

WAYNE STATE
UNIVERSITY
COLLEGE OF ENGINEERING
DEPARTMENT OF INDUSTRIAL
AND MANUFACTURING ENGINEERING

Bachelor of Science in Industrial Engineering
Student Handbook

Revised 2/2/2007

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Welcome

From the Undergraduate Program Chair

On behalf of the Undergraduate Program Committee and the entire IME faculty, I would like to welcome you to our program. I am dedicated to ensuring that you receive a high-quality, rewarding education in Industrial Engineering.



Important Contact Information

Department Chair	Undergraduate Program Chair	Academic Advisor
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The purpose of this handbook is to provide industrial engineering students at Wayne State University a quick and complete source of information and guidelines to curriculum requirements and academic policies. The most up-to-date version of this document will be placed on the department web site at <http://www.eng.wayne.edu/IME>. This Handbook is intended to be comprehensive and up-to-date, but is subject to change without notice. Since the University Bulletin is published infrequently, this document supersedes the University Bulletin with regard to IE requirements and policies. Always consult the Academic Advisor or the Undergraduate Program Chair to determine your official status, as well as for information beyond the scope of this document.

About the Profession & Program

Industrial Engineering...

...is concerned with the design, improvement, and installation of integrated systems of people, material, information, equipment, and energy. It draws upon specialized knowledge and skills in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems.

- Institute of Industrial Engineers, 2004

The industrial engineer is a broadly-trained integration engineer, concerned with enabling complex systems to function effectively. Managing the inventory of a production facility, for example, involves issues of production and stocking policy, manufacturing equipment, human resources, customer demand, and supplier relationships. The industrial engineer must understand the interaction of the components of a system, and coordinate the flow of materials and information to effectively manage the operation. The industrial engineer plays an important role in defining information needs and developing strategies for decision making based on incomplete knowledge. However, the skills of the industrial engineer have much greater application than to traditional production environments. In a growing service sector of the economy including health care delivery, public safety, air transportation, and banking, for example, issues of resource management, scheduling, quality of service, and systems design are important.

Traditionally, the manufacturing engineer was responsible for developing the process capability to realize the output of design engineering. Today, however, the boundary between design and manufacturing engineering is becoming blurred. Both groups work together in teams to assure the soundness of design and manufacturability of product. The manufacturing engineer must have an understanding of the design process, but the special expertise which is brought by the manufacturing engineer is the knowledge and understanding of the production process.

Today's production is computer-based and provides flexibility through computer control. The manufacturing engineer is responsible for designing and implementing the cells and production lines which become the basic units of manufacture. Increasingly, such production units are becoming parts of an integrated factory system, and are not simply islands of automation. The manufacturing engineer must understand the multi-layered control architecture of the integrated factory, and the computer-based technologies which enable it.

The Department maintains laboratories in systems simulation, computer-aided manufacturing, human systems, and concurrent engineering design.

Program Professional Objective

Building on skills developed in the academic program, and extended by experience and personal self-improvement, the graduates of our program have ability to:

1. Identify opportunities and formulate solutions which integrate technological and human systems to create value, and
2. Apply the tools and techniques of industrial engineering to make value-based decisions,
3. Provide leadership as a member of high performance teams in a diverse global business environment

Program Outcomes (Enabling Objectives)

Upon completion of the Industrial Engineering Program, our graduates will exhibit skills necessary of all engineering professionals, including an ability to:

G-1	<i>communicate</i> effectively (ABET g)
G-2	<i>apply</i> fundamental understanding of mathematics and basic science to <i>identify, formulate, and solve</i> engineering problems (ABET a,e)
G-3	design and conduct experiments, as well as to analyze and interpret data. (ABET b)
G-4	<i>discuss</i> issues of professional and ethical responsibility (ABET - f)
G-5	<i>construct</i> engineering solutions which <i>consider</i> the impact in global, economic, environmental, and societal contexts. (ABET h).
G-6	<i>recognize</i> the need for, and <i>develop an ability to engage</i> in life-long learning (ABET i)
G-7	an ability to function on multi-disciplinary teams (ABET d)

Upon completion of the Industrial Engineering Program, our graduates will exhibit special skills to enable them to practice in the field of industrial engineering. They will have the ability to:

