computer science requirement.
b. Must include at least 1/3 unit from each of the following areas: Systems (CS 3013, CS 4513, CS 4514, CS 4515), Theory and Languages (CS 3133, CS 4123, CS 4533), Design (CS 3041, CS 3431, CS 3733, CS 4233), and Social Implications of Computing (CS 3043, SS 2208). (If SS 2208 is used to satisfy this requirement, it does not count as part of the 16/3 units of CS.)
c. At least 5/3 units of the Computer Science requirement must consist of 4000-level courses. These units can also be met by WPI graduate CS courses, with the exception of CS 501 and CS 507.
d. The MQP must involve the application of computer science concepts to the Application Area specified in Requirement 4.
e. Only one of CS 1101 and CS 1102 may count towards the computer science requirement. Only one of CS 2301 and CS 2303 may count towards the computer science requirement.

2. A cross-listed course may be counted toward only one of areas 1, 2, 3, above.
3. The two courses satisfying the science requirement must both come from one of the following disciplines: BB, CH, GE, PH.
4. This requirement is satisfied by a cohesive set of work from disciplines other than Computer Science. Work used for any other degree requirements cannot be used for the Application Area. At least 3/3 units must be course work at the 3000 level or higher. Independent Study / Project (ISP) work, if any, must be conducted under the supervision of a member of the faculty in that discipline.

**ECONOMIC SCIENCE**

<table>
<thead>
<tr>
<th>Minimum Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Economics (Note 1)</td>
<td>3</td>
</tr>
<tr>
<td>2. Economics and/or Management (Note 2)</td>
<td>2/3</td>
</tr>
<tr>
<td>3. Other Social Science</td>
<td>1</td>
</tr>
<tr>
<td>4. Modeling Techniques</td>
<td>2/3</td>
</tr>
<tr>
<td>5. Mathematics (Note 3)</td>
<td>2</td>
</tr>
<tr>
<td>6. Basic Science</td>
<td>1</td>
</tr>
<tr>
<td>7. Electives</td>
<td>2/3</td>
</tr>
<tr>
<td>8. MQP</td>
<td>1</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Must include courses in both micro and macro economic theory at the intermediate level and in econometrics and international trade (available through the Consortium or independent study).
2. Must include financial accounting, ACC1100. May include other relevant management courses as approved by the Departmental Program Review Committee.
3. Must include differential equations, integral calculus, and statistics.

**ELECTRICAL AND COMPUTER ENGINEERING**

<table>
<thead>
<tr>
<th>Minimum Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics and Basic Science (Notes 1a-1d)</td>
<td>4</td>
</tr>
<tr>
<td>2. Engineering Science and Design (ES/D) (including the MQP) (Notes 2a-2g)</td>
<td>6</td>
</tr>
</tbody>
</table>

**NOTES:**

1. Mathematics and Basic Science:
   a. Must include at least 7/3 units of math (prefix MA). Mathematics must include differential and integral calculus, differential equations, discrete mathematics, and probability and/or statistics.
   b. Must include at least 2/3 units of physics (prefix PH).
   c. Must include at least 1/3 units of chemistry (prefix CH) or 1/3 units biology (prefix BB).
   d. Must include an additional 2/3 units of math or basic science (prefixes MA, PH, CH, BB, or GE)

2. Engineering Science and Design (including the MQP):
   a. Must include at least 5 units within the Electrical and Computer Engineering area (including the MQP). All courses with prefix ECE (except ECE 3601) and ES 3011 are applicable to these 5 units.
   b. The 5 units within the Electrical and Computer Engineering area must include at least 1 unit of courses from an approved list of Electrical Engineering courses.
   c. The 5 units within the Electrical and Computer Engineering area must include at least 2/3 unit of courses from an approved list of Computer Engineering courses.
   d. The 5 units within the Electrical and Computer Engineering area must include 1/3 unit of Capstone Design Experience. (This requirement is typically fulfilled by the MQP.)
   e. Must include at least 1/3 unit of computer science (prefix CS), at the 2000 level or above (other than CS 2111, CS 2022, CS 3043 which cannot be applied to this requirement).
   f. Must include at least 1/3 unit of engineering science (prefix ES) at the 2000 level or above. ES 3011 cannot be applied to this requirement.
   g. Must include an additional 1/3 unit of engineering science and design at the 2000 level or above, selected from courses having the prefix BME, CE, CHE, CS (other than CS 2011, CS 2022, CS 3043), ECE (other than ECE 3601), ES, FP, or ME.
### MINIMUM DISTRIBUTION REQUIREMENTS FOR STUDENTS

#### ENVIRONMENTAL ENGINEERING

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics and Basic Science</td>
<td>4</td>
</tr>
<tr>
<td>(Note 1)</td>
<td></td>
</tr>
<tr>
<td>2. Advanced Science (Note 2)</td>
<td>1</td>
</tr>
<tr>
<td>3. Engineering Science and Design (Includes MQP) (Note 3)</td>
<td>6</td>
</tr>
</tbody>
</table>

#### NOTES:
1. Mathematics and Basic Science
   a. Must include 6/3 units of mathematics, including differential and integral calculus, differential equations, and statistics.
   b. Must include 6/3 units of basic science, including 1/3 unit of biology (BB), 3/3 units of chemistry (CH), 1/3 unit of earth science (GE 2341 recommended) and 1/3 unit of PH (calculus based).
2. Advanced Science: Must include 3/3 units of science at the 2000-level or higher. Minimum of 1/3 unit in biology (BB) and 1/3 unit in chemistry (CH). Courses may not be double counted toward the basic science requirement.
3. Engineering Science and Design
   a. Must include 2/3 units in thermofluids, including 1/3 unit in fluid mechanics (ES 3004 recommended) and 1/3 unit in thermodynamics (ES 3001, CH 3501 or CHE 2013).
   b. Must include 2/3 units in mechanics and materials (CE 2000 or ES 2501, CE 2001 or ES 2502, ES 2001, ES 2503).
   c. Must include 3/3 units of Core Environmental Engineering (CHE 2011, CE 3059, CE 3062, CHE 3201).
   d. Must include 6/3 units in Environmental Engineering Electives, arranged as follows: 3/3 units in water quality and resources, 2/3 units in air and land environmental systems, and 1/3 unit in environmental management.
   e. Must include exposure to public health issues (CE 370X or other appropriate experience through IQP, independent study, or appropriate consortium courses).
   f. Must include 2/3 units with laboratory experimentation. Must include either CE 4060 or CHE 4401. The remaining 1/3 unit may be CE 4060, CHE 4401, laboratory courses in CH (CH 2640 or CH 2650, which would satisfy Advanced Science course requirements), CE 3026, or CE 2020.
   g. Must include 1/3 unit major design experience through the MQP, or other approved design experience in a course such as CHE 4403 or ME 4429.

#### HUMANITIES AND ARTS

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Humanities and Arts (including MQP) (Note 1)</td>
<td></td>
</tr>
<tr>
<td>2. Electives (Note 2)</td>
<td>4</td>
</tr>
</tbody>
</table>

#### NOTES:
1. Humanities and Arts majors may choose to complete 2 units of work and an MQP in one of the following areas of Concentration: History, Literature, Music, Philosophy, Religion, Drama/Theatre, Writing and Rhetoric, Art History/Architecture, German Studies, Hispanic Studies, American Studies, Environmental Studies, or Humanities Studies of Science and Technology.
2. May be from any area except Aerospace Studies, Military Science, or Physical Education. Courses used to satisfy other degree requirements (i.e. the IQP and the Sufficiency) may not be used to fulfill this requirement.

#### DOUBLE MAJOR IN HUMANITIES AND ARTS

Students may pursue a double major in Humanities and Arts and in an area of science, engineering, or management. To pursue the double major, a student must satisfy all of the degree requirements of the technical discipline including an MQP and Distribution Requirements. In addition, the double major in Humanities and Arts requires 6 units of studies in the Humanities and Arts, including the MQP. Students pursuing a double major in Humanities and Arts are not required to complete a Sufficiency Program in Humanities and Arts, nor are they required to complete a second IQP. Students interested in pursing this option should contact Prof. B. Addison, 39 Dean St., Room 260, for additional information.

#### INDUSTRIAL ENGINEERING (Management Department)

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics and Basic Science (Notes 1, 2)</td>
<td>4</td>
</tr>
<tr>
<td>2. Industrial Engineering Topics (including the MQP) (Notes 3, 4)</td>
<td>6</td>
</tr>
</tbody>
</table>

#### NOTES:
1. Mathematics must include differential and integral calculus, ordinary differential equations, and 2/3 units in probability and statistics.
2. Basic Science must include both chemistry and physics, with a minimum of two courses in either.
3. Must include 1/3 unit of Capstone Design Experience.
4. Industrial Engineering Topics must include courses in the following three topic areas.
   a. 3 units of industrial engineering core courses, including 1/3 unit in each of the following 9 areas: engineering basics outside industrial engineering, deterministic operations research methods, process design, production planning and control, simulation, stochastic methods in operations research, information systems design, financial modeling and organizational science.
   b. 1 unit in Industrial Engineering electives. 3000/4000 level OIE courses, MIS 3720, MIS 4720, and Operations Research courses in Mathematics qualify. Courses in financial modeling and organizational science do not qualify.
   c. 1 unit in technical electives. Industrial Engineering electives and any other Engineering Science/Design courses qualify.
INTERACTIVE MEDIA AND GAME DEVELOPMENT

<table>
<thead>
<tr>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Core IMGD (Note 1) 2/3</td>
</tr>
<tr>
<td>2. Math 1/3</td>
</tr>
<tr>
<td>3. Science 1/3</td>
</tr>
<tr>
<td>4. Computer Science 1/3</td>
</tr>
<tr>
<td>5. Social and Philosophical Issues (Note 2) 1/3</td>
</tr>
<tr>
<td>6. Studio Art (Note 11) 1/3</td>
</tr>
<tr>
<td>7. Computer Music (Note 12) 1/3</td>
</tr>
<tr>
<td>8. English (Note 3) 1/3</td>
</tr>
<tr>
<td>9. Advanced IMGD (Note 4) 2/3</td>
</tr>
<tr>
<td>10. Major Qualifying Project (Note 5) 3/3</td>
</tr>
</tbody>
</table>

In addition to the requirements listed above, students must satisfy one of the two area requirements, Technical (Computer Science) or Artistic (Humanities and Arts):

AREA

<table>
<thead>
<tr>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>11a. Computer Science (Note 6) 10/3</td>
</tr>
<tr>
<td>11b. Humanities and Arts (Notes 7, 8) 10/3</td>
</tr>
</tbody>
</table>

Students have electives that can be tailored to meet specific degree requirements and interests:

ELECTIVES

<table>
<thead>
<tr>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Total Electives (Notes 9, 10) 6/3</td>
</tr>
</tbody>
</table>

NOTES:

1. Choose from: Critical Studies of Interactive Media and Games (IMGD 1000), The Game Development Process (IMGD 1001), Storytelling in Interactive Media and Games (IMGD 1002).
3. Courses with the prefix EN or WR.
4. Taken from 2 technical offerings (IMGD 3000 and IMGD 4000) or 2 artistic offerings (IMGD 3500 and IMGD 4500).
5. Students who double-major in IMGD with the Technical area requirement and a second major in Humanities and Arts or International Studies will be deemed to have satisfied the Sufficiency requirement. Students who double major in IMGD with the Artistic area requirement and a second major in a science, engineering, or mathematics discipline will be deemed to have satisfied the Sufficiency requirement. In these cases, the IMGD MQP advisor must certify that the content of the IMGD MQP matches the student’s Artistic or Technical IMGD area requirement.
6. At least 4/3 from: Human-Computer Interaction (CS 3041), Software Engineering (CS 3733, CS 4233), Computer Architecture (CS 4732), Computer Networks (CS 4514), Graphics (CS 4731), Animation (CS 4732), or Artificial Intelligence (CS 4341).
7. At least 1/3 from each of the following areas: Art, Music and English.
8. At least 5/3 units at the 2000-level or higher.
9. Electives must be chosen from the following areas: Computer Science, Humanities and Arts, Interactive Media and Game Development, Mathematics, Science, Social Science, Management, or Engineering.
10. At least 3/3 units must be in a single one of the areas listed in Note 9.
12. Choose from: Computer Techniques in Music (MU 3611), Computers and Synthesizers in Music (MU 3612), or Digital Sound Design (MU 3613).
LIBERAL ARTS AND ENGINEERING

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics and Basic Sciences (Notes 1, 2)</td>
<td>3</td>
</tr>
<tr>
<td>2. Engineering Science and Design (Notes 3, 4, 5)</td>
<td>3</td>
</tr>
<tr>
<td>3. Humanities and Arts, Social Science, and Management Topics (Notes 6, 7)</td>
<td>3</td>
</tr>
<tr>
<td>4. MQP (Note 8)</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTES:
1. Mathematics must include differential and integral calculus and either probability or statistics.
2. All courses with prefixes BB, CH, PH, or GE count toward this requirement. Must include at least 1/3 Unit each of BB, CH, and PH.
3. Courses with prefixes BME, CE, CHE, CS, ECE, ES, and ME are eligible to count toward this requirement. These courses should be thematically related; students must gain approval of their program of study in this area from the Liberal Arts and Engineering Program Committee.
4. Must include either CS 1101 or CS 1102.
5. Must include at least one course in engineering design (such as ECE 2799 or ME 2300), plus at least two other courses with a significant laboratory component (a list of such courses will be maintained by the Liberal Arts and Engineering Program Committee).
6. Must include 2 Units of Humanities and Arts and Social Science. Courses with prefixes AR, HI, PY, RH, WR, IMGD, ECON, GOV, PSY, STS, and SD may be eligible to count toward this requirement. Courses must be selected from areas that strongly complement the practice of engineering, such as the history of technology, ethics, writing and visual rhetoric, economics, society-technology studies, and environmental studies. A list of such courses will be maintained by the Liberal Arts and Engineering Program Committee.
7. May include up to 1 Unit of Management. All courses with prefixes ACC, BUS, ETR, FIN, MKT, MIS, OIE, and OBC are eligible to count toward this requirement.
8. The MQP provides a capstone experience that builds on both the technical (Engineering Science and Design) and nontechnical (Humanities and Arts, Social Science, and Management Topics) components of the student’s particular program. At least one advisor to the MQP must be a member of the Liberal Arts and Engineering Associated Faculty.

MANAGEMENT ENGINEERING (Note 1)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Management Foundation (Note 2)</td>
<td>11/3</td>
</tr>
<tr>
<td>2. Mathematics (Note 3)</td>
<td>4/3</td>
</tr>
<tr>
<td>3. Basic Science</td>
<td>2/3</td>
</tr>
<tr>
<td>4. Management Engineering Major (Note 4)</td>
<td>6/3</td>
</tr>
<tr>
<td>5. Breadth Electives (Note 5)</td>
<td>3/3</td>
</tr>
<tr>
<td>6. Computer Science (Note 6)</td>
<td>1/3</td>
</tr>
<tr>
<td>7. MGE MQP</td>
<td>3/3</td>
</tr>
</tbody>
</table>

NOTES:
1. Courses may not be counted more than once in meeting these distribution requirements. The total number of units taken in the Department of Management may not exceed 50% of the total number of units earned for the degree.
2. The Management Foundation must cover the foundation knowledge in the management functional areas, including at least 1/3 unit of financial accounting, managerial accounting, financial management, organizational science, deterministic management science, operations management, marketing management, information systems management, and business law and ethics. Microeconomics and Macroeconomics are required and also fulfill the WPI Social Science requirement.
3. Mathematics must include 2/3 units of calculus and 2/3 units of statistics.
4. The Management Engineering Major must complete six courses from one of the concentrations as specified in the WPI Undergraduate Catalog “For the MGE Major” or work with their academic advisor to create a custom MGE Program. Such custom programs must be approved by the advisor and the Department of Management’s Undergraduate Policy & Curriculum Committee.
5. Breadth Electives must include at least 1/3 unit from among the 3000- and 4000-level courses in the Department. The remaining 2/3 units specified in the requirement may be satisfied with courses from Mathematics, Basic Science, Computer Science, Social Science, or courses with any of the following prefixes: ACC, BUS, ETR, FIN, MIS, MKT, OBC, or OIE, but excluding courses FIN 1250 and OIE 2850.
6. A minimum of 1/3 unit of Computer Science (except CS 2022 and CS 3043). Either CS 1101 or CS 1102 is recommended.
## Management Information Systems

**Minimum Units**

1. Management Foundation (Note 2) 11/3
2. Mathematics (Note 3) 4/3
3. Basic Science 2/3
4. Management Information Systems Major (Note 4) 6/3
5. Breadth Electives (Note 5) 3/3
6. Computer Science (Note 6) 1/3
7. MIS MQP 3/3

### NOTES:

1. Courses may not be counted more than once in meeting these distribution requirements. The total number of units taken in the Department of Management may not exceed 50% of the total number of units earned for the degree.
2. The Management Foundation must cover the foundation knowledge in the management functional areas, including at least 1/3 unit of financial accounting, managerial accounting, financial management, organizational science, deterministic management science, operations management, marketing management, information systems management, and business law and ethics. Microeconomics and Macroeconomics are required and also fulfill the WPI Social Science requirement.
3. Mathematics must include 2/3 units of calculus and 2/3 units of statistics.
4. The Management Information Systems Major must complete six courses from those specified in the WPI Undergraduate Catalog “For the MIS Major” or work with their academic advisor to create a custom MIS Program. Such custom programs must be approved by the advisor and the Department of Management’s Undergraduate Policy & Curriculum Committee.
5. Breadth Electives must include at least 1/3 unit from among the following areas is required: ACC, BUS, ETR, FIN, MIS, MKT, OBC, or OIE, but excluding courses FIN 1250 and OIE 2850.
6. A minimum of 1/3 unit of Computer Science (except CS 2022 and CS 3043). Either CS 1101 or CS 1102 is recommended.