IE-1	<i>quantify</i> the uncertainties involved in engineering systems and <i>apply</i> the tools of probability and statistics in analysis and design.
IE-2	<i>apply</i> IE tools including statistical methods, operations research, process management, and computer simulation for systems analysis and process design. (ABET- e,k)
IE-3	<i>develop</i> a business case to justify expenditures for new or enhanced tools, equipment, or large-scale integrated systems.
IE-4	design integrated systems which include: technology, methods, software and human elements. (ABET c,d and ABET/IE c)
IE-5	<i>apply</i> modern management tools such as Total Quality Management,

	Continuous Improvement, Lean Manufacturing, Six Sigma, and Team Building. (ABET k)
IE-6	use the computer as a tool for communication, analysis, and design. (ABET k)
IE-7	discuss contemporary issues which impact the practice of engineering. (ABET j)

Note: parenthetical references in the tables above to ABET refer to Criterion 3 of the ABET criteria for Accrediting Engineering Programs ([Available Online](#))

Consistency of Program Objectives with University Mission Statement

The [Wayne State University mission statement](#) recognizes a dual character of the university and its programs. It is *"a national research university... committed to high standards in research and scholarship"*. At the same time, the university describes itself as *"an urban teaching university"... whose "graduates typically remain to live and work in the area throughout their lives."* The Industrial Engineering Program defined by the objectives stated above, aims to prepare graduates for careers applying skills and knowledge to benefit the manufacturing and service industries in southeast Michigan.

Accreditation

The IE Program at Wayne State University is accredited by the Engineering Accreditation Commission of ABET Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700, <http://www.abet.org>. Wayne State University is accredited by the North Central Association Commission on Accreditation and School Improvement (NCA CASI).

Faculty

Name	Room No	Phone No (313)	E-mail	Research Interests
Kenneth Chelst, Department Chair	2143.1	577-3857	kchelst@wayne.edu	Decision and Risk Analysis, Engineering Management, Urban Services, Operations Research
Ratna Babu Chinnam	2161	577-4846	r_chinnam@wayne.edu	Intelligent Engineering Systems, Supply Chain Management, and Production and Operations Management.
Darin Ellis,	2145	577-3296	rdellis@wayne.edu	Human Factors Engineering, Human Computer Interaction
Don Falkenburg (Emeritus)			dfalken@wayne.edu	Management of Technology and Global Engineering Mgmt.
Kyoung-Yun Kim	2067	7-4396	kykim@wayne.edu	Product Development, Process optimization, Facilities Design
Olugbenga Mejabi	2157	577-3134	mejabi@wayne.edu	Flexible Manufacturing, Simulation, Factory Control.
Leslie Monplaisir	2163	577-1645	leslie.monplaisir@wayne.edu	Group Decision Support Systems, Integrated Product Development & Computer-Integrated Manufacturing.
Alper Murat	2051	577-3872	alper@eng.wayne.edu	Supply Chain Management, Logistics and Distribution Planning, Supplier Selection and Contracting, Applied Operations Research
Namkyu Park	2043	577-0862	namkyu@wayne.edu	Agile Enterprise Computing, Supply Chain Management, Design Informatics, Global Engineering Management.
Frank Plonka	2167	577-9665	fplonka@wayne.edu	Agile Enterprise Systems, Production Control Architecture.
Nanua Singh	2155	577-7586	nsingh@wayne.edu	Concurrent Engineering, Computer-Integrated Manufacturing.
Gary Wasserman	2169	577-3301	gwasserm@wayne.edu	Reliability & Robust Design; SPC; Computer-Intensive Applied Statistics.
Kai Yang	2151	577-3858	kyang@wayne.edu	Robust Engineering, Quality Engineering, Operations Research

Admission Requirements

Pre-Professional Admission

For students to be admitted to the pre-professional program, a 2.5 gpa with a 3.0 in math and science courses from high school or community college will be required. Students applying directly from high school must also have a minimum Math ACT score of 22 (Math SAT of 550). Students will be required to have completed courses in pre-calculus, chemistry, and physics. In addition, to be admitted to the pre-professional program, students will have to receive scores on the Mathematics Placement (MP) and Chemistry Qualifying (CQ) exams to place them in MAT 2010 and CHM 1225. Students who do not meet these requirements will need to complete coursework at Wayne State or a community college in order to reach these expected levels.

Professional Program Admission:

For admission to the professional program and continuation on to 3000- and 4000-level Engineering courses, students will need to meet one of the following criteria:

- Direct from High School – Students must have earned a gpa of 3.5 or above in science/math, along with a score on the Math ACT > 26 or Math SAT > 650. In addition, their scores on the MP and CQ (see Testing and Placements Services at <http://www.testing.wayne.edu>) must be sufficient for them to enter MAT 2010 and CHM 1225/1230.
- Direct from Community College – Students must have earned a gpa > 3.0 in their MAT sequence (16 cr), CHM 1225/1230, and physics sequence (8 cr), with no grade lower than a C.
- From Pre-Professional Program – Students must have completed their pre-professional courses with a gpa of 2.5 or above and no grade lower than a C-. Students must also have completed their Critical Thinking and English Proficiency Exams.

Degree Requirements

Candidates for the Bachelor of Science degree must complete a minimum of 124 credits in course work, including satisfaction of the University General Education Requirements (see General Education Requirements, <http://www.bulletins.wayne.edu/ubk-output/gen10.html#14766>, online), as outlined in the following curriculum. All course work must be completed in accordance with the academic procedures of the University and the College governing undergraduate scholarship and degrees; see the following sections in the Undergraduate Bulletin: Degree Requirements, Baccalaureate, Academic Regulations, University, Division of Engineering: B. S. Program.

The Bachelor of Science in Industrial Engineering degree program is built on a strong core of Industrial Engineering courses. A number of IE Technical Electives allow the student to gain depth in an area of concentration such as production management or quality engineering. In addition to the Technical Electives, the student must complete a Directed Elective to support their plan of work. The directed elective must be approved by the IE undergraduate adviser. A list of courses appropriate for the directed elective is available from the IE adviser. Students are strongly encouraged to meet with the IE undergraduate adviser to complete a plan of work for their professional program, including both IE core requirements, Technical Electives and Directed Electives.

The Engineering Design Project course sequence (IE 4800 and 4880) is a capstone endeavor and is intended to build on and integrate the knowledge that the student has accumulated throughout the undergraduate program, and is intended to be taken in the student's last academic year, that is, within 40 credits of graduating. This course sequence is a year-long undertaking. Students enroll for IE 4800 (2 cr.) in their last Fall semester, and spend the term building their teamwork skills and selecting and planning their project. Practical, professionally relevant projects are usually selected in concert with the Department's industrial partners. In the Winter term students enroll in IE 4880 (2 cr.), and engage in an intensive effort to bring their IE skills and knowledge to bear on the problem. Students who intend to take the capstone sequence should consult their academic advisor.

In order to qualify to take IE 4800 the student must be in the last year of their program (i.e., within 40 credits of graduating. For IE 4800 (Fall semester) complete IE 3120, IE 4250, IE 4420, and IE 4850. In order to register for IE 4880, students must have taken IE 4800 in the immediately previous term, plus meet the following requirements: Students must have completed IE 4560, IE4260 and be at least co-registered for IE 4310 and IE 4330 (these courses will also be accepted as prerequisites).

Completing the Industrial Engineering degree program is demanding. Students taking a full load (16 credits) should plan to spend in excess of 40 hours per week on their academic work. With careful planning and consistent academic progress, it is reasonable to expect to complete all degree requirements within 4 academic years. For transfer students and students with a non-traditional path, plan a minimum of 2 years for the IE professional program (2.5 years if starting IE classes in Winter term).

The table below provides a summary of the curriculum requirements. Non-engineering courses, cited below by subject rather than by individual course numbers, indicate courses to be selected in fulfillment of University General Education Requirements. The degree requirements shown in the curriculum below are in effect as of the publication date of this handbook. However, students should consult an academic advisor for verification of current requirements.