## Mathematical Science

**Minimum Units**

1. Mathematics including MQP (Notes 1-4) 7
2. Courses from other departments that are related to the student’s mathematical program. At least 2/3 unit in computer science must be included; the remaining courses are to be selected from science, engineering, computer science or management (except FIN 1250) (Note 5) 2
3. Additional courses or independent studies (except MS, PE courses, and other degree requirements) from any area 1

### NOTES:

1. Must include MA 3831-3832, or their equivalents, at least one of MA 3257, MA 3457, or equivalent, and at least one of MA 3823, MA 3825, or equivalent.
2. Must include at least three of the following: MA 2073, MA 2271, MA 2273, MA 2431, MA 2631, or their equivalents.
3. At least 7/3 units must consist of MA courses at the 3000 level or above.
4. May not include both MA 2631 and MA 2621.
5. May not include both CS 3043 and CS 2022.

## Mechanical Engineering

### Minimum Units

1. Mathematics and Basic Science (Notes 1, 2, 3) 4
2. Engineering Science and Design (includes MQP) (Notes 3, 4, 5, 6, 7, 8, 9) 6

### NOTES:

1. Must include a minimum of 5/3 units of mathematics, including differential and integral calculus and differential equations.
2. Must include a minimum of 1/3 unit in chemistry and 2/3 unit in either physics, or 1/3 unit in physics and 2/3 unit in chemistry.
3. Must include an activity that involves basic matrix algebra and the solution of systems of linear equations, and an activity that involves data analysis and applied statistical methods.
4. Must include 1/3 unit in each of the following: electrical engineering, materials science, and mechanical engineering experimentation.
5. Must include at least one unit of ME courses at the 4000-level or higher.
6. May include 1000 level courses only if designated ES or ME.
7. Must include two stems of coherent course and/or project offerings as noted below in a and b.
   a. A minimum of one unit of work in thermofluid systems that includes the topics of thermodynamics, fluid mechanics and heat transfer, plus an activity that integrates thermofluid design.
   b. A minimum of one unit of work in mechanical systems that includes the topics of statics, dynamics, and stress analysis, plus an activity that integrates mechanical design.
8. Must include an activity which realizes (constructs) a device or system.
9. Must include 1/3 unit of Capstone Design Experience. Items 3, 5, 7a integration, 7b integration, 8, 9 may all be “multiple-counted.”
### PHYSICS

<table>
<thead>
<tr>
<th>Minimum Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics (Note 1)</td>
<td>3</td>
</tr>
<tr>
<td>2. Physics (including the MQP) (Notes 2, 3)</td>
<td>5</td>
</tr>
<tr>
<td>3. Other subjects to be selected from mathematics, science, engineering, computer science, and management (Note 3)</td>
<td>2</td>
</tr>
</tbody>
</table>

#### NOTES:
1. Mathematics must include at least 2/3 unit of mathematics at the level of MA 3000 or higher.
2. ES 3001 and CH 3510 count as physics courses.
3. Either item 2 or 3 must include at least 1/3 unit from each of the five principal areas of physics: mechanics, experimental physics, electromagnetism, quantum mechanics, and thermal and statistical physics. This core distribution requirement is satisfied by successfully completing at least one course from each of the following five sets of courses: PH 2201 or 2202 (mechanics); PH 2651 or 2601 (experimental physics); PH 2301 or 3301 (electromagnetism); PH 3401 or 3402 (quantum mechanics); ES 3001, CH 3510, or PH 4206 (thermal and statistical physics); or other courses approved by the department Program Review Committee following petition by the student.

### ENGINEERING PHYSICS

1. Same requirements as PHYSICS, with the addition that the 10 units must include 2 units of coordinated engineering and other technical/scientific activities. The 2-unit program must be formulated prior to final year of study by the student in consultation with the academic advisor, and must be certified prior to the final year by the departmental Program Review Committee.

These distribution requirements in physics apply to all students matriculating at WPI after May, 2005. Students who matriculated prior to May, 2005, have the option of satisfying the degree requirements in the catalog current at the time of their matriculation.

### PROFESSIONAL WRITING

<table>
<thead>
<tr>
<th>Minimum Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scientific and/or technical concentration (Note 1)</td>
<td>6</td>
</tr>
<tr>
<td>2. Writing and Rhetoric concentration (Note 2)</td>
<td>3</td>
</tr>
<tr>
<td>3. MQP</td>
<td>1</td>
</tr>
</tbody>
</table>

#### NOTES:
1. The student’s scientific and/or technical concentration must be a plan of study, approved by the student’s program review committee, with a clear underlying rationale in mathematics, basic science, computer science, engineering, and/or management.
2. The Writing and Rhetoric concentration consists of 1 unit in each of the 3 following categories of courses. Courses taken to fulfill these distribution requirements will not include courses that fulfill other degree requirements, such as the Humanities and Arts Sufficiency and the Social Sciences requirement. Exceptions to this restriction, not to exceed 1 unit, must be approved by the student’s program review committee, and will be granted only under unusual circumstances.

- **A. Written communication (1 unit)**
  - Recommended courses:
    - EN/WR 2211 Elements of Writing
    - EN/WR 3011 Peer Tutoring in Writing
    - EN/WR 3214 Writing About Disease and Public Health
    - EN/WR 3216 Writing in the Professions or equivalent writing courses or ISPs

- **B. Rhetoric and communication studies (1 unit)**
  - Recommended courses:
    - RH 3111 The Study of Writing
    - RH 3112 Rhetorical Theory
    - RH 3211 Rhetoric of Visual Design or ISP or any of the courses listed in Category A not used to fulfill that requirement.

### ROBOTICS ENGINEERING

<table>
<thead>
<tr>
<th>Minimum Units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics (Note 1)</td>
<td>7/3</td>
</tr>
<tr>
<td>2. Basic Science (Note 2)</td>
<td>4/3</td>
</tr>
<tr>
<td>3. Entrepreneurship</td>
<td>1/3</td>
</tr>
<tr>
<td>4. Engineering Science and Design, including the MQP (Notes 3, 4, 5, 6, 7, 8, 9)</td>
<td>6 *</td>
</tr>
</tbody>
</table>

#### NOTES:
1. Must include Differential and Integral Calculus, Differential Equations, Discrete Mathematics, and Probability or Statistics.
2. Must include at least 2/3 units in Physics.
3. Must include at least 5/3 units in Robotics Engineering.
4. Must include at least 1 unit in Computer Science, including Algorithms and Software Engineering.
5. Must include at least 2/3 units in Electrical and Computer Engineering, including Embedded Systems.
6. Must include at least 1/3 unit in Statics and 1/3 unit in Controls.
7. Must include at least 1/3 unit of Social Implications of Technology (CS 3043, GOV 2302, GOV/ID 2314, IMGD 2000, STS 2208).
8. Must include at least 1 unit from a list of Robotics Electives, of which at least 1/3 unit must be in Advanced Systems (CS 4341, ECE 3308, ME 3310).
9. The MQP must be a Capstone Design Experience in Robotics Engineering.

* 6 units if GOV 2302, GOV/ID 2314, or STS 2208 are double-counted as meeting the Social Science Requirement and Engineering Science and Design Requirement.
<table>
<thead>
<tr>
<th>SOCIETY, TECHNOLOGY AND POLICY</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Social Science (Notes 1, 2)</td>
<td>4</td>
</tr>
<tr>
<td>2. Minimum Basic Science background</td>
<td>2/3</td>
</tr>
<tr>
<td>3. Minimum Mathematics background</td>
<td>1</td>
</tr>
<tr>
<td>(Note 3)</td>
<td></td>
</tr>
<tr>
<td>4. Technical concentration (Note 4)</td>
<td>5/3</td>
</tr>
<tr>
<td>5. Electives (Note 5)</td>
<td>5/3</td>
</tr>
<tr>
<td>6. MQP</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTES:
1. Students must obtain approval of their proposed program from the Departmental Program Review Committee. Course distribution will focus on a disciplinary specialty and either policy analysis or a society-technology specialization such as Social Impact Analysis or Technology Assessment.
2. Relevant Humanities and Arts or Management courses approved by the Departmental Review Committee may be counted for a maximum of 2/3 of a unit in fulfilling the 4-unit requirement.
3. One course in calculus-based statistics is required.
4. A series of courses in one field of science or engineering, or a combination of courses approved by the Departmental Review Committee which focus on issues to be developed in the MQP.
5. These courses are to be approved by the Departmental Review Committee and are meant to broaden the technical concentration and tie it to social concerns.

<table>
<thead>
<tr>
<th>SYSTEM DYNAMICS</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. System Dynamics (Note 1)</td>
<td>5/3</td>
</tr>
<tr>
<td>2. Other Social Science (Note 2)</td>
<td>5/3</td>
</tr>
<tr>
<td>3. Management (Note 3)</td>
<td>2/3</td>
</tr>
<tr>
<td>4. Mathematics/basic sciences/engineering (Note 4)</td>
<td>8/3</td>
</tr>
<tr>
<td>5. Computer Science (Note 5)</td>
<td>2/3</td>
</tr>
<tr>
<td>6. Application Area (Note 6)</td>
<td>5/3</td>
</tr>
<tr>
<td>7. MQP</td>
<td>1</td>
</tr>
</tbody>
</table>

NOTES:
1. Only social science courses with a “5” in the second digit of the course number count toward the system dynamics requirement.
2. Must include microeconomics or macroeconomics, cognitive or social psychology, and public policy.
3. Must include organizational science.
4. Must include differential and integral calculus, differential equations, and numerical analysis or statistical analysis.
5. Courses on computer programming and programming languages are recommended.
6. This requirement is satisfied by a cohesive set of work from the fields of social science, management, science, mathematics, computer science, or engineering as specified in the curriculum guidelines for system dynamics major.
Mathematics
All Courses designated “MA.”
Advanced placement established by AP exam or through passing WPI advanced courses (see page 276) also qualify.

Basic Science
All courses designated “PH,” “CH,” “BB,” and GE 2341.

Engineering Science/Design
The following courses may be applied to the “Engineering Science and Design” distribution requirement for each respective engineering major:
- **BME:** All courses designated “BME” (except BME 3110) and CE, CHE, ECE, and ME courses at the 2000-level or above.
- **CE:** All courses designated “CE.” Also ES 2503 and ES 3004.
- **CHE:** All courses designated “CHE.” Also ES 3002, ES 3003, ES 3004, and other courses approved by the Chemical Engineering Department. See page 97, and consult with your academic advisor for details.
- **ECE:** All courses designated “ECE” (except ECE 3601) and ES 3011 may be included in the six-unit ECE area distribution requirement.

ME: All courses designated “ME” except ME 3601.

IE: OIE courses including OIE 2500, OIE 3401, OIE 3405, OIE 3420, OIE 3450, OIE 3460, OIE 3501, OIE 4410, and OIE 4460.

In addition, engineering majors selecting “Engineering Science/Design” courses from outside their major may choose appropriate activities from any of the following:
- All courses designated ES, ECE, CHE, ME.
- All OIE courses listed above (for ME majors only).
- All courses designated as CE except CE 3022.
- All courses designated as CS except CS 1101, CS 1102, and CS 3043.

(Electrical and Computer Engineering majors are restricted to these courses at the 2000-level or higher.)

All ABET engineering programs require six units of Engineering Science and Design.
All graduate-level courses may be counted in the appropriate categories.

### PROJECTS

Project activity is an integral part of the educational experience for all students under the WPI Plan. The two types of qualifying projects are:

1. A project in the major field of study (the Major Qualifying Project, or MQP).
2. A project which relates technology and science to society or human needs (the Interactive Qualifying Project, or IQP).

Projects should be chosen in consultation with the student’s academic advisor and must be accepted by a project advisor before project registration can be completed. Many project opportunities come from off-campus organizations, and provide challenges to solve real-world problems and thus gain experience invaluable for seeking jobs and for professional practice. Students are encouraged to develop their own projects, to solicit support for their ideas from potentially interested faculty, and to form teams to pool resources and share points of view.

The Major Qualifying Project should focus on the synthesis of all previous study to solve problems or perform tasks in the major field with confidence, and communicate the results effectively.

The Interactive Qualifying Project should challenge students to relate social needs or concerns to specific issues raised by technological developments.

### PAY AND CREDIT

The WPI Faculty approved the following project policies in 1973:

1. A student may receive pay for related work that is above and beyond the work clearly defined for academic credit for a project.
2. Wherever possible remuneration for this extra work will be paid by WPI to the student from funds directly obtained through grants from the company to the college.
3. Results obtained from paid or unpaid work performed while students are not registered for project credit at WPI may be used in projects only after consultation with the project advisor. When possible such consultation should take place before the work begins.
4. Students who wish to pursue project work off-campus for WPI credit can do so only if 1) they are registered for that term at WPI, 2) their project advisors have established appropriate methods of supervising the off-campus work. Such supervision must make adequate provision for periodic review and advising.
RESOURCES - GETTING STARTED
Students are encouraged to avail themselves of the many resources and advice areas found in the Projects Program web page (www.wpi.edu/Academics/Projects).

In addition, personal advice can be provided by meeting with the Projects Administrator (Daniels Hall) or the project coordinators listed on page 261.

AVAILABLE PROJECTS
Students may obtain information about new or ongoing projects from a variety of sources. Principal sources include discussions with other students, especially those currently involved in a project, the Projects Program web site, department offices, or their web pages. Off-campus projects are discussed annually in the fall. In the spring, “Available Projects” on the Projects Program web site (www.wpi.edu/Academics/Projects/) can be used as a directory of specific projects or as a source of ideas for developing your own projects. Some students will find a project listed which fits their needs and interests exactly. In other cases, the listing will serve to lead students to a faculty member with whom project involvement can be negotiated. The proposals in the Projects Program web page are updated periodically to provide an accurate listing of available projects.

PROJECT ADVISOR
Academic advisors can assist students in identifying a project. They are aware of the project interests of many other faculty members, and have a list of faculty interests which will enable a student to find a faculty member who can help to develop a project idea. Faculty associated with the Interdisciplinary and Global Studies Division (IGSD) are available to assist students in interdisciplinary and interactive projects. The Projects Office can also assist in finding an appropriate project advisor. See pages 261-262.

PROJECT PERFORMANCE
A student is normally expected to expend 15-17 hours per week on the average for each 1/3 unit of credit for project work, and expected achievement is based upon that commitment.

A project group, whether it involves one student or more, should have a minimum of one scheduled conference per week with the advisor(s). Additional time should be scheduled when the effort exceeds 1/3 unit per student or when more students are involved.

Students should be prepared to submit written project reports to the advisor each week. Students are also encouraged to complete a proposal at the beginning of the project activity to define the scope and timeline for completion of the effort. In addition, oral reports may be required as determined by the advisor. At the end of the project, a report must be prepared to the satisfaction of the project advisor. For projects sponsored by off-campus organizations, both a written and oral report for the sponsors is normally expected. Written qualifying project reports go on file in Gordon Library for a period of five years.

QUALIFYING PROJECT DOCUMENTATION
In completing the qualifying project degree requirement, students must submit to their project advisors a final document of record. It is expected that the qualifying project documentation will, in most cases, consist of a written report only. In some cases, however, the project documentation may include, in addition to the written report, material in another medium or form, such as software, a video tape, a CD-Rom, or a publication. It is reasonable to expect that the scope of the written report in such instances may be narrower than would be the case if the documentation were by written report only; for example, the objective of a project might be the preparation of a videotape to serve a special purpose, meet a specified need, record a singular event, etc. At the very least, however, the written report portion of the project documentation should provide the reader with a history of the student’s involvement with the project, its aims and objectives, its rationale, the role played in the project by the material in the other medium, and the conclusions reached and recommendations framed by the student. All additional forms of documentation must also be submitted with the written report.