Description	Credits
Life Sciences Course (LS) BIO 1510 (3 cr.) *or* PSY 1010 (4 cr.)	3 (or 4)
Any Social Sciences Course (SS)	3
Any Foreign Culture (FC)	3
Any Historical Studies (HS)	3
Any American Institutions (AI)	3
Any Visual and Performing Arts (VP)	3
PHI 1120 Professional Ethics (PL/EI)	3
ENG 1020 Introductory College Writing (BC)	4
ENG 3050 Technical Communication I: Report Writing (IC)	3
ENG 3060 Technical Communication II: Writing & Speaking (OC)	3
CHM 1225 Chemical Structure, Bonding and Reactivity (PS)	3
CHM 1230 Chemical Principles in Laboratory (PS)	1
MAT 2010 Calculus I	4
MAT 2020 Calculus II	4
MAT 2030 Calculus III	4
MAT 2150 Differential Equations and Matrix Algebra	4
PHY 2175 General Physics (PS)	4
PHY 2185 General Physics	4
BE 1200 Basic Engineering I - Design in Engineering (CL)	3
BE 1300 Basic Engineering II - Material Science for Engineering Applications	3
BE 1310 Basic Engineering II – Material Science for Engineering Applications Lab	1
BE 2100 Basic Engineering III - Probability and Statistics in Engineering	3
BE 2550 Basic Engineering IV – Numerical Methods & Computer Programming	3
Engineering Breadth #1 (See Advisor for current list of acceptable courses)	4
Engineering Breadth #2 (See Advisor for current list of acceptable courses)	4
IE 3120 Work Design	3
IE 4250 Engineering Data Analysis	3
IE 4420 System Simulation	3
IE 4850 Engineering Economy	3
IE 4560 Operations Research	3
IE 4260 Principles of Quality Control	3
IE 4310 Production Control (WI)	3
IE 4330 Facilities Design	3
IE 4800 Engineering Design Project I	2
IE 4880 Engineering Design Project II	2
IE Technical Electives (See Advisor for current list of acceptable courses)	13
Directed Elective (See Advisor for current list of acceptable courses)	3
TOTAL MINIMUM CREDITS REQUIRED	124

In addition to these courses, students must complete the Critical Thinking (CT) and English Proficiency (EP) exams offered through WSU's Testing and Placement Services (<http://www.testing.wayne.edu>), who can be reached at 577-3400. Students MUST complete the EP and CT exams by the time they accumulate 60 credits.

Curriculum

Semester by Semester

Freshman Year

<i>First Semester</i>	<i>Credits</i>
MAT 2010 – Calculus I	4
CHM 1225 – (PS) Chem Structure, Bonding & React	3
CHM 1230 – Chemical Principles in the Laboratory	1
ENG 1020 – (BC) Introductory College Writing	4
B E 1200 – Basic Engg I - Design in Engg (CL)	3
Total	15

<i>Second Semester</i>	<i>Credits</i>
MAT 2020 – Calculus II	4
PHY 2175 – (PS) General Physics	4
B E 1300 – Basic Engg I - Science of Engg Matls	3
B E 1310 – Basic Engg I - Science of Engg Matls Lab	1
American Institutions general education– (AI)	3
Total	15

Sophomore Year

<i>First Semester</i>	<i>Credits</i>
MAT 2030 – Calculus III	4
PHY 2185 – General Physics	4
B E 2100 – Basic Engg II - Prob and Stats in Engg	3
Engineering Breadth Option ¹	4
Total	15

<i>Second Semester</i>	<i>Credits</i>
MAT 2150 – Differential Equations and Matrix Algebra	4
BE 2550 – Basic Engg IV - Comp Apps in Engg	3
Social Sciences general education - (SS)	3
Life Sciences general education - (LS) ²	3
Visual & Performing Arts general education– (VP)	3
English Proficiency Exam	0
Critical Thinking Exam	0
Total	16

Junior Year

<i>First Semester</i>	<i>Credits</i>
I E 4850 – Engineering Economy	3
I E 3120 – Work Design	3
ENG 3050 – (IC) Technical Communication I	3
Historical Studies general education – (HS)	3
PHI 1120 – (PL/EI) Professional Ethics	3
Total	15

<i>Second Semester</i>	<i>Credits</i>
I E 4420 – Systems Simulation	3
I E 4250 – Engineering Data Analysis	3
ENG 3060 – (OC) Technical Communication II	3
Engineering Breadth Option	4
Foreign Culture general education– (FC)	3
Total	16

Senior Year

<i>First Semester</i>	<i>Credits</i>
I E 4800 – Engineering Design Project I	2
I E 4560 – Operations Research	3
I E 4260 – Principles of Quality Control	3
Industrial Engineering Technical Elective	3
Industrial Engineering Technical Elective	3
Directed Elective	3
Total	17

<i>Second Semester</i>	<i>Credits</i>
I E 4880 – Engineering Design Project II	2
I E 4310 – (WI) Production Control	3
I E 4330 – Facilities Design	3
Industrial Engineering Technical Elective	4
Industrial Engineering Technical Elective	3
Total	15

Total Credits¹ 124

¹Note: See Academic Advisor for current list of Engineering Breadth options.

²Note: Currently acceptable LS courses include BIO1510 and PSY1010

General Note: Courses are generally offered during the semester shown in the curriculum. That is, IE 3120/ IE 4850/ IE 4560/ IE 4260/ IE 4800 are offered in Fall semester. IE 4250/ IE 4420/ IE 4310/ IE 4330/ IE 4880 are offered in Winter semester.