FINAL REPORT PROCEDURES
The student will submit the project documentation (the original copy of the written report plus any additional documentary material) to the project advisor. The deadline for the submission of the initial report draft and the final document may be established at the discretion of the project advisor. Drafts and reports need not be accepted by the advisor after the established deadline.

The qualifying project advisor will fill out the “Completion of Degree Requirement” form and forward both the form and the project documentation to the Registrar. The Registrar will record the completion of the degree requirement and the evaluation grade only if the project documentation accompanies the form. Otherwise, the Registrar will return the form to the initiator. In the case of a group project report, a separate completion form must be submitted for each student.

The student is responsible for the cost of preparing only the original copy of the written report. The cost of additional copies will be borne by the individual or organization desiring them. It is highly recommended that each student retain a copy of their project for future reference.

GROUP QUALIFYING PROJECT EFFORTS
Students meeting a qualifying project degree requirement by participation in a group, or team effort, will submit, at the discretion of the project advisor, either a single, comprehensive written report from the group, or individual written reports from each member of the group. A single, comprehensive written report must, however, include some means by which each individual’s contribution to the group effort may be clearly identified. This identification may take the form of an “authorship page,” simply a list of individual chapters and their respective authors, or
of a prefacing statement in which each contributing group member is named as having carried out one or more specific tasks within the overall project effort.

In the case where one or more students leave an ongoing group project after having contributed at least one unit each of project effort, those students, again at the discretion of the project advisor, will submit either a single written report or individual written reports in satisfying the qualifying project documentation requirement. The same means of identifying individual contributions will be employed as described above.

CENTER FOR COMMUNICATION ACROSS THE CURRICULUM
(Upper Level; Project Center)

Accompanying strong emphasis on project work at WPI is strong emphasis on high quality presentation of materials such as proposals, written reports, term papers, and abstracts. To assist you in developing your writing and oral presentation skills, WPI has established a Center for Communication Across the Curriculum that offers writing and presentation consultations, style guidelines, writing manuals and presentation videotapes. Style guidelines, writing manuals and specially prepared handouts concerned with report writing are available. Small group or individual conferences scheduled by appointment with the writing tutors constitute an additional service provided by the Center to help students with their writing skills. For further information, contact Dr. Higgins at x5503.

DISSEMINATION OF PROJECT REPORTS

MQPs and IQPs completed for off-campus agencies are usually distributed within the sponsoring agency by the agency project liaison. MQP and IQP reports are catalogued for in-library use only at the Gordon Library (1999 to the present) after being submitted to the faculty advisor. Electronic undergraduate Interactive and Major Qualifying projects have begun to be submitted online, see http://www.wpi.edu/Pubs/E-project/ for more information on this project.

Students thus must be responsible for keeping personal copies of project reports for their own permanent professional records. WPI strongly encourages students to prepare MQP and IQP reports in electronic as well as hard copy formats. In this way, reports can be reviewed for later use by students, and incorporated into a professional portfolio.

Thus, MQPs and IQPs are best viewed as research reports which establish good professional practices as well as being potential sources for further study and research.
GILLETTE COMPANY PROJECT CENTER

Gillette is the world leader in grooming products. Their South Boston Manufacturing Center (SBMC) is their primary location for the manufacture of shaving systems such as the Mach 3 and Venus razors, where over a billion units are produced each year. Many major qualifying project opportunities are available, principally in mechanical and manufacturing engineering. Projects can range from the design of equipment for automated production systems to the analysis and modeling of the kinematics, dynamics, and vibrations of existing systems. Students who do these projects will have the opportunity to solve real engineering problems, interact with professional engineers at one of the most automated assembly facilities in the world, and demonstrate their presentation skills. Those interested in exploring project opportunities at Gillette should contact Professor Robert L. Norton, Mechanical Engineering Department.

UMASS MEMORIAL HEALTH CARE/UNIVERSITY OF MASSACHUSETTS MEDICAL SCHOOL/ TUFTS UNIVERSITY SCHOOL OF VETERINARY MEDICINE PROJECT CENTERS

Biomedical projects (MQP, IQP, PQP, and thesis) are available at UMass Memorial Health Care, University of Massachusetts Medical School (UMMS), and Tufts University School of Veterinary Medicine (TUSVM) for students from all disciplines on campus. Each of these centers is located close to WPI. It is recommended that students spread their projects over the entire academic year. However, in some cases, full-time activity for a term can be accommodated. Students interested in project opportunities should contact the Biomedical Engineering Department Projects Faculty Coordinator well in advance of their planned project activity.
THE MAJOR QUALIFYING PROJECT

The qualifying project in the major field of study should demonstrate application of the skills, methods, and knowledge of the discipline to the solution of a problem that would be representative of the type to be encountered in one’s career. The project’s content area should be carefully selected to complement the student’s total educational program. In defining the project area within which a specific topic is to be selected, the student and academic advisor should pay particular attention to the interrelationships that will exist between the bodies of knowledge represented by courses, independent studies, and Preliminary Qualifying Projects; and by the Interactive Qualifying Projects.

MQP activities encompass research, development, and application, involve analysis or synthesis, are experimental or theoretical, emphasize a particular subarea of the major, or combine aspects of several subareas. In many cases, especially in engineering, MQP’s involve capstone design activity. Long before final selection of a project topic, serious thought should be given as to which of these types of activities are to be included. Beyond these considerations, the MQP can also be viewed as an opportunity to publish, to gain experience in the business or public sectors, or to utilize special facilities like those listed on pages 8 through 15.

Off-campus MQPs are also very valuable for access to state-of-the-art resources and contacts for future professional work.

GETTING STARTED ON AN MQP

Project topics are originated by students, faculty, or practicing professionals participating in WPI’s off-campus project programs. A faculty member in each academic department acts as Project Coordinator for all majors within the department. The Project Coordinator has assembled MQP topic descriptions being proposed and has identified the faculty who will serve as project advisors for each topic. All project opportunities—MQP, IQP, PQP, on-campus originated and off-campus originated—are made available to the student body through a planned information-sharing program of activities during C and D terms of the academic year prior to the start of the project.

PROJECT PROPOSALS

Students are strongly encouraged to begin their MQPs with a project proposal. A detailed guide to preparing project proposals is available in department offices or on the Projects Program web page (www.wpi.edu/Academics/Projects/).

THE INTERACTIVE QUALIFYING PROJECT

The Interactive Qualifying Project (IQP) challenges students to address a problem that lies at the intersection of science or technology and societal structures or human needs. The objective of the IQP is to enable WPI graduates to understand, as citizens and as professionals, how their careers will affect the larger society of which they are part. Generally, these projects involve some analysis of how technology affects, and is affected by, individuals and communities. Many of the projects are proposed by external agencies or organizations, and most are done in teams.

The IQP is an intentionally broad and integrative educational experience; student teams are drawn from all disciplines, and the topic is not necessarily related to the students’ major field. The procedure employed to relate the scientific or technological component to a social issue sometimes arises from students’ training in the social sciences or humanities. The IQP provides opportunities for significant international and pre-professional experience that are unique in technological education. (See Residential Project Centers, page 50)

PREPARING FOR THE IQP

While the preparation of most students for the Major Qualifying Project (MQP) involves extensive studies in technology, preparing for the IQP emphasizes the development of an understanding of the concepts and analytical techniques of the social sciences. The social science courses taken to satisfy the 2/3-unit social science requirement should be chosen to support IQP preparation (as explained on pages 187-188). In some cases, this background will include the study of other disciplines relevant to particular IQP topics. Preparation guidelines are included in the respective IQP division descriptions which follow, pages 43-49.

Students should begin preparing for their IQPs during their first two years at WPI; most of this preparation should be completed prior to work on the project itself. Be sure to discuss IQP opportunities with your first-year advisor. In preparing for specific IQPs, you can seek the assistance of the IQP division coordinators indicated on the following pages by the divisions below.

RESOURCES

To help students decide on an area of study and to identify faculty members who might be potential advisors, the division descriptions that follow indicate the chief areas of IQP interest. The names of faculty who have expressed interest in advising projects in each of these divisions may be determined by scanning the project proposals listed on the web-site, www.wpi.edu/Academics/Projects/. A list of residential project centers, with associated faculty, follows the division descriptions. These consultants can provide you with more information about the areas, and can assist you in finding an advisor. If you have questions or need assistance with your early exploration of interactive project opportunities, see the staff at the Interdisciplinary and Global Studies Division Office in the Project Center. Also, consulting the database of Completed Projects (on the campus computer system) is most helpful in suggesting topics and/or advisors.
**PROJECT PROPOSALS**
Students are strongly encouraged to begin their IQP activity with a project proposal. A detailed outline on preparing project proposals is available in the Interdisciplinary and Global Studies Division Office in the Project Center. Only students submitting project proposals and the accompanying budget are eligible for college financial support for their IQPs.

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**DIVISION 41, TECHNOLOGY AND ENVIRONMENT**
IQPs in the environmental area have dealt with a wide range of subjects, including hazardous waste, open space planning, climate changes, acid rain, aquatic weed control, and environmental impact statements. Topics may be global or a local issue; some projects are experimental and generate new data, while others are more theoretical in nature and apply prior research data. Projects must define an appropriate interaction, and be defined and managed within the allotted time period. Environmental projects require a broad base of interest and knowledge, and therefore should be undertaken by student teams rather than isolated individuals. A faculty advisor familiar with your topic and knowledgeable in its interdisciplinary aspects will be able to help your project group.

A project proposal should be done before the actual project is initiated. This proposal should state the question being examined, review the literature in the area of concern, summarize the methodology to be used in the project, suggest the data which will have to be collected, and describe the intended usefulness of the project. This proposal may be done as the first stage of the project, or as a PQP, depending on the advisor’s requirements.

A wide range of environmental problems are available for projects. The solution to some of these problems may be sought by various environmental organizations (such as Massachusetts Audubon Society) or governments (municipalities or state agencies); the chance to work on such problems provides the student group with the opportunity to solve a real problem while providing the organization or community with a beneficial report.

**PREPARATION GUIDELINES**
The following courses may provide some basic skills for projects:
- BB 2040 Principles of Ecology
- CE 3059 Environmental Engineering
- ECON 2117 Environmental Economics
- GOV 2311 Legal Regulation of the Environment

Other courses should be taken, depending upon the particular project selected; for this reason it is helpful to think about the project in your sophomore year.

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**DIVISION 42, ENERGY AND RESOURCES**
This division focuses on the problem of meeting society’s needs for energy and other mineral resources. The division seeks to promote interdisciplinary project work on energy and resource use and supply. We are concerned with the technological alternatives, the economic, environmental and human value questions that must be faced in choosing among these alternatives, and the role of our social systems and institutions in determining the choices that are made.

Emergence of energy as a distinct area of project activity began at WPI with the energy crisis of 1973-1974. Since then, the pattern of interests in this area both here and elsewhere have evolved in response to international energy developments. Initially, issues of scarcity — the adequacy of the world’s energy resources to meet a growing demand and the sudden massive escalation of energy prices that occurred from 1974-1979 — were a primary concern. This period witnessed much activity in modeling energy markets and forecasting trends in energy demand, supply, and prices. Similar concerns were raised about the supply of basic metals and minerals. Many studies were undertaken of the markets for these natural resources to identify long-run price trends, the prospects for cartelization, and the need for stockpiles.

More recently, at WPI, the interests of students and faculty alike have shifted to an emphasis on “solutions.” In the last half dozen or so years, most of our interdisciplinary student projects have examined the economic feasibility, the environmental side effects, and the impact on public health and mortality of various resource technologies. Renewable sources of energy such as solar, wind, wood, and hydroelectric have been investigated frequently. More conventional alternatives to high-priced oil such as coal, natural gas, and nuclear power have received their share of attention. Many of these investigations have been of the case study type, examining the feasibility of a new technology in a particular setting. Energy independence at the level of the individual home owner has been a popular theme. But other projects have examined more global issues such as the public’s attitude toward nuclear power and its role in shaping national energy policy.

**PREPARATION GUIDELINES**
The implementation of government resource policies frequently involves manipulation of resource markets. The decisions our society makes about alternative sources of natural resources and the extent of resource conservation adopted will, to a large extent, be determined by the economic laws of supply and demand operating in these markets. Therefore, an understanding of how the economy functions at the level of individual economic decision makers and individual markets is essential for the effective conduct of many resource IQPs. Appraising the economic viability of alternative means of obtaining resources frequently involves making investment studies; i.e., capital budgeting.
The role of government and public opinion in the formation of our national energy policy can best be understood and analyzed by a student who has a background in sociology or political science. To obtain information on these subjects a student would take as many of the following courses as possible:

**Management**
- FIN 2200 Financial Management
- OIE 2850 Engineering Economics
- OIE 3400 Production System Design

**Philosophy and Religion**
- PY 2712 Social and Political Philosophy
- PY 2714 Ethics and the Professions: Personal, Professional and Social Dilemmas

**Social Sciences**
- ECON 1110 Introductory Microeconomics
- ECON 1120 Introductory Macroeconomics
- STS 2208 The Society-Technology Debate
- GOV 1301 U. S. Government
- GOV 1303 American Public Policy
- GOV 2304 Governmental Decision Making and Administrative Law

The Social Sciences courses listed above may be counted toward the 2/3-unit social science requirement.

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**DIVISION 43, HEALTH CARE AND TECHNOLOGY**

For much of the period since the advent of Medicare and Medicaid legislation in the mid-1960s, the cost of medical care has grown explosively. Both in inflation adjusted dollars and as a percentage of Gross Domestic Product, medical care in the United States is now at a level greatly exceeding that of the early 1960s. Furthermore, because of the aging of the American population (the over-85 age group — the so-called “frail elderly” — is the fastest growing element of our population) and the growth of expensive medical technology, forces remain strong towards an even higher level of medical expenditures.

Projects in this division address the interaction between health care technologies and the delivery of medical care in the United States. These IQPs focus on major social concerns in medicine (e.g., Magnetic Resonance Imaging — MRI, the potential for computer-based “expert systems” in medical care, new technologies for maintaining the independence of the elderly, managerial systems to control the cost of medical care, laser surgery, etc.) and moral and legal issues (e.g., the living will, the right-to-die controversy, organ transplantation, wrongful-death and wrongful-life issues, human cloning, use of steroids in sports, universal health insurance, abortion, fetal tissue transplants, etc.).

There are several off-campus institutions and project centers available as resources for students interested in projects in this area. They include: St. Vincent Hospital, the University of Massachusetts Medical Center, the Massachusetts Biotechnology Park (located in Worcester), San Francisco General Hospital, and St. Mary’s Hospital, San Francisco. The division coordinators should be contacted for the names of WPI faculty members associated with these institutions.

**PREPARATION GUIDELINES**

Projects in this division are multidisciplinary and should appeal to students with widely differing backgrounds and interests. Those students planning to do IQPs in this area should develop institutional and methodological background in both the technological and social science areas appropriate to their projects. Examples of courses which introduce social science concepts fundamental to this project area are listed below; course work in more specific topics within this project area (e.g., PY 2713, Bioethics, etc.) is also available.

- ECON 1110 Introductory Microeconomics
- ECON 1120 Introductory Macroeconomics
- STS 2208 The Society-Technology Debate
- GOV 1301 U. S. Government
- GOV 1310 Law, Courts and Politics
- PSY 1402 Introduction to Social Psychology
- GOV 2302 Science-Technology Policy

The Social Sciences courses listed above may also be counted toward the 2/3-unit social science requirement.

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**DIVISION 44, URBAN AND ENVIRONMENTAL PLANNING**

Urban and Environmental Planning IQPs offer the student a wide range of opportunities to investigate and analyze problems that require a systematic and comprehensive approach. IQP topics cover a wide range of areas, including:

Environmental analysis—such as the investigation of the “quality of life” or the impact resulting from physical alterations of the environment.

Environmental impact statements.

Resource management programs—such as water management programs for lakes, groundwater, rivers; or forest management programs for fuel, lumber, and recreation.

Redevelopment and renewal of city neighborhoods.

Rehabilitation of historic places and buildings.

Fiscal analysis and program impacts—such as those resulting from the implementation in Massachusetts of Proposition 2 1/2.

Preservation of agricultural lands.

Conservation and open-space planning.

Demographic policies and community facilities planning.

Land use planning.

Impacts of infrastructure development.

Often these problems are complex, requiring the use of concepts and skills provided by a range of professions and disciplines: sociology, economics, political science, physical science, law, and engineering. Ignoring these
contributions often leads to environmental and social impact, such as air and water pollution, unexpected fiscal burdens, noise, environmental disasters, and unhealthy living conditions. These now are evident in the “treated” water from our urban areas, in the disposal of solid waste from our consumer society, in the sterility of our “planned” subdivisions, and in the global alteration of fragile environment. Comprehensive planning for our urban and natural environment necessitates a holistic approach to solving specific problems which are faced by our neighborhoods, rural environments, urban areas, and the nation, as well as the world itself. Such problems will become worse unless comprehensive planning is understood and used.

PREPARATION GUIDELINES
The concepts and skills necessary for a planning-project will depend on the specific area. Often these multidisciplinary skills are brought to a project through a team effort, in which individuals share their learned disciplinary skills and concepts to solve the problem together. The following are suggested courses which could be beneficial to students who are interested in doing projects in Area 44:

Civil Engineering
CE 3070 Urban and Environmental Planning
CE 3074 Environmental Analysis
CE 4071 Land Use Development and Controls

Social Science
ECON 2117 Environmental Economics
GOV 2311 Legal Regulation of the Environment

The Social Sciences courses listed above may be counted toward the 2/3-unit social science requirement.

DIVISION 45, SCIENCE AND TECHNOLOGY: POLICY AND MANAGEMENT
Projects in this division share a concern for government’s role in solving or preventing a problem related to science and technology. Society must make collective choices about technology; increasingly, it does so through the political process. The politics of nuclear power, impact of urban forests on the environment, consumer needs and their impact upon public policy, the relationship between the educational needs of society and responses in the field of education, health policy, and organizational approaches to information management, examples of the issues addressed by students and their advisors. Frequently, the projects use one of the many techniques of policy analysis, which include statistical measures, interviews, and examination of legal case materials.

Policy analysis is one approach, but other projects have used a slightly different approach by focusing on the organizations that perform research and develop technologies. These projects contribute to the design of successful public and organizational policy by explaining how universities and corporations operate, and by identifying those organizational characteristics that are pertinent to corporate or to public policy. IQPs have analyzed the prospects for university-industry relations, the development of entrepreneurs, the implications of the diffusion of innovations in organizations, the impact of new technologies on jobs, and the government’s role in moderating the social impact of the shift to a high-technology service economy.

PREPARATION GUIDELINES
Students should prepare for these projects by learning about the American political economy, public policy, the legal system, and in some cases the management of organizations.

Political Economy and Public Policy
STS 1207 Introduction to Psycho-sociology of Science
GOV 1301 U. S. Government
GOV 2302 Science-Technology Policy
STS 2208 The Society-Technology Debate

Legal System
GOV 1310 Law, Courts, and Politics
GOV 2311 Legal Regulation of the Environment

Students are encouraged to blend their technical knowledge with a policy analysis. They could identify a policy issue in their major field and look at it from an economic, political, legal, or management perspective.

DIVISION 46, SOCIAL STUDIES OF SCIENCE AND TECHNOLOGY
Projects in this area cover a variety of specific topics, but are united by a general perspective which is characteristic of the field of Science, Technology and Society studies. S.T.S., as it is called, is known by its emphasis on the critical examination of conventional wisdom about the social implications of science and technology.

When proponents proclaim the dawn of a new era or predict that great social progress will accompany the emergence of a technology, S.T.S. people look for the other side of the coin. When opponents attack technology, due to the alienation, loss of meaning, and control issues it creates, S.T.S. proponents probe to see what new possibilities will emerge. Whether the result will be new freedom or new tyranny often depends on the surrounding social arrangements.

In short, the aim of a S.T.S. project is to put aside traditional thinking about the nature of technology, and really examining the ways in which technologies interact with social systems. One starts by dropping the idea that technology impacts society, rather than vice versa, and by questioning the assumption that technological advances automatically represent social progress. Much follows from this modest beginning.

S.T.S. is sometimes called “the Science of Science,” as you adopt an attitude of scientific skepticism and then look at science itself, or a technological issue. The result is
a critical, but not negative, perspective on technology which paves the way toward a balanced assessment of the benefits and costs of technical change.

Classic S.T.S. projects might involve analysis of tension between technical experts and democratically-elected leaders, the conditions under which technology seems to become an irresistible social force or the way in which distribution of wealth, power, and status are affected by technological change. Organizational “mindsets” leading to technical accidents have also been good project themes.

Technology is rarely neutral in socio-political terms, but its impact can be subtle. The most challenging and rewarding type of S.T.S. study deals with the way technology affects the way in which we relate to the world or view ourselves. Those interested in the interface of technology and society are often like a fish trying to understand water, the medium in which it lives. The great challenge of this field, but also its greatest reward, is that it seems to require considerable reflection about society and the role of the technologist in it to do a first-rate S.T.S. project.

CURRENT PROJECT THEMES

Within this broad field, four general project themes are being developed into continuing project streams. A few illustrations of each type are offered below from the list of completed projects:

1. Technological Literacy and Public Understanding of Science
2. Technology Assessment and the Forecasting of “Breakthroughs” in a Field of Technology
3. Equity Issues Related to Gender, Race or Ethnicity
4. Reforms in Science or Engineering Education
5. The Social Implications of a New Space Race to the Moon

PREPARATION GUIDELINES

As one can see, S.T.S. is by its nature an interdisciplinary field. Hence, project preparation could appropriately draw from a range of academic disciplines. However, it is usually best to concentrate on picking up the perspective first, and a variety of courses in social sciences, history, and philosophy are taught from S.T.S. perspective. The courses that do the best job of introducing this approach include:

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>STS 2208</td>
<td>The Society-Technology Debate</td>
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<tr>
<td>HI 3331</td>
<td>Topics in Science, Technology and Society</td>
</tr>
<tr>
<td>ID/ AR 3150</td>
<td>Light, Vision, and Understanding</td>
</tr>
<tr>
<td>GOV 2302</td>
<td>Science-Technology Policy</td>
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<tr>
<td>GOV 2304</td>
<td>Governmental Decision Making and Administrative Law</td>
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<tr>
<td>CS 3043</td>
<td>Social Implications of Information Processing</td>
</tr>
<tr>
<td>HI 2334</td>
<td>European Technology Development</td>
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<tr>
<td>EN 2252</td>
<td>Science and Scientists in Modern Literature</td>
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DIVISION 47, SAFETY ANALYSIS AND LIABILITY

Projects in this division deal with issues of people and property safety and the management of risk associated with the hazards inherent in today’s society.

The analysis of risk required two components:

1. a measure of severity, and
2. a probability distribution

Typical measures of severity include deaths, injuries, dollars of property damage and days of business interruption. The probability distribution gives a probability for each value the severity measure can take. Some of the risks that have been studied as part of this project division have included risks due to unwanted fires, the misuse and abuse of consumer products, those risks associated with workplace safety and risks associated with natural disasters. Risk management and analysis tools used have included scenario development, fault tree construction and event tree analysis.

The risk associated with unwanted fires is of special interest because each year fires claim a greater toll than earthquakes, floods, tornadoes, and all other natural disasters combined. In just a few minutes time, a single fire or explosion can have catastrophic consequences in facilities ranging from hotels, hospitals and schools to high-rise offices and complex manufacturing operations. Projects in this topic have examined fire department operation, investigated the economic consequences of design changes in residential smoke detectors and evaluated firesafety risks in passive solar heated homes.

Liability issues focus on the risk associated with products and the consequences of people’s actions. Some recent projects in this have been:

1. Forensic Investigation of an LP-Gas Cylinder Explosion
2. An Injury Investigation of Quadriplegia Resulting from an Automatic Shoulder Seatbelt: Design Failure or Negligent in Use
3. Rollover Propensity of the Suzuki Samurai
4. Legal, product liability and personal injury issues resulting from the case of Locke vs. Mack Trucking, Inc.

Some useful courses for preparing for “Safety Analysis and Liability” IQP’s include:

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<th>Course Code</th>
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<tr>
<td>FP 3070</td>
<td>Fundamental of Firesafety Analysis</td>
</tr>
<tr>
<td>BUS 2950</td>
<td>Business Law and Ethics</td>
</tr>
<tr>
<td>MA 4213</td>
<td>Risk Theory</td>
</tr>
<tr>
<td>STS 1207</td>
<td>Introduction to Psycho-sociology of Science</td>
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<tr>
<td>GOV 1301</td>
<td>U.S. Government</td>
</tr>
<tr>
<td>GOV 1310</td>
<td>Law, Courts, and Politics</td>
</tr>
<tr>
<td>GOV 2311</td>
<td>Legal Regulation of the Environment</td>
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</table>
DIVISION 48, HUMANISTIC STUDIES OF TECHNOLOGY

The overall theme of projects in this group is the interaction of science and technology with the humanistic and nonquantitative aspects of culture. Together with the relevant fields in science and technology, the appropriate areas of culture from which the methodologies and substance of the projects will be drawn include philosophy, literature, history, religion, humanistic psychology, and the fine arts, with emphasis on values and ideas. The interaction of all levels of technology with the cultures of traditional and developing societies, as well as developed ones, is within the scope of the group. Thus, projects can range over an enormously broad area to include such diverse topics as the relationship of the literature to technology or science, philosophical analysis of the nature and role of the individual in a high-level technological society, or an historical examination of the reductionist view of man as a machine.

Whenever possible, two faculty members will advise each project, one advisor being drawn from the appropriate humanities or art discipline. Faculty members will explain to students the scientific, technological, and humanistic background necessary to begin the projects for which they will act as advisors.

PREPARATION GUIDELINES

Besides a general familiarity with the basic concepts and ideas in the physical sciences, projects in this area involve historical, cultural, social, psychological, or philosophical analysis. Many projects are aided by a general background and familiarity with the literature and fine arts of the modern era.

EN 2252 Science and Scientists in Modern Literature
HI 2332 American Science and Technology from 1859
HI 2333 History of Science From 1700
HI 2334 European Technological Development
HI 3331 Topics in Science, Technology and Society
ID/AR 3150 Light, Vision, and Understanding
PY 2711 Philosophical Theories of Knowledge and Reality
PY 2713 Bioethics
STS 2208 The Society - Technology Debate

Courses might also be selected from the literature, music, art, and philosophy offerings appropriate for the period and national group being studied (either American, European, or Asian), or the history of architecture.

The Social Science course listed above may be counted toward the 2/3-unit social science requirement.

DIVISION 49, ECONOMIC GROWTH, STABILITY AND DEVELOPMENT

There are two major areas of interest in the division:

A. PROBLEMS OF STABILITY AND CHANGE IN MATURE COUNTRIES

This project area is concerned with many of the issues that confront the world’s developed economies. These issues include the distribution of income and wealth, the kinds and quantities of available jobs, who obtains or fails to obtain the more desirable jobs, and the causes and consequences of inflation and recession. The analysis can focus upon particular sectors or upon the nation as an aggregate. Emphasis is placed upon the manner in which technological and social changes are integrated into the organization of work in society. Economic, social, psychological, as well as political and technological questions can be raised in this project area.

B. PROBLEMS ASSOCIATED WITH GROWTH IN DEVELOPING NATIONS

This project area is intended to encompass a wide range of problems facing developing nations. Generally, projects analyze the environmental, social, economical, and distributional impacts of growth and development, and the design of policies aimed at eradicating poverty and unemployment. In more specific terms, these projects address such issues as sustainable development strategies, the choice of sectoral policies, the choice of monetary and fiscal policies, rapid population growth, housing and urbanization, education and training, questions of “appropriate technology” and its transfer, import substitution and export promotion, foreign aid and foreign debt, foreign investment, and the role of international firms.

PREPARATION GUIDELINES

The foci of these project areas are economics, psychology and policy studies. Students anticipating work in these areas should have a background in economics, social science, and psychology, and a familiarity with the techniques of statistical analysis and/or computer simulation. Among the courses suggested for preparation are:

ECON 1120 Introductory Macroeconomics
ECON 2120 Intermediate Macroeconomics
ECON 2125 Development Economics
ECON 1110 Introductory Microeconomics
ECON 2110 Intermediate Microeconomics
ECON 2117 Environmental Economics
The courses listed above may be counted toward the 2/3-unit social science requirement.

DIVISION 50, SOCIAL AND HUMAN SERVICES

The delivery of social services is one of the most difficult and controversial problems currently faced by our society. In the past, IQPs have examined such issues as services for the mentally or physically handicapped, especially public school students, rehabilitation of juveniles, treatment for alcoholism and drug abuse, consumer information awareness, assessment of college life and student attitudes, and other community service concerns. Many projects in this division will be concerned with the strengths and deficiencies of the systems which the private and the public sectors of our society have established or are proposing to establish for dealing with community problems.

PREPARATION GUIDELINES

Projects in this category are multidisciplinary, and should appeal to students with widely differing backgrounds and interests. Those students who expect to do IQPs in this area should develop analytic backgrounds in the particular social science area(s) appropriate to their project. Examples of courses which introduce concepts fundamental to this division are listed below. Students anticipating IQPs which involve economic analysis should consider course work in that discipline. Also, projects involving surveying of public attitudes will require background in social analysis as found in PSY 1402 and PSY 2401. OBC 2300 is recommended for projects involving conflict resolution and management of social problems through industrial engineering techniques.

Recommended Courses

OBC 2300 Organizational Science—Foundation
ECON 1110 Introductory Microeconomics
ECON 1120 Introductory Macroeconomics
STS 2208 The Society-Technology Debate
GOV 2311 Legal Regulation of the Environment

The Social Sciences courses listed above may be counted towards the 2/3-unit social science requirement.

DIVISION 51, EDUCATION IN A TECHNOLOGICAL SOCIETY

Offerings in this area include projects in which WPI students teach and/or develop curricula at all grade levels from K through college in a variety of subjects. In other projects, students apply technology to learning (through research and development of teaching aids and machines), deal with mass media (methods and implications of teaching large segments of the population), or focus on the teaching-learning process (through study and research of learning models and theories).

Many projects are carried out with local regional public and private schools through the “WPI School-College Collaboration in Mathematics and Science Education.” WPI has a close working relationship with the nearby Doherty High School. For details of these programs, contact Assistant Provost Lance Schachterle, Boynton Hall.

PREPARATION GUIDELINES

Education plays a dominant role in the modern, technical society. It is a compulsory, long-term experience for a significant segment of the American population. To prepare for projects in this area, the student should have a perspective on modern American history with emphasis on the development and growth of the present educational system, an understanding of psychological development and theories of learning, and a background in the elementary concepts of social science research.

PSY 1402 Social Psychology
PSY 2401 Psychology of Education
STS 1207 Introduction to Psycho-Sociology of Science

The Social Sciences courses listed above may be counted toward the 2/3-unit social science requirement.

For students planning to develop science curriculum, the appropriate science and mathematics background is assumed.

TEACHER LICENSING OPTION

Students doing education IQPs may be interested in also qualifying as a secondary school mathematics or science teacher. For information on this option, see “Teacher Licensing” on page 136.
DIVISION 52, LAW AND TECHNOLOGY

Technological developments take place in the context of a complex legal and regulatory environment. For example, courts will apply principles drawn from unwritten common law to restrict land uses by property owners. In contrast, developments in telecommunications, energy, and pharmaceuticals are governed by an interlocking structure of statutes and regulations at both the state and federal levels.

IQPs in this division focus on the interaction between legal and regulatory institutions and technology. Project students study statutes and their history, regulatory systems, agency decision making, and judicial decisions to determine their impact on technology.

In addition, students study the operation of technology in a legal environment to determine whether social goals expressed in law are realized in practice. Will the Clean Air Act clean air? Do regulations for the handling and disposal of toxic materials protect the public? Can regulation effectively promote energy conservation? Do procedures governing drug approval unnecessarily prevent the speedy introduction of new treatment methods?

Aspects of legal and regulatory decision making are also studied. When do courts accept scientific evidence as determinative of facts? Can scientists provide objective, expert advice for governmental decisions or are scientists destined to become partisan policy advocates?

The answers to all these questions are important if technology is to aid us in the achievement of social goals and if courts and regulatory agencies are to succeed in defining and implementing social policy.

PREPARATION GUIDELINES

Successful completion of IQPs on the topics described above depend, in part, on prior preparation in government, law and society-technology issues. The following courses support IQP research in this division:

- HI 2317 Law and Society in America, 1865-1910
- ECON 1110 Introductory Microeconomics
- ECON 1120 Introductory Macroeconomics
- GOV 1301 U.S. Government
- GOV 1303 American Public Policy
- GOV 1310 Law, Courts, and Politics
- STS 2208 The Society-Technology Debate
- GOV 2302 Science-Technology Policy
- GOV 2304 Governmental Decision Making and Administrative Law
- GOV 2310 Constitutional Law
- GOV 2311 Environmental Policy and Law

Students should consider combining courses listed above to form sequences in policy studies, law, or society-technology studies. Additional information on sequences appears in the description of social science courses.