IE Course Descriptions

The Bachelor of Science programs offered by the College of Engineering are built upon a strong core of common courses generally completed in the Freshman and Sophomore years under the *Pre-Professional Engineering* status. They satisfy the University General Education Requirements, and provide the foundation for more targeted study at the department level. These courses and other University obligations can be found on the *Degree Requirements* section.

In the Junior year, you'll transfer to the *Professional Industrial Engineering* program and focus on courses that support their major. Professors in the Department of Industrial and Manufacturing Engineering have developed classes and sequences that provide in-depth understanding of the principles of industrial engineering. Listed below are brief descriptions of courses offered for students declaring a major in Industrial Engineering. In addition to these undergraduate courses, students are allowed to select IE technical electives from the 6000-level courses listed in the Graduate Bulletin (note: all prereqs apply).

Note: Courses with the IE designation are open only to students in the Professional IME program. Required courses are shown in boldface type.

IE 3120 – Work Design Cr. 3

Role of the human as an element of the work environment. Traditional issues of work standards, productivity analysis, and occupational safety are introduced. Examination of functional and organizational role of the worker; impact of emerging computer-based technologies on work design and implementation strategies are discussed.

IE 3450 – Manufacturing Processes I Cr. 3

Prereq: ME 2400. A study of the field of manufacturing processes from a mechanical engineering design standpoint. Topics include: processing of metals, polymers, and ceramics, and computer-aided manufacturing.

IE 4250 – Engineering Data Analysis Cr. 3

Prereq: BE 3220. Advanced concepts for the analysis of variability in engineering problems, multivariate distributions, hypothesis testing, non-parametric statistics, point and interval estimation, fitting straight lines, goodness of fit tests, contingency tables, and an introduction to the analysis of variance.

IE 4260 – Principles of Quality Control Cr. 3

Prereq: BE 3220. Statistical quality control including process capability, control charts, and acceptance sampling procedures. Procedures for measurement of dimensional tolerance are introduced. Computer-based data collection and analysis.

IE 4310 – Production Control (WI) Cr. 3

Prereq: IE 4560, ENG 3050. The design of production planning and control systems. Materials management, forecasting, planning, scheduling of production systems, the planning and scheduling for large scale projects and introduction to the design of computerized materials management systems. Applications of operations research models to production control problems.

IE 4330 – Facilities Design Cr. 3

Prereq: IE 3120 and 4850. Design of manufacturing, warehouse, and material handling facilities. Use of analytic and computer-aided methods in the facilities design process.

IE 4410 – Computer Aided Manufacture Cr. 4

Prereq: BE 1010. The use of microprocessors in the design of computer-aided manufacturing systems. A design project involving software development and the construction of a physical simulation is required.

IE 4420 – Systems Simulation Cr. 3

Prereq: BE 3220, BE 1010. Systems modeling and discrete event simulation. Methodology applied to analysis and design of a broad range of systems including both production and service systems. Computer assignments and a term project are required.

IE 4450 – Concurrent Engineering Design Cr. 4

Prereq: IE 3450. Integration of product and process design. Topics include: design for manufacture, design for assembly, material selection, and producibility. Introduction to a strategic approach to product design that integrates technical aspects of product design with basic issues of manufacturing system design.

IE 4560 – Operations Research Cr. 3

Prereq: BE 3220, MAT 2150. An introduction to the philosophy of operations research. Formulation of linear programming models and their solutions. Duality and sensitivity analysis. The transportation model. Introduction to probabilistic modeling and application of queuing models.

IE 4800 - Engineering Design Project I Cr. 2

Prereq: IE 3120, 4250, 4420, 4850. Co-Req: IE 4560, 4260. Preparation for capstone course – Covers project selection, team building and methodological preparation required for Engineering Design Project II.

IE 4850 – Engineering Economy Cr. 3

Prereq: BE 3220. Economic analysis of engineering projects. Selection of appropriate interest rates and methods of analysis, depreciation, tax considerations and use of accounting data in the comparison of investment alternatives.