DIVISION 53, HISTORIC AND ARTISTIC PRESERVATION TECHNOLOGY

Projects in this division examine the value and policy issues surrounding decisions on which historic and artistic objects such as buildings, battlefields, statues, monuments, prints, drawings, paintings, and sculptures should be preserved and how best to preserve them. They may also deal with the technical issues involved in art conservation and restoration and involve application of the technical methods available for analyzing the composition of historic objects.

PREPARATION GUIDELINES

Ideal preparation for projects in this division would include art history and material science and familiarity with data base management programs.

Recommended Courses:

- AR 1111 Introduction to Art History
- AR 2113 Topics in 19th and 20th Century Architecture
- HI 1331 Introduction to the History of Science
- HI 1332 Introduction to the History of Technology
- ES 2001 Introduction to Materials Science
- ME 2820 Materials Processing
In addition to IQP and MQP opportunities on campus, through the Global Perspective Program, overseen by the Interdisciplinary and Global Studies Division, WPI students have many opportunities to work for a term at one of WPI's residential project sites. Project work conducted at these sites provides teams of students with extraordinary opportunities to learn by solving problems provided by industrial, non-profit, non-governmental or government agencies.

Application for IQP work in these programs begins in the fall with the Global Opportunities Fair. At the Fair, IQP and exchange program directors will be available to talk with students about these opportunities. Students should apply in the fall of the year preceding the year in which they would like to participate. Further information is available at the Interdisciplinary and Global Studies Division in the Project Center.

All students accepted to an off-campus IQP Center will be registered for the preparation course ID 2050 in the term immediately preceding their time off campus. Students must also be making satisfactory progress in their academic program.

Prior to leaving campus for a project program site, each student is required to complete a project registration form as described on page 259.

### RESIDENTIAL PROGRAMS

All programs offer the students the opportunity to complete a project in one term of full-time work. Advance preparation is required. Faculty advisors are in residence at IQP and Humanities and Arts sites and some MQP sites.

#### TERMS OFFERED

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<tr>
<td>Limerick, Ireland*</td>
<td>Kyoho, Japan*</td>
<td>Ifra, Morocco**</td>
<td>Cape Town, South Africa</td>
<td>Washington, D.C.</td>
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<td>London, England**</td>
<td>Wall Street, NY*</td>
<td>Venice, Italy</td>
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<td>Budapest, Hungary</td>
<td>Hon Kong, Peoples Republic of China</td>
<td>London, England</td>
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<td>Nancy, France*</td>
<td>Silicon Valley, California*</td>
<td>Boston, Massachusetts</td>
<td>Copenhagen, Denmark</td>
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<td>Melbourne, Australia</td>
<td>San Juan, Puerto Rico</td>
<td>Windhoek, Namibia</td>
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<td>Wuhan, Peoples Republic of China</td>
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* MQP opportunities only.

** Humanities and Arts opportunities only.

### PROGRAMS IN THE UNITED STATES

#### WASHINGTON PROJECT CENTER – IQP

**Director:** Prof. D. DiBiasio, Goddard Hall 127

Students work on projects with prestigious sponsoring agencies while living in the heart of Washington, D.C., just blocks from the White House. The Washington Project Center is located in an attractive neighborhood near The Mall, shopping, businesses, embassies and international agencies. Take advantage of this ideal location and easy access to the subway to enjoy an endless supply of free museums, national monuments, and impressive buildings that house the seat of national government.

Past projects have been completed with such agencies as the Smithsonian, the Environmental Protection Agency, the U.S. Patent and Trademark Office, the National Science Foundation and the Consumer Product Safety Commission. This is an opportunity to examine the inner workings of government and the importance of national action in areas of the environment, science education, urban issues, and consumer protection.

#### BOSTON PROJECT CENTER – IQP

**Director:** Prof. F. Carrera, Project Center

The Boston project site is a residential program with resident faculty advisors. This world-class city, featuring a wealth of cultural, educational, recreational, and tourist opportunities, is an exciting, vital and stimulating environment in which to live and work.

Projects focus on the improvement of the quality of life of the city for its inhabitants and visitors. Most projects will focus on environmental issues, as well as on urban maintenance, management and planning issues, and will include field work in the city’s neighborhoods and in the greater Boston area. The data collected will usually be archived in databases and displayed on Geographical Information Systems, as a prelude to a careful analysis to produce insightful conclusions and recommendations.

Past projects include: a plan for the reduction of neighborhood disruption during the work on the Big Dig (for the North End Neighborhood Association); an analysis of the impacts of Historic Districts on surrounding neighborhoods and a method of streamlining construction permits in those districts (for the Boston Landmark Commission); the creation of a computerized information system for the management and maintenance of street trees (for the city of Cambridge Department of Public Works); the collection and analysis of environmental data about Chelsea Creek (for the Environmental Protection Agency); the improvement of public safety through the inventory and mapping of all underground fuel tanks (for the Boston Fire Department), as well as projects for various departments of the cities of Boston, Cambridge, Brookline, Quincy and Newton.
Worcester Community Project Center – IQP

Director: Prof. R. Krueger, Project Center

Students will work in offices in the central Worcester region and commute daily from their residences. The Worcester Community Project Center (WCPC) develops projects around five core competencies: 1) planning for community sustainability, 2) green building design, 3) economic development, 4) historic, cultural, and environmental preservation and outreach, and 5) environmental justice. The WCPC has been recognized around the City and the region as a valuable community resource. As a result, students have the opportunity to work on a number of “high profile” community projects. Typically, these projects make significant contributions to improving the city we live in. Project sponsors range from municipal government, the Mayor’s Office, the Broad Meadow Brook Audubon Sanctuary, the Regional Environmental Council, the Greater Worcester Land Trust, the Worcester Art Museum, Centro Las Americas and various community development corporations.

Recent projects include a historical analysis of Institute Park (sponsored by Benoit Reardon Architects and the Worcester Art Museum); green building design for Friendly House (sponsored by WPI and Friendly House); brownfield redevelopment in Worcester (sponsored by the Honorable Timothy P. Murray, Mayor, City of Worcester); “Sustained Planning for a Sustainable Worcester” (sponsored by WPI and the City Office of Neighborhood Services); mapping of Worcester’s open spaces (sponsored by Broad Meadow Brook Audubon Sanctuary); developing an on-line artist database (sponsored by ArtsWorcester and the City Manager’s Office).

Silicon Valley Project Center – MQP

Co-Directors: Prof. D. Finkel, Fuller Labs 231
Prof. J. Orr, Boynton Hall

Silicon Valley, California, is home to many of the most dynamic companies in the computer industry and in other related high-technology industries. Long-established companies such as Sun, Intel and Hewlett-Packard, and research centers such as SRI International and NASA Ames Research Center, mix with recent successes such as eBay and small start-ups to provide a dynamic and exciting atmosphere. The projects will expose students to both the cutting-edge technology and the dynamic entrepreneurship of Silicon Valley.

Students participating in the Silicon Valley Project Center will participate in a Preliminary Qualifying Project (PQP) during B-Term 2007. During this PQP, the students will perform background research in the area of their project, learn about the company and the industry where they will be performing their project, and hold discussions with their company mentor about their project work.

The projects will be conducted during C-Term 2008 in Silicon Valley. The students will work full-time at the sponsor’s site for approximately nine weeks, from early January through early March. They will work with a mentor from the sponsoring company and with a WPI faculty advisor. The project work will include the completion of an MQP report and presentation on the project to the sponsoring organization. Admission to the Silicon Valley Project Center is based on academic standing and performance, essay response, evidence of maturity and independence, availability of projects in a specific area, qualifications relevant to the project offered, and results of an interview.

Projects may be available in Computer Science, in Electrical and Computer Engineering, and in Interactive Media and Game Development.

Wall Street Project Center – MQP

Director: Prof. A. Gerstenfeld, Washburn Shops 212

New York is one of the world’s most exciting cities. Some of the best theater and museums are found there. Wall Street is known as the world center of investments and banking and is seen as the capital of business and technology. It has proved to be a training ground for the leaders of the future. New York is a place where people both work and play hard. It is fast moving and allows the opportunity to apply many of the skills learned at WPI.

At the Wall Street Project Center, students complete MQP’s while working with a wide variety of agencies, such as Morgan Stanley, Deutsche Bank, Lehman Brothers, and J.P. Morgan. Wall Street, now much more than investments, is the center of world commerce; there is a need for WPI projects involving computer science, management, industrial engineering, and mathematical sciences. Some of our projects include work-flow analysis, risk analysis (country risk limits), system usability, and data-base corruption issues. Other projects include user-on-line functionality, and user help functions for global settlement systems. The projects are challenging and important to the clients as well as to the students.

Programs in Europe

Budapest Project Center – MQP

Director: Prof. G. Sarkozy, Fuller Labs

Hungary has gone through a deep-rooted transformation during the past 15 years, and today it is a free and democratic country with a smoothly working market economy. The country has enjoyed a steady GDP growth, a bullish stock market and a decreasing inflation rate as well. As a result of these changes Hungary became a full member of the European Union on May 1, 2004. Hungary is a link between Eastern and Western Europe. New investment is revitalizing the country, and grand old Budapest is being restored. It’s the country’s cultural, political, intellectual, and commercial heart – and it teems with cafes, restaurants, markets, and bars. Budapest offers breathtaking Old World grandeur and thriving cultural life. Situated on both banks of the Danube River, the city unites the colorful hills of Buda and the wide, businesslike boulevards of Pest. The
city is simultaneously peaceful and bustling, a big metropolis and yet friendly, it treasures the old and embraces the new. These days with all the changes happening, Budapest is one of the most exciting places in Europe.

These CS MQPs will be at the Computer and Automation Research Institute in Budapest. This Institute is the national research center in Hungary for information technology, computer science and their related fields. In addition to pursuing basic and applied research, system design and system integration, consulting and software development are also among the activities of the Institute. The Institute puts a special emphasis on education related activities; it is closely affiliated with several Hungarian and European universities, including the Budapest University of Technology and Economics (BME) and the Eotvos Lorand University of Sciences, Budapest (ELTE).

DENMARK PROJECT CENTER – IQP

Directors: Prof. P. C. Pedersen, Atwater Kent 205
T. H. Thomsen, International House

The IQP project sites are in or near Copenhagen, the capital of Denmark, located on the island of Zealand. The Danish population numbers 5.3 million and inhabits an area of 16,630 sq. miles. In addition to farming, Denmark has a diverse and highly technological industry, with emphasis on electronics, pharmaceuticals, shipbuilding, furniture craft and alternative energy sources. The Danish culture is very open to interdisciplinary academic questioning, the foundation of every IQP. Danes are brought up to question and debate the impact of technology on the quality of life and is a leader in utilizing the positive aspects of modern technology while trying to lessen its negative impacts.

IQP projects in Denmark span a wide range of topics, with an emphasis on environmental issues and technology for people with disabilities. Alternative transportation, food quality, technology to assist visually impaired people with disabilities are all topics of great interest to both the public and private sector. Not-for-profit agencies are also expected to sponsor several future projects.

LIMERICK PROJECT CENTER – MQP

Directors: Prof. R. Vaz, Project Center
Prof. R. Brown, Atwater Kent 307

Visitors to Ireland encounter spectacular scenery including 3,500 miles of coastline, a rich cultural and literary heritage, vibrant cities and villages, and a warm and friendly populace eager to help visitors feel at home. Ireland also enjoys one of the fastest-growing economies in the EU. Limerick is Ireland’s third largest city, and a center for both tourism and business, yet it retains the charm and feel of a small community in many ways. Limerick’s center is located on the River Shannon, and features both medieval and Georgian influences; the outskirts of the city are home to a number of high-technology business parks and a major university. The areas surrounding Limerick are famous for their natural beauty and historical significance; the Republic of Ireland is small enough so that it can be explored from end to end in a series of weekend excursions.

MQPs in the Limerick area involve working at local electronics firms and research facilities. Students spend 10 weeks in Limerick, working fulltime in collaboration with local engineers on the projects. MQPs in Limerick typically focus on analog and mixed-signal hardware design, digital design and embedded systems, signal processing and communications, and software engineering. Specific project descriptions are not available until the beginning of the projects, as project sponsors typically provide the opportunity for students to work on cutting-edge problems of immediate interest to the sponsors.

Admission to the ECE MQP Program in Limerick is based on the following criteria: academic standing and performance, evidence of maturity and independence, qualifications relevant to the anticipated projects, faculty references, and the results of an interview.

LONDON PROJECT CENTER – IQP

Directors: Prof. P. Davis, Stratton Hall
Prof. J. Brattin, Salisbury Labs 24

Students at the London Project Center spend seven weeks in one of the world’s finest capital cities. Some of the best theater and museums are found here, as well as neighborhood pubs where relaxation, music and conversation are an age-old tradition. A vibrant city, which has undergone rapid change, today London is known for its diverse cultures and interests – truly a city for everyone. This juxtaposition of past and present, tradition and modernity makes London a city with much to offer.

At the London Project Center, students complete IQPs while working with a wide variety of agencies. Recent or current project sponsors include Her Majesty’s Tower of London, the Victoria and Albert Museum, the Museum of Science and Industry, the Association of Chief Executives of National Voluntary Organizations, and the London Boroughs of Merton, Lewisham and Brent.

LONDON HUMANITIES PROGRAMS

Coordinator: Prof. J. Brattin, Salisbury Labs 24

WPI offers Sufficiency Projects in London in Terms B and E. London Sufficiency Projects are interdisciplinary and intended for students with many backgrounds in the humanities and arts. London was once the center of a global empire and its influence continues to radiate throughout the British Isles and well beyond. Sufficiency students in London study topics that might include history, literature, music, theatre, or culture, and work on projects that build on at least three previous courses in humanities and arts. As an interdisciplinary program, the London Sufficiency is not limited to the history or literature of Britain, but all projects take advantage of the unique resources available in London. These include some of the world’s most vibrant theatre and the arts, outstanding museums, ambitious architecture, the libraries of the University of London, collections of film or sound recordings, and
NANCY PROJECT CENTER – MQP

Director: Prof. T. Camesano, Goddard Hall 218B

Nancy, France is a medieval city of about 350,000, located in the heart of the beautiful Lorraine region. The city is well connected by train to Paris, Frankfurt, and Brussels (each about 200 miles), and Luxemburg (75 miles). The “vielle ville” (old city) region of Nancy is known for its small streets, beautiful mansions, museums, and historic walks. There is a large student population, as well, and Nancy offers plenty of sports, concerts, movies, shopping, and eating places that are of interest to students.

The projects will be done in collaboration with the chemical engineering school of the Institut National Polytechnic de Lorraine (INPL), and l’Ecole Nationale Supérieure des Industries Chimiques (ENSICh). The projects will take place in one or more of the following: Laboratoire de Chimie Physique Macromoléculaire (LPCM, Physical Chemistry of Macromolecules), Département de Chimie Physique des Réactions (DPCR, Physical Chemistry of Reactions), Laboratoire de Thermo-dynamique des Séparations (LTS, Thermodynamics and Separation Processes), or Laboratoire des Sciences du Génie Chimique (LSCG, Chemical Engineering Sciences). Projects are anticipated in testing a polymeric drug delivery system, image analysis of bacteria from a wastewater treatment process, bacterial biofilm formation in bioreactors, and possibly in fuel cells.

VENICE PROJECT CENTER – IQP

Director: Prof. F. Carrera, Project Center

Called the most beautiful city in the world, Venice features a haunting atmosphere which exudes the splendor of its past. A city without cars, yet with an outstanding historical, artistic, and architectural heritage, much of its uniqueness comes from its symbiotic relationship with the sea and the lagoon. Yet, despite its millenary history, the historic city of Venice is so trying to adapt to our XXI century lifestyles, while preserving its environmental, artistic and cultural heritage. The rising cost of living in Venice has led to a dramatic exodus of its population which decreased since WWII from about 200,000 to around 60,000, while tourism has ballooned to 12 million visitors per year. Venice is a microcosm that reflects and magnifies many of the issues confronting the rest of the world, and at the same time it is a place that will allow you to experience a unique – more relaxed – pace of living.

Since the founding of the VPC in 1988, the IQPs in Venice provide an opportunity for students to see the implementation of their projects for the benefit of an entire city. Projects are conducted for Venetian, American and international organizations and include environmental, socioeconomic, artistic, cultural, and technical concerns important to the revitalization of this historic city. The over 120 projects completed in Venice include: studies on aspects of the Canals of Venice; which resulted in the publication of a book under the auspices of UNESCO; a number of projects on the preservation of Venetian art; several environmental studies on the lagoon ecosystem, which are contributing to the creation of a Lagoon Park; a variety of projects for the improvement of the urban quality of life in the city and the lagoon islands, which have resulted among other things, in the re-engineering of the Venetian cargo delivery system and the design of a vacuum sewer system to prevent discharges in the city’s canals.

PROGRAMS IN AFRICA

CAPE TOWN PROJECT CENTER – IQP

Director: Prof. S. Jiusto, Project Center

Cape Town is located at the southern tip of South Africa. It is a city of many flavors, encompassing both developed nation aspects and developing nation characteristics. It is accessible to some of the loveliest and most interesting terrain that Southern Africa has to offer. Students will be able to visit the African bush (to see wild animals in well maintained and controlled parks), experience a cosmopolitan African city, and work on projects in some of the poorest and neediest areas of the region. Cape Town has wonderful resources and climate.

South Africa has the infrastructure of a developed nation but very limited resources for those areas that were neglected under apartheid. There will be a focus on energy resources, water conservation and the provision of housing, health care and other issues of sustainability to under-developed areas. The projects will be sponsored by government and non-governmental organizations (NGO’s) and will focus on issues of sustainable development for the region. Students will have opportunities to work in informal housing settlements, in semi-rural areas, under the guidance of local experts.

The preparation for these projects will require no prior knowledge of Africa and will focus on the specific projects the students will undertake as well as the historical context.

NAMIBIA PROJECT CENTER – IQP

Directors: Prof. A. Gerstenfeld, Washburn Shops 212 Prof. C. Peet, Project Center

Namibia is a southern African nation of extensive national parks, deserts, seaside ports, livestock farms, and towns, with an excellent infrastructure of maintained roads, clean water, and good services. Students will live in Windhoek, the modern capital city, on the campus of the Polytechnic of Namibia, WPI’s partner university in Namibia. They will work in the city as well as other parts
of the country. There will be an opportunity to visit national parks and other tourist attractions and a limited opportunity to become familiar with African rural life.

Namibia’s well-developed government agencies at both the national and municipal levels will sponsor many of the projects, and these projects will generally focus around issues of sustainable development. In particular, projects typically investigate alternative energy sources, improved water and sanitation management, improved preventive health education, low-income housing, micro-level income generating activities and tourism development. Local towns and peri-urban informal settlements will be the venue of some of the projects. No prior knowledge of Africa is needed, but the preparation will include a heavy commitment to learning about the culture of Namibia in addition to preparing specifically for the projects.

MOROCCO HUMANITIES PROGRAM

Coordinator: Prof. W.A. Addison, 39 Dean Street

Students will study at Al Akhawayn University (AUI), located in Ifrane, Morocco. Ifrane is 120 miles east of Morocco’s capital Rabat and 35 miles from the historic imperial cities of Fes and Meknes—cities famous for their revered mosques and colorful Berber migrants. With a population of about 15,000, Ifrane is a peaceful resort and recreational village in the foothills of the Atlas Mountains, known for its French colonial architecture as well as a royal palace. Al Akhawayn University is a semi-private, English-speaking university founded by King Hassan II of Morocco and King Fahd of Saudi Arabia. Since about half the faculty hold American graduate degrees, AUI resembles in some respects an American university.

Throughout Morocco, cous cous is the favorite meal in local restaurants and traditional pastries and fresh mint tea are typical snacks at sidewalk cafes.

Two-thirds unit of AUI courses will be devoted to the history of the Arab World, Islamic Civilization, and contemporary issues in North Africa. One-third unit will be an independent study project based upon course work and upon tours to Moroccan historic and cultural sites under the supervision of the on-site advisor. These projects may focus upon a variety of areas, including history, religion, art and architecture, as well as contemporary socio-political issues, with the goal of providing greater understanding of Arab and Muslim peoples. The unit of work will either conclude the sufficiency or can be credit toward a Humanities and Arts or International Studies minor or major.

PROGRAMS IN ASIA

BANGKOK PROJECT CENTER – IQP

Directors: Prof. C. Demetry, Washburn Shops

Situated in the heart of Southeast Asia, Thailand presents many of the opportunities and challenges common to developing nations. Students at the Bangkok Project Center have a unique opportunity to become acquainted with the people of Thailand and to help address local problems by working on a variety of social and environmental projects. Some projects provide the opportunity to work with underserved communities, and some give students the opportunity to experience life in the countryside. Despite its challenges, Thailand is intensely beautiful: a land of gilded temples and golden beaches. The Thai people are among the friendliest and most hospitable in the world and have a great talent for enjoying life. Accommodations on the prestigious Chulalongkorn University campus position WPI students to meet Thai students and to explore the city’s many attractions.

WPI students work in project teams on IQPs sponsored by local nonprofit organizations, universities, governmental and non-governmental organizations. Projects are conducted on a wide variety of topics and are arranged in advance through resident coordinators in Bangkok.

Project themes often center on health and human services, community development, sustainable development and appropriate technology, and environmental issues.

HONG KONG PROJECT CENTER – IQP

Director: Prof. C. Peet, Project Center

Hong Kong provides a gateway to the most dynamic and important region on the planet. The wealth of the world has moved to Asia, and Hong Kong plays a crucial role in the development of China—currently the most significant economy in Asia. This city radiates energy as it rapidly modernizes and takes the lead in economic development, hi-rise building, efficient transportation, artistic expression, educational reform and environmental conservation. Students will live in furnished apartments with small kitchens, with 2-3 students in each apartment, in a typical Chinese residential neighborhood, somewhat different from typical tourist areas of Hong Kong.

In Hong Kong WPI works with a number of educational, social service and environmental organizations and institutions. Hong Kong University, Hong Kong Polytechnic University and Hong Kong University of Science and Technology have sponsored projects, while other sponsors include Friends of the Earth, Hong Kong Council of Social Service, St. James Settlement and Caritas. New sponsors are sought on a regular basis. In addition, WPI has a Memorandum of Understanding with Hong Kong Polytechnic University (HKPU), giving WPI students access to library and other facilities on the conveniently located campus in TsimShaTsui, Kowloon,
as well as enabling some HKPU students to work with WPI students on their projects, especially in the first half of January.

IQPs will deal with urban planning, a greener environment, sustainable resource use, education reform and innovation, economic and social issues, and other topics as appropriate.

**KYOTO PROJECT CENTER – MQP**

**Director: Prof. R. Lindeman, Fuller Labs**

Japan is a country contrasts. From the breathtaking natural beauty of Hokkaido to the frenetic sprawl of the Tokyo megalopolis, from the centuries-old tradition of Japanese calligraphy to the quirky humor of Anime, from kimonowearing women to purple-haired punk rockers, from world-leading electronic gadgetry to hand-made porcelain, from baseball to sumo, Japan provides something unexpected at every turn. Kyoto, Japan’s third-largest city and one of its oldest, is located in the Kansai region of Japan. As a former capital, and one of the places that was spared from war damage, Kyoto is considered the “heart of Japan,” with many important cultural sites. Kansai is a convenient launching point for travel to other parts of Japan. The location of the project site is about 45 minutes from Kyoto city, about one hour from Osaka, Japan’s second-largest city, and about 20 minutes from Nara, another former Japanese capital, and cultural center.

MQPs in the Kyoto area will be conducted at ATR International, a leading research center for human communication technology (www.atr.jp). Current projects will involve work in the areas of ubiquitous and wearable computing, knowledge sharing, and human-computer interaction, and will be conducted within the Knowledge Science Lab of ATR (www.atr.jp/ksl/), which “...aims at establishing the fundamental technology to support our everyday processes of creating and sharing working knowledge for our everyday lives.” Specific project descriptions will be available in the first half of 2007.

Admission to the CS MQP Program in Kansai is based on the following criteria: academic standing and performance, evidence of maturity and independence, qualifications relevant to the anticipated projects, faculty references, and the results of an interview.

**WUHAN PROJECT CENTER – MQP**

**Director: Prof. Y. Rong, Washburn Shops 307T**

As manufacturing industry becomes more and more global, many research, design, and manufacturing activities go to China. To experience working with professionals from different backgrounds and in a different cultural environment, 10 ME students from WPI will be selected to work with 10 students from Huazhong University of Science and Technology (HUST), Wuhan, China. Five projects defining problems and providing solutions with social constraints will be completed. HUST is a major university in China with excellent engineering programs. The mechanical engineering major has been consistently ranked among the top major in China. Wuhan is a large and industrialized city in central China, with a rich cultural heritage and easy access to Beijing and Shanghai, as well as other cities, by train or airplane. Students will stay on HUST’s campus, but may travel to other cities based on the project requirements. Students will have a chance to merge into Chinese culture and experience people’s daily life in China. The projects will be completed within 7-8 weeks.

These ME MQPs will be conducted at HUST, with 2-3 trips to other cities. The WPI students will work with HUST students in mixed teams, with co-advisors from both WPI and HUST. The projects are real world problems and sponsored by local companies (some of them are foreign invested) and institutions, in the area of mechanical product and system design, the manufacturing processes, and lean manufacturing implementations.

**PROGRAMS IN LATIN AMERICA**

**COSTA RICA PROJECT CENTER – IQP**

**Director: Prof. S. Vernon-Gerstenfeld, Project Center**

Costa Rica is a land of contrasts: banana plantations, flaming volcanoes, misty black sand beaches and a thriving modern capitalist economy. A remarkably stable country, politically and economically, Costa Rica offers an opportunity for students to become immersed in a Central American culture where democracy, economic development, and concern for the environment are a permanent part of the landscape. Students stay in the capital city of San José, but ample opportunity is found to visit the country’s attractions. Many projects have fieldwork associated with them.

Costa Rica’s unique environment provides students opportunities to focus on environmental conservation and sustainable development by working with government agencies dedicated to those issues and with selected museums and private organizations. Prior knowledge of Spanish language is not required for participation. All students, however, must complete a two-week intensive language program on site.

**PUERTO RICO PROJECT CENTER – IQP**

**Director: Prof. S. Vernon-Gerstenfeld, Project Center**

The Puerto Rico Project Center offers an opportunity to be immersed in a Caribbean culture that is a unique and harmonious blend of Spanish and North American influences found nowhere else in the world. Located in San Juan, the Center offers the attractions of a large metropolitan area within easy reach of El Yunque national rain forest, white sand beaches, historic El Morro Spanish fortress, Arecibo Observatory, and many other sites of interest.

Projects are completed in teams and span a wide variety of topics including the environment, public health, housing, social welfare, transportation, and land use. Sponsoring agencies have included many offices of the government of the commonwealth as well as local industries.
Melbourne, situated along Australia’s southeast coast, is the country’s second largest city. A city of parks and gardens, specializing in arts festivals, sporting events, and fine dining, it was voted “the world’s most livable city” in an international survey. Melbourne, Boston’s sister city, is also a fine place from which to explore the diversity of Australian life; only a short distance from mountains, deserts, beaches, mining towns, and extensive parklands and wildlife reserves.

IQPs involve outreach to the Australian public on issues or topics regarding science, technology and society. The projects usually focus on disabilities, fire protection or the environment.

REQUIREMENTS FOR INDIVIDUALLY SPONSORED RESIDENTIAL PROJECTS (ISRPS)

Many students and faculty augment the educational opportunities available at WPI’s formal project centers and programs with individually sponsored residential, off-campus projects. All such programs must adhere to common, carefully structured risk management protocols such as those developed and implemented at established project centers. Otherwise, students, faculty, and WPI are exposed to unnecessary risk.

Hence, the Provost requires completion of the following risk management protocol by all faculty intending to advise students who will earn academic credit while in residence off-campus in individually sponsored projects.

1. Two terms in advance of the off-campus activity: Faculty advisor sends a letter of intent to the Provost’s Office. The letter describes the scope of the anticipated project, where it will happen, how many students will participate, and the term that the students will be off-campus.

2. Ten weeks prior to departure: Faculty advisor submits a completed ISRP form (126KB PDF) to the Provost’s office. The ISRP form is co-signed by the academic department head (MQP or Sufficiency) or Dean of IGSD (IQP). At this time a signed Transcript and Judicial Release Form (55KB PDF) must be submitted for each potential student participant.

3. Eight weeks prior to departure: All students expecting to participate in an ISRP should be in good academic standing at this time. WPI reserves the right to withdraw acceptance to students who are subsequently placed on academic warning. Students placed on academic probation are not eligible to participate. Upon review of academic and judicial records for each student the IGSD will inform the advisor of students who may be disqualified due to poor academic performance or judicial history at WPI.

4. Six weeks prior to departure: Student participant(s) submit the following forms to the faculty advisor: the Acknowledgement of Voluntary Participation, the Off-Campus Students’ Health Update and Records Release Form, and the WPI Off-Campus Travel Information Form (198 KB PDF).

5. Five weeks prior to departure: The advisor submits these completed forms (item 3) to the IGSD. Please note that all forms can be found at the IGSD Web Page.

Please note that all forms can be located on the Web at http://www.wpi.edu/Academics/Depts/IGSD/ Project registration will not be complete until the conditions of this protocol are met.

At the completion of step 2, WPI’s risk managers will review the information provided and make a recommendation to the Dean of IGSD, who will assist the Provost in making a final decision to approve or disapprove the activity based on considerations of risk management. The faculty advisor will learn of this decision no later than the first day of the term preceding the proposed activity.

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<td>Completed ISRP form submitted to Provost’s Office</td>
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<td>Completed Health &amp; Safety Forms for each student submitted to the IGSD</td>
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LIVING MUSEUMS PROGRAM

The Living Museums Program provides students with unusual opportunities to carry out IQP projects at various culturally rich museums of New England. Museums synthesize knowledge and combine artifacts with primary and secondary documents, often to create an entire social and physical environment. Thus, as students work with professional staff, documents, and artifacts at museum sites, they gain an understanding of the past and present, and begin to see how distinct aspects of human life fit together to form a specific culture. At the outstanding museums participating in the program, students can select projects from a varied list of areas ranging from medieval warfare at the Higgins Armory Museum in Worcester to the rich history and literary culture of Concord, MA, at the Concord Museum and the Thoreau Lyceum.

Special projects are available each summer in Term E at several museums and historical institutions such as: Mechanics Hall, Worcester, MA; the Worcester Historical Museum; Fruitlands Museum in Harvard, MA, Martha’s Vineyard, and Higgins Armory Museum.

GENDER, RACE, AND TECHNOLOGY

Prof. S. Vernon-Gerstenfeld, IGSD

Student projects in this program research issues in two general areas: (a) the participation of women and people of color in engineering and science education and in engineering professions, and (b) the effects of particular technologies on women, African Americans, Hispanics, Native Americans, and other specific racial or ethnic groups.

Projects are often co-advised, with one advisor from humanities or social science, and one advisor from science, engineering, or computer science disciplines.

Past and ongoing project topic areas include:

• effects of automation on office workers
• women in science and engineering professions
• underrepresented groups in science and engineering professions
• sex differences in learning styles in technical subjects
• ethics and reproductive technologies
• science and math education for precollege Native Americans, Hispanics and African Americans.

Project ideas in these or other areas related to gender, race, and technology can be initiated by students or faculty. For more information, contact Prof. Susan Vernon-Gerstenfeld, Project Center 216.

AWARDS AND SCHOLARSHIPS

THE PRESIDENT’S IQP AWARDS

The President’s IQP Awards have been established to encourage and recognize meritorious accomplishment in the performance of the Interactive Qualifying Project. To be considered for an award, the IQP, while of overall good quality, should be outstanding in conception, execution, and presentation. There are no predetermined categories for the awards, but the award will recognize the qualities in which the project excels. By thus calling attention to projects which are deemed to be outstanding, the awards help to establish standards for exceptional quality in IQPs.

Each award consists of a certificate of merit to each student and an honorarium. The IQP awards competition is conducted each fall. For further information, see Dean Paul Davis, IGSD Office, Project Center.

THE PROVOST’S MQP AWARDS

The Provost of WPI conducts an annual competition to recognize several project teams in each discipline whose MQPs, in the view of the judges, have been unusually innovative, well executed, and well presented. To qualify as a contestant, the student team must be identified by the department of the team as one of the best presenters in the department oral competition. For more information, contact Associate Provost Lance Schachterle in Boynton Hall.
RECENT CHANGES IN THIS REQUIREMENT
Effective with the class entering in the fall of 2007 the requirements in the Humanities and Arts have changed. The set of requirements previously referred to as the “Sufficiency” has been modified, and this new set of requirements will no longer be referred to as the Sufficiency. Students entering prior to A term of 2007 may elect to follow either the previous (“Sufficiency”) or new Humanities and Arts Requirements. Students entering for A term, 2007 or later must follow the new requirements. In this Catalog the term Sufficiency will still appear as the transition to the new requirements proceeds.

OVERVIEW
The Humanities and Arts Requirement empowers students to meet the broad educational goals of WPI. The balance between technological and humanistic education and the emphasis on inquiry-based approaches to student learning have been and remain hallmarks of a WPI education. In concert with WPI’s other degree requirements, the humanities and arts requirement embodies the institute’s definition of an educated person. The humanities and arts requirement engages students with theory and practice – Lehr und Kunst – through the following educational goals.

GOALS OF THE HUMANITIES AND ARTS REQUIREMENT
• to introduce students to the breadth, diversity, and creativity of human experience as expressed in the humanities and arts;
• to develop students’ ability to think critically and independently about the world;
• to enhance students’ ability to communicate effectively with others in a spirit of openness and cooperation;
• to enrich students’ understanding of themselves;
• to deepen students’ ability to apply concepts and skills in a focused thematic area through sustained critical inquiry;
• to encourage students to reflect on their responsibilities to others in local, national and global communities;
• to kindle in students a life-long interest in the humanities and arts.

MEETING THE REQUIREMENT
Students fulfill the humanities and arts degree requirement by completing two units of work consisting of six student-selected courses. In selecting these courses, students complete breadth and depth components of the requirement. To ensure breadth, students select at least one course each from two of three different intellectual clusters. To ensure depth, students complete one unit of thematically-related work which must include at least one course at the 2000-level or above and culminate in an inquiry seminar or practicum. The one exception to this breadth requirement is that students may take all six courses in a foreign language. Development of proficiency in a foreign language necessitates sustained engagement in the language beyond the elementary and intermediate level. Foreign language instruction is broadly interdisciplinary and includes elements of the history, literature, and culture of a particular language area. A student in foreign languages must still meet the depth component of the requirement through completion of a practicum or seminar in the language. A student who begins foreign language study is not compelled to remain in that subject, but could choose to switch to another subject of study and complete the depth component in another thematic area.

DEPTH COMPONENT:
To ensure depth, students complete at least one course from at least two of the following three intellectual clusters:
• art/art history, drama/theatre, and music (AR, MU, TH);
• languages, literature, and writing/rhetoric (EN, WR, RH, SP, GN);
• history, philosophy and religion (HI, HU, PY, RE).

WPI offers a flexible curriculum to entrust students with a significant amount of choice and responsibility for planning their own course of study. At the same time, WPI requires students to take at least one course each in at least two of three intellectual clusters to provide exposure to the creativity of the fine and performing arts, modes of communication in languages and literature, and the cultural analysis of the past and present. Students are encouraged to experiment and to take courses beyond the minimum requirement of one course in two different areas. By providing exposure to multiple areas, the breadth component encourages students to appreciate the fundamental unity of knowledge and the interconnections between and among diverse disciplinary fields.

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In most areas, students complete the depth component of the requirement by taking an Inquiry Seminar. In areas such as drama/theatre, music, the visual arts, or foreign languages, it may be appropriate for students to complete the depth component of the requirement with a Practicum. In either format, the combination of courses and seminar or practicum provides a deeper engagement with sustained critical inquiry and the integration of theory and practice in an area of the humanities and arts.

The Humanities and Arts department defines specific materials that each student submits at the end of the seminar or practicum to document completion of the breadth and depth components of the requirement. For example, a Humanities and Arts Requirement Portfolio could include a list of the courses taken to fulfill the breadth and depth components and a selection of each student’s individual work from the culminating seminar or practicum. Such a portfolio would not include material from all courses, nor would it include all material from the culminating seminar or practicum. Rather, a portfolio would enable each student to demonstrate that they have met the goals of the Humanities and Arts Requirement and to reflect on their progress toward achieving the overall learning outcomes of WPI.

It is expected that in most cases the final grade of the seminar or practicum will be used as the overall evaluation for the Completion of Degree Requirement (CDR) for the Humanities and Arts Requirement.

**INQUIRY SEMINAR OR PRACTICUM**

The culmination of the depth component of the humanities and arts requirement is an inquiry seminar or practicum. The educational goals for the seminar or practicum are the same regardless of the format.

**GOALS OF THE INQUIRY SEMINAR OR PRACTICUM:**

- **Critical inquiry:** to develop each student’s ability to apply concepts and skills learned in the humanities and arts, the seminar/practicum offers opportunities to engage in sustained critical inquiry, analysis, or problem-solving in a focused thematic area.

- **Research and investigation:** to engage students in research, discovery, creativity, or investigation, the seminar/practicum provides opportunities for students actively and critically to seek and evaluate new information and insights using multiple sources. These opportunities need not necessarily be research papers.

- **Communication and writing:** to develop each student’s ability to communicate effectively both orally and in writing, the seminar/practicum includes discussion of appropriate communications skills and provides opportunities to revise written work after receiving feedback from the instructor.

- **Intellectual independence:** to foster independence of thought, the seminar/practicum offers significant opportunities for individual, self-directed work.

- **Conversation and dialogue:** to promote individual reflection and the appreciation of diverse perspectives, the seminar/practicum consists of classroom activities other than traditional lecture to encourage discussion and collaborative learning in a spirit of openness, cooperation, and dialogue with peers. The thematic focus, structure, and assignments for each seminar or practicum are to be determined by each individual instructor to achieve these goals.

**INQUIRY SEMINAR**

The Inquiry Seminar, usually taken in the sophomore year, represents the culmination of the Humanities and Arts Requirement. The Seminar provides an opportunity for students to explore a particular topic or theme in the humanities in greater depth. The Seminar has two primary goals. The first is to foster independence of student thought, typically through some form of self-directed activity. The second is to encourage a cooperative, dialogic approach to inquiry, through open exchanges with peers in a small, intensive classroom setting (typically 12 students or fewer). Students learn how to frame questions in the context of a particular discipline or field of study, and to explore or investigate problems using methods appropriate to work in the humanities and arts.

As the student’s capstone experience in the humanities and arts, the Inquiry Seminar is intended to help students take their knowledge of the humanities to a higher level. The purpose of the Inquiry Seminar, therefore, is not to provide a broad survey or general introduction to a given discipline, but to provide a structured forum in which students might approach a specific humanities-related problem or theme at a deeper, more sustained level of intellectual engagement than would normally be possible within a traditional course setting. The pedagogical idea behind the Inquiry Seminar is that work in the humanities and arts is at once an intensely personal enterprise, in which the individual freely draws on her or his own particular interests, abilities, passions, and commitments, and at the same time a form of ethical community in which the practitioner is always in conversation with and accountable to others.

While the specific content and requirements of the Inquiry Seminar vary from instructor to instructor, all Inquiry Seminars incorporate self-directed learning as a significant part of the curriculum. It is the department’s expectation, therefore, that by the time they enroll in the Seminar, students should have sufficient background in the humanities and arts to be able to work independently and to pose questions of their own. Students will be asked to research and write a term paper, to assemble a portfolio of writings or exercises, or otherwise to demonstrate their ability to pose a question of relevance to humanities inquiry, and to answer it. At the same time, the Seminars are designed to foster an atmosphere of intellectual collaboration and discovery. Students are required to participate fully in seminar discussion, to share the results of their own research or activities, and to engage the ideas and interests of their peers in a constructive and collegial way.

**INQUIRY PRACTICUM**

Students in the performing arts have the option to complete their Humanities and Arts sequence with an Inquiry Practicum in music or drama/theatre. A practicum shares the same goals and objectives of an inquiry seminar but provides students with a production/performance experience which emphasizes the hands-on, practical application of skills and knowledge gained from previous
Humanities and Arts courses. Samples of practicums in music include composing, arranging, or performing a solo recital. Drama/Theatre students may choose to act, direct, or design for a campus production. In addition to weekly meetings, students may be required to attend rehearsals and performances. The design of the final project is determined through conversations between instructors and students. Due to the unique nature of the practicum, permission of the instructor is required to enroll in a practicum.

FOREIGN LANGUAGES: PRACTICUM OR SEMINAR

Students in foreign languages may complete the Humanities and Arts Requirement in one of the following three ways:

1. **practicum in the sixth and final course in a foreign language.**
   The practicum will include evaluative components or exams to demonstrate overall language skills in four areas: listening, speaking, reading, and writing. The practicum will require students to demonstrate breadth of cultural knowledge of the language area. (Examples of practicum courses: GN 3512, GN 3515; SP 3522; SP 3527)

2. **advanced language seminar after five previous courses in the foreign language.** The seminar will explore a thematic topic and provide opportunities for individual inquiry. (Seminar examples: GN 3513, GN 3514; SP 3523, SP 3524, SP 3525, SP 3526, SP 3528, SP 3529, SP 3530, SP 3531)

3. **advanced language seminar after advanced-level language courses combined with courses from other areas of study.** Students who demonstrate basic oral, written, and cultural knowledge of a foreign language in a placement test at the advanced level may combine courses from other areas for their requirement. (Seminar examples are the same as option 2.)

Option 1 and 2 require students to take six courses in a foreign language. For example, in option 1, a student without prior language training might begin with GN 1511 Elementary German I and conclude with a practicum in GN 3512 Advanced German II. In option 2, for example, a student might start with SP 2521 Intermediate Spanish I followed by five Spanish courses which culminate in one of the designated seminars. In option 3, students who demonstrate knowledge of the foreign language at the advanced level may mix courses from other areas in their course sequence. For example, a student might take two courses from history, philosophy, music, etc. along with four advanced Spanish courses which would culminate in a designated seminar. Students in all three options for foreign languages would be required to submit the same materials to demonstrate completion of the requirement as students whose culminating experience was an inquiry seminar/practicum in another area of the Humanities and Arts.

TRANSITION IN DEGREE REQUIREMENTS

As stated above, the new degree requirement in Humanities and Arts take effect for the class entering WPI in the fall of 2007. All current students, who have yet to complete their Sufficiency Requirement, may follow either of the following options:

1. **Current students may complete their Humanities and Arts requirements by following the rules that were in effect at the time that they enrolled.** Faculty will be available to advise individual students in ISP/Sufficiency during the 2007-2008 academic year, but we anticipate that most students will enroll in either inquiry seminars or practicums. Students who wish to complete their Humanities and Arts requirement by enrolling in an ISP may only do so with the consent of the instructor. Students completing foreign language Sufficiency course sequences will continue to do so by completing 6 courses in language study.

OR

2. **Current students may complete their Humanities and Arts requirement by completing courses in Humanities and Arts and then completing an inquiry seminar or practicum in place of the ISP.** Before enrolling in the inquiry seminar or practicum, students need only complete 2 courses in the discipline of the inquiry seminar/practicum. (This is a relaxation of the five thematically related courses requirement of the past and does not impose any new requirements on current students). For clarity, students who have enrolled before the fall of 2007 will not be obligated to complete either the breadth requirement (at least one course in two of three disciplinary clusters) or the requirement that one course in the depth area be taken at the 2000 level or above. Advisors, however, should encourage students to select courses that will meet these requirements whenever possible.

Students who transfer less than six Humanities and Arts courses from another institution must complete an inquiry seminar or practicum to complete the Humanities and Arts requirement. Students who transfer six or more courses in Humanities and Arts will have the option of submitting a CDR form or engaging in additional work (or documentation of work) to earn an “A” on the CDR, in accordance with current transfer rules (see below).

All students, whether enrolled before or after the Fall of 2007, may have the option of completing their Humanities and Arts requirement while enrolled for 1 unit of coursework at an off-campus project center where one-third unit of the coursework shall include an inquiry seminar or practicum. Other than dropping the term “Sufficiency”, there is no change to the Off-campus Humanities and Arts study option (See page 62 of the Catalog).

TRANSFER STUDENTS AND THE HUMANITIES AND ARTS REQUIREMENT

Transfer credit in the Humanities and Arts at WPI is granted on a course-for-course basis. All Transfer and 3-2 Program students entering WPI with fewer than six courses or their equivalent of transfer credit in the Humanities and Arts must complete work in the Humanities and Arts, including an Inquiry Seminar/Practicum to the extent that the overall Humanities and Arts credit totals two units.

No credit toward the Humanities and Arts requirement is given for introductory-level foreign-language courses unless the entire program is in that foreign language. Usually only one transfer course in Freshman English can be applied toward the requirement. In all cases, the pro-
fessor for the Inquiry Seminar/Practicum has the final
decision on what courses are acceptable within the
student’s sequence leading up to the project. Up to one
unit (i.e. three courses) of transferred work in the Hu-
manities and Arts that is not credited toward the Hu-
manities and Arts Requirement can be credited toward
the fifteen-unit graduation requirement; such courses
shall receive credit under the category of EL 1000.

If a Transfer or 3-2 Program student has completed two
units of acceptable college-level work in the Humanities and
Arts prior to entering WPI, a Completion of Degree Re-
quirement form will be submitted by the Humanities and
Arts Department Coordinator for Transfer Students at
the request of the student. The grade for such a Humanities
and Arts Requirement met by transfer credit is normally a
grade of “CR”. Students whose grades on transferred
courses average A can engage in additional work or sub-
mit samples of their previous work and may be awarded
an A for the Humanities and Arts Requirement. Alter-
nately a transfer student may elect to undertake an In-
quiry Seminar/Practicum in an effort to achieve an A
grade. These evaluation options must be exercised prior
to the Department’s submission of the Completion of De-
gree Requirement form to the Registrar.

Decisions concerning credit toward the Humanities
and Arts requirement are made by the Humanities
and Arts Coordinator for Transfer Students, Professor
James Hanlan. He can be contacted in room 28 of
Salisbury Laboratories, or at extension 5438, or email
jphanlan@wpi.edu.

GUIDELINES FOR GRANTING TRANSFER
CREDIT TO U.S. STUDENTS FOR FOREIGN
LANGUAGE STUDY

A. Credit for study on the high school level:
1. Transfer credit of 1/3 unit is given for Advanced
Placement with a score of 4 or 5.
2. Students with three or more years of foreign-lan-
guage study in high school, but who have not taken
the Advanced Placement examination in that lan-
guage, may receive 1/3 unit credit for their high
school language study upon satisfactory completion
of two courses in the same language on the interme-
diate level or above. (Note: Courses in German and
Spanish in addition to those offered at WPI, as well
as courses in other languages, are available at other
colleges in the Consortium.)
3. In either case 1. or 2. above, in order to receive 1/3
unit credit, students must begin their WPI course se-
quence at the Elementary II level or above.

B. Credit for study at other colleges and universities:
1. Language study which is done at other universi-
ties and colleges prior to entering WPI, or done with
the prior written permission of the student’s Humanities
and Arts Consultant (not the Department Head) as
part of an agreed-upon Humanities and Arts se-
quence, transfers on a course-for-course basis.

2. Language study which is done at foreign universi-
ties, language institutes, cultural institutes, etc., prior
to entering WPI, or done with the prior written per-
mission of the student’s Humanities and Arts Con-
sultant (not the Department Head) as part of an
agreed-upon Humanities and Arts sequence, is as-
cessed by the Foreign Languages Consultant on the
basis of matriculation papers and the level or work
accomplished.

REQUIREMENTS FOR HUMANITIES
AND ARTS MAJORS

Students majoring in Humanities and Arts, International
Studies, and the Artistic branch of Interactive Media and
Game Development are expected to complete studies in
the areas of science, mathematics, and/or technology. The
specific requirements are presented in the Distribution
Requirements for those majors. These requirements are
currently under revision. Students should refer to the
Catalog supplement and/or on-line Catalog for the most
current information. Students entering prior to August 1,
2007 may complete a “Technical Sufficiency” as described
in the Catalog of their matriculation year, or they may fol-
low the revised Distribution Requirements that relate to
this component of their education.

OTHER OPTIONS

SOCIAL SCIENCE COURSES

Humanities and Arts advisors may allow students to in-
clude one social science course in their Humanities and
Arts sequence on the basis of that course’s suitability to
the development of students’ particular humanities
themes.

Such a course must be more than “related to” or “in
support of” a given theme. It must be at the interface of
humanities (normally history) and blend in with certain
Humanities and Arts courses. A course in American gov-
ernment, for example, could logically be included in any
number of American history sequences.

The inclusion of a social science course in the Humanities
and Arts requirement of any student requires the written
“advice and consent” of his or her Humanities and Arts
advisor after the theme has been determined and before
the student registers for the seminar.

One of the following social science courses (and no other)
may be included in the Humanities and Arts sequence:

- GOV 1301 U.S. Government
- PSY 1402 Introduction to Social Psychology
- STS 2208 The Society - Technology Debate

INTERDISCIPLINARY STUDY AT THE AMERICAN
ANTIQUARIAN SOCIETY

A unique opportunity for interdisciplinary work in the
humanities and arts is offered by the American Studies
Seminar sponsored each fall by the American Antiquarian
Society. Organized in collaboration with Worcester’s five
undergraduate colleges and universities, this seminar fo-
cuses on topics that allow students to investigate the
Society’s rich holdings in early American history, litera-
ture, and culture. The Society’s unparalleled collection of
documents is a short walk from the campus.
Students must submit a written report or paper at the end of the project. Students might be required by the faculty advisor to give an oral presentation at the end of the project. Under normal circumstances, students must complete the project within one term in order to receive the full unit of credit; students may use it to complete the requirement.

**OFF-CAMPUS HUMANITIES AND ARTS OPTION**

WPI offers the option to complete the Humanities and Arts Requirement during one term of study at several Project Centers. Normally, students complete the requirement through at least six courses or independent-study projects on campus. However, the “Off-Campus” option allows students to combine at least three courses on campus with one term studying the humanities and arts at a Project Center. Since this one-term project is equivalent to three courses, students may use it to complete the requirement.

Off-campus projects are available in Germany for the study of foreign languages and in London for other fields. These off-campus programs have a flexible format. Students devote themselves to one term studying the history, literature, language or culture at the project site with a WPI faculty advisor. The program might combine a thematic seminar in an area of the faculty advisor’s expertise with visits to museums, the theatre, musical performances, or cultural excursions.

Although themes or areas of emphasis vary from year to year, all off-campus Humanities and Arts activities culminate in a written report in an area of interest to the student.

To be eligible for this one-unit activity, students must have already completed three courses in humanities and arts before they leave campus. Students may apply to the off-campus program before they have taken all three courses. However, students may not participate in the program unless they successfully complete one unit of work in humanities and arts before the term of the project. In addition, students going to any Project Center must complete all of the forms required by the Interdisciplinary and Global Studies Division. Requirements:

- Students must have completed at least three courses in the Humanities and Arts at WPI, or have earned equivalent course credit approved by the Humanities and Arts Department, before the term of the off-campus activity. The Department may allow students to count transfer or advanced placement credits toward the three course minimum;
- Students must be accepted into the off-campus Humanities and Arts program by the Humanities and Arts Department, and complete all forms required by the Interdisciplinary and Global Studies Division, in order to register for these projects.
- Students might be required by the faculty advisor to complete a PQP or attend required meetings before the off-campus project;
- Students must submit a written report or paper at the end of the project. Students also may be required to submit written updates at various times in the course of the project. In all cases, the faculty advisor at the project site will determine the precise form of the written requirements.
- Students may be required to give an oral presentation at the end of the project;
- Under normal circumstances, students must complete the project within one term in order to receive the full unit of credit;
- Only members of the Humanities and Arts faculty at WPI may advise off-campus Humanities and Arts projects.

**OFF-CAMPUS RECOMMENDATIONS**

All off-campus programs benefit from advance planning. Discuss the possibility of an off-campus activity with your academic advisor at the beginning of the freshman year. Consult with the WPI faculty who will advise these off-campus projects as early as possible, since they may be able to suggest useful courses or other background resources for the projects. Also keep in mind that three courses are the minimum required, but many students find it advantageous to take additional courses before going away.

The interdisciplinary London program is open to students with a background in areas of the humanities and arts besides foreign languages, including art history and architecture, drama/theatre, history, literature, music, philosophy, religion, or writing/rhetoric. After taking at least three courses in any of these areas on campus, you could then go to London to complete your project. Some students also have gone to London with this program to study beyond the Humanities and Arts requirement for international studies, history, literature, music, theatre, or other areas.

WPI offers programs in the German language at Darmstadt. This program requires completion of foreign language courses through the level of intermediate II or above (2000-level or above) before going abroad. For students who have taken foreign language courses in high school, language placement exams are available during New Student Orientation. Some students with basic foreign language preparation have completed their arts projects in Germany. We welcome a creative approach to off-campus study.

More advanced students may participate in these off-campus programs by doing work toward a minor or major. A student who had already completed their Humanities and Arts requirement on campus, for example, might be able to work in the humanities and arts on an Independent Study Project that could count toward a minor. Or a student at one of these sites could work on a Major Qualifying Project in fields such as Humanities and Arts, International Studies, or Technical, Scientific and Professional Communication.

The Humanities and Arts Department advertises upcoming project locations and application deadlines at the Global Opportunities Fair each September. Future project opportunities might include other foreign locations or projects that provide the context for an intensive study of humanistic themes associated with particular locales within the United States. Contact the Department of Humanities and Arts for more information.
Social science deals with the behavior of individuals and groups as well as the functioning of the economic and political systems and institutions that shape and control our lives. As such, it offers a perspective that is essential for anyone desiring a well-rounded education.

Therefore, WPI, in common with other colleges, requires some exposure to the social sciences for its graduates. In satisfying the two-course social science requirement, students are free to take courses in any of the traditional social sciences: economics, political science, sociology, and psychology. Courses with the following prefixes may be counted toward the social science requirement: ECON, GOV, PSY, SD, SOC, SS, STS. The social science courses offered at WPI are grouped into two broad categories. The first consists of core courses that introduce students to the social sciences and help them understand the scope and limits of social science approaches and how they might be related to the design of Interactive Qualifying Projects.

The second, more advanced, set of courses looks in depth at particular issues and problems, providing students with a more detailed understanding of social science disciplines and their use in social problem solving and interactive projects.

To obtain maximum benefit from their study of social science, students should choose courses that will provide knowledge and skills relevant to their Interactive Qualifying Project. These courses should be taken prior to or concurrent with undertaking the IQP and should be selected, if possible, after the student has identified the general topic area in which his or her interactive project work will be carried out.

More information on the alternatives available and the factors that should be considered in choosing courses to satisfy the social science requirement are presented in the Social Science and Policy Studies section of this catalog, page 182.

AWARDS AND PRIZES

Awards and prizes are determined by the academic department or by selected committees.

COLLEGE AWARDS

SALISBURY PRIZE AWARDS
These historic awards are made to 14 highly meritorious seniors. These awards were established by Stephen Salisbury, a WPI founder and former president of the Board of Trustees.

TWO TOWERS PRIZE
This prize is awarded to the student who, through general academic competence, campus leadership, regular course work and special work in research and projects, best exemplifies a combined proficiency in the theoretical and practical union implicit in the Two Towers concept, which is at the heart of WPI's Two Towers tradition.

SIGMA XI AWARDS IN ENGINEERING AND SCIENCE
These awards in engineering and science are given to the students and their advisors for the Major Qualifying Projects which are judged to be the best in originality, contribution to the field, professional competence, and for the most useful applications.

PRESIDENT’S IQP AWARDS
These awards are given to student teams whose conception, performance, and presentation of their Interactive Qualifying Projects have been judged outstanding in focusing on the relationships among science, technology, and the needs of society.

PROVOST’S MQP AWARDS
These awards offer recognition to those students who have completed outstanding Major Qualifying Projects as a demonstration of their competency in a chosen academic discipline. Each academic department conducts its own competition to select the winners.

UNITED TECHNOLOGIES CORPORATION MINORITY AWARD
This award is presented to an outstanding minority undergraduate student.

OUTSTANDING WOMEN STUDENT AWARDS
Marietta E. Anderson Award, an award which is presented to the most outstanding woman student in one of the three lower classes who not only has a superior academic record, but also has been a work-study student, participated in recognized extracurricular activities, and has been a volunteer for college-sponsored activities.

Funds from an anonymous donor provide the following awards to women students preparing for careers in engineering or science. Awards are based on academic excellence, contributions to the WPI community, and professional goals. The awards are named each year for women who have played significant roles at WPI.

Bonnie-Blanche Schoonover Award, honoring WPI's former librarian.

Ellen Knott Award, honoring a long-time secretary in the Mechanical Engineering Department.

Gertrude R. Rugg Award, honoring WPI's late Registrar Emerita.
WILMER L. AND MARGARET M. KRANICH PRIZE
Students who are seniors or completing their junior year will be nominated by faculty for the annual award. The award will go to a student majoring in engineering, science or management who best exemplifies excellence in the humanities and in the full integration of humanities into his/her undergraduate experience. Double-majors who fulfill one major in Humanities and Arts are not eligible.

SPECIAL AWARDS

ALPHA PHI OMEGA SERVICE AWARD

AMERICAN INSTITUTE OF CHEMISTS FOUNDATION
Chemistry and Biochemistry
An award by the New England chapter of the American Institute of Chemists to honor outstanding seniors majoring in chemistry and biochemistry.

AMERICAN SOCIETY FOR METALS: CHESTER M. INMAN ’14 OUTSTANDING STUDENT AWARD
Mechanical Engineering
The Worcester Chapter of the American Society for Metals presents $200 to a student for excellence in a Major Qualifying Project dealing with processing or materials science.

HAROLD S. BLACK AWARD
Electrical and Computer Engineering
This award was established in 2001 to honor the memory of inventor Harold S. Black '21. The award is given by the faculty of the Electrical and Computer Engineering (ECE) Department to one or more ECE seniors who have demonstrated outstanding creativity and enthusiasm in engineering problem solving, practical implementation of problem solutions, and exemplary character in their contributions to the welfare of the WPI community.

CENTRAL NEW ENGLAND AIChE AWARD FOR SIGNIFICANT CONTRIBUTION
Chemical Engineering
This award is given to an individual in recognition of significant contributions to the American Institute of Chemical Engineers.

CLASS OF 1879 PRIZE FOR OUTSTANDING PROJECTS IN THE HUMANITIES
Humanities and Arts
This prize is awarded by the Humanities and Arts Department each year to three students for excellent work in Humanities and Arts Sufficiency projects. Sufficiencies must demonstrate exceptional creativity and skill in conceiving, developing and expressing a theme within any discipline in the humanities and arts.

COMMUNITY SERVICE AWARD PRESENTED IN THE MEMORY OF EDWIN B. COGHLIN '23
Alumni Office
This award recognizes individuals who have demonstrated an extraordinary personal commitment above and beyond their normal involvement on campus in both academic and extracurricular activities.

COMPUTER SCIENCE OUTSTANDING JUNIOR AWARD
Computer Science
This award is presented to a computer science junior who has an excellent academic record and who shows promise for continuing success.

COMPUTER SCIENCE OUTSTANDING SENIOR AWARD
Computer Science
This award is presented to one or more computer science seniors who have an outstanding record and who have contributed to the enrichment and professional development of fellow students.

JAMES F. DANIELLI AWARD
Biology and Biotechnology
This award, given by the Department of Biology & Biotechnology, honors the memory of Dr. James F. Danielli, a former department head and world-famous scholar.

FRANK D. DEFALCO AWARD
Civil and Environmental Engineering
Award to WPI undergraduate Civil Engineering students who has completed two and one half years towards a B.S., interested in career constructed facilities and a member of ASCE student chapter.

ETA KAPPA NU OUTSTANDING STUDENT AWARD
Electrical and Computer Engineering
The electrical and computer engineering honor society presents this award to the outstanding senior and junior in recognition of their academic achievement and their service to the WPI community.

GENERAL CHEMISTRY ACHIEVEMENT AWARD
Chemistry and Biochemistry
This award is given to the student who has completed the freshman chemistry course with superior academic performance. Department award.

ALLAN GLAZER AWARD
Mechanical Engineering
Established in 1992 by the family and friends of Allan Glazer '47, this award is given to a junior majoring in mechanical engineering who has demonstrated outstanding academic achievement, special ingenuity in problem solving, and enthusiasm for engineering challenges.

GOAT’S HEAD AWARD FOR OUTSTANDING CONTRIBUTION TO THE STUDENT GOVERNMENT ASSOCIATION
Student Government Association
THE ROBERT H. GODDARD AWARD
Physics
Established by the classes of 1908 and 1909 as a memorial to Dr. Goddard, this prize is awarded for outstanding achievement, scholarship, consistent effort and dedication of purpose in both theoretical and experimental areas of physics.

HEALD BROTHERS SCHOLARSHIP
Mechanical Engineering
This scholarship identifies and supports outstanding young men and women who represent, in modern form, the spirit of “Yankee Ingenuity” that characterizes the evolution of the great manufacturing enterprises from the beginnings of the American Industrial Revolution.

ANDREW HOLT MEMORIAL AWARD
Civil and Environmental Engineering
This award is presented to a civil engineering senior who has consistently earned academic honors and who shows excellent promise for success.

STEVEN J. KAHN AWARD
Humanities and Arts
This award is presented to the outstanding senior in the WPI Glee Club in recognition of his contribution, commitment, and unwavering loyalty to the organization.

THE WILLARD ELLIOT LAWTON-SAMUEL JAMES PLIMPTON AWARD
Physics
Established in honor of Professors Lawton and Plimpton, this award is presented to a student who has shown improvement in scholarship, not only in grades but also in depth of understanding.

LINCOLN ARC WELDING FOUNDATION AWARD
Civil and Environmental Engineering
This award recognizes outstanding achievement in solving design, engineering, fabrication, and research problems.

MEDWIN HONORS STRING QUARTET SCHOLARSHIP
Humanities and Arts
Scholarship money is given to the members of the Medwin Honors string Quartet (4 string players, 2 violins, 1 viola, 1 cellist), who are selected by audition each year.

THE ALFRED R. AND JANET H. POTVIN AWARD
Biomedical Engineering
Separate awards are given to the outstanding undergraduate and graduate student in Biomedical Engineering in recognition of their academic performance and their service to WPI and/or the outside community.

MANAGEMENT EXCELLENCE AWARD
Management
This award is given to one or more seniors who have demonstrated ability in courses and projects and who exhibits outstanding promise of future success in the field of management engineering.

CARL F. MEYER IMPROVEMENT AWARD IN CIVIL ENGINEERING
Civil and Environmental Engineering
Established by Professor Emeritus Meyer, this award is presented to the civil engineering senior who has demonstrated the most improvement in academic and professional attitude since entering the department.

RICHARD V. OLSON AWARD
Mathematical Sciences
Established to honor the memory of mathematics Professor Richard V. Olson, this annual award to a WPI sophomore recognizes outstanding performance in basic mathematics courses.

EDWARD C. PERRY AWARD
Mechanical Engineering
This award is given annually to an engineering student or students for an outstanding major qualifying project in the area of mechanical design. The award is made possible through a bequest from Miriam Perry Goll and honors the memory of her father, Edward C. Perry ’04, a design engineer with General Electric Company throughout his professional career.

PI TAU SIGMA AWARD FOR EXCELLENCE
Mechanical Engineering
The mechanical engineering honor society, Pi Tau Sigma, presents this award to the outstanding junior mechanical engineering student.

SENIOR MATHEMATICAL SCIENCES MAJOR AWARD
Mathematical Sciences
This award is presented to the senior mathematical sciences major who has shown outstanding performance and who has made valuable contributions to the WPI mathematical community.

SOCIETY OF MANUFACTURING ENGINEERING SCHOLARS AWARD
ME/Manufacturing Engineering Program
An MFE senior, recommended by the MFE faculty and confirmed by the officers of SME chapter 25, who has demonstrated excellent scholarship, leadership, service, potential to contribute to the profession of Manufacturing Engineering.

The award includes scholarship assistance ($900) for full-time study if the winner enrolls in WPI’s graduate MFE program.

SOCIETY OF MANUFACTURING ENGINEERING UNDERGRADUATE SCHOLARSHIP AWARD
ME/Manufacturing Engineering Program
Awarded to a 1st, 2nd, or 3rd year MFE major, recommended by the MFE faculty and confirmed by the officers of SME chapter 25, who has demonstrated excellent scholarship, commitment, and contribution to the Manufacturing Engineering program at WPI.
SOCIETY OF MANUFACTURING ENGINEERS
OUTSTANDING STUDENT AWARD
ME/Manufacturing Engineering Program
The top three MFE majors each year, regardless of year, who have not already received the award.

SOCIETY OF MANUFACTURING ENGINEERS
MQP AWARD
ME/Manufacturing Engineering Program
An MFE major, selected by a panel of practicing manufacturing engineers to have the best MQP in the area of Manufacturing Engineering.

STUDENT-ALUMNI INTERACTION AWARD
Alumni Office
This award is presented by the WPI Alumni Association in recognition of individuals who, through their involvement on campus, have facilitated the continuing development of interaction between students and alumni. Recipients are full-time undergraduate students who have demonstrated extraordinary personal commitment to WPI and the Alumni Association above and beyond the normal involvement on campus.

The award is designed to recognize students who have stepped forward to become leaders in the alumni and student communities and, in doing so, have benefited both WPI students and alumni in a unique and purposeful way.

CHARLES O. THOMPSON SCHOLARS
Academic Advising
Named in honor of the first president of WPI, this honor recognizes outstanding performance by first-year students. To be eligible for membership, students must receive all A’s and B’s, with a minimum of six A’s, in their academic subjects during the first three terms at WPI. Selections are made in Term D.

A cash award is presented to the outstanding first year student. Charles O. Thompson Scholars are eligible to apply for this award by submitting an essay to the Office of Academic Advising during D Term.

ACS UNDERGRADUATE AWARD
IN ANALYTICAL CHEMISTRY
Chemistry and Biochemistry
Award which is intended to encourage student interest in analytical chemistry and to recognize a student who displays an aptitude for a career in the field. This award is for third-year students.

WALL STREET JOURNAL AWARD
Management
The Wall Street Journal presents this award to a senior with an outstanding record of achievement.