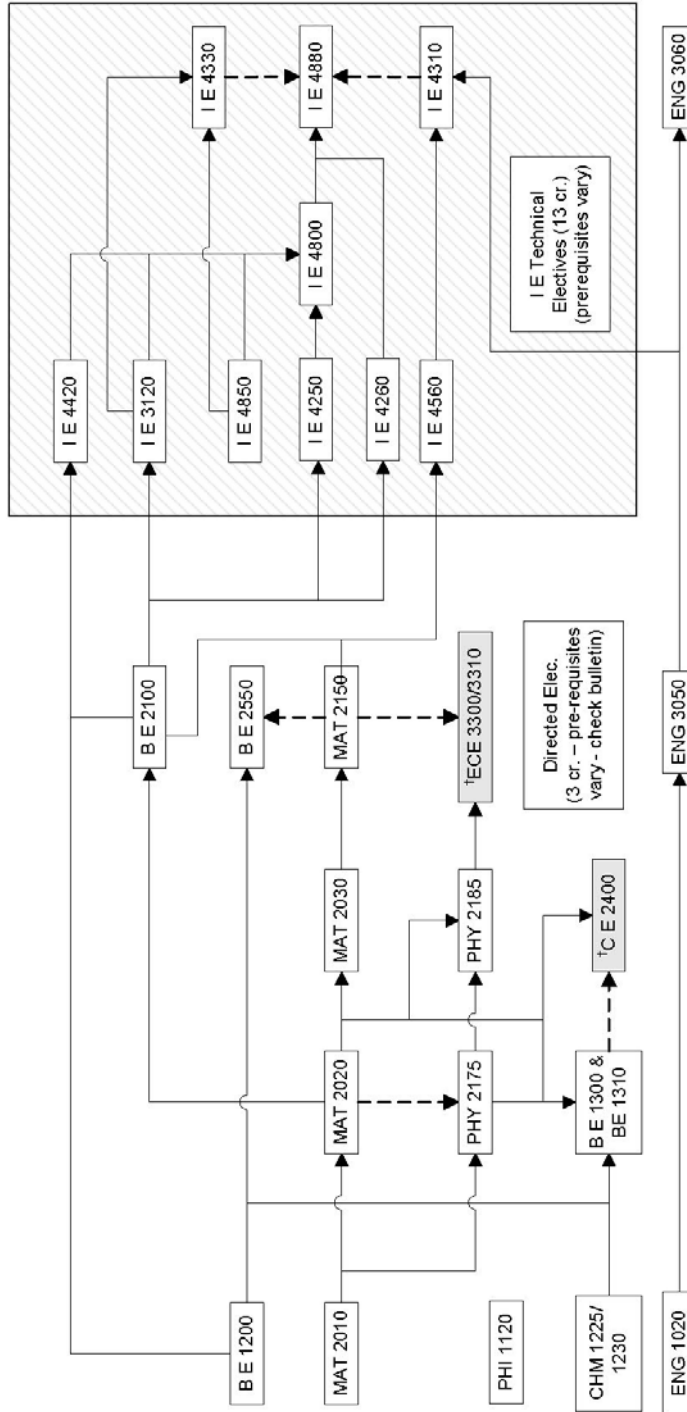
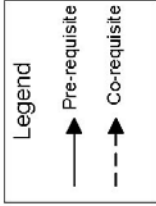
IE 4880 - Engineering Design Project II Cr. 2

Prereq: IE 4800. Co-Req: 4310, 4330. An intensive design experience defined and executed by the student; Requires synthesis and application of skills and knowledge gained in the program.

IE 4990 – Directed Study Cr. 1-6

Prereq: senior standing; consent of chairperson; outline of proposed study approved by instructor and chairperson prior to election of course. Supervised study and instruction in a field selected by the student.

Model Flow Chart for BSIE Required Courses



Industrial Engineering Requirements

There are 10 core courses (28 cr.), plus 13 credits of IE technical electives required. All IE courses require students to be registered in the IE Professional Program (i.e., all Pre-Professional requirements must be met).

The course sequence shown is for illustrative purposes only, depicting a typical path through the program. Check the Undergraduate Bulletin for current prerequisites.

To be eligible for IE 4800, the student must have completed, or be able to complete 6 of the regular 8 IE core courses (i.e., non-capstone required courses). To be eligible for IE 4880, the student must have successfully completed IE 4800 in the previous term, and be on track to complete all 8 regular core courses at the same time as IE 4880.

See the IME Dept Advising Team for a plan of work that will best suit your needs.

General Education Requirements (19 cr.)

- Life Sciences (LS) (choose from BIO1510/PSY1010)
- Social Sciences (SS)
- Foreign Culture (FC)
- Historical Studies (HS)
- American Institutions (AI)
- Visual and Performing Arts (VP)
- UGE 1000 Information Power (GE)

(prerequisites vary - check bulletin)

Pre-Professional Requirements

Complete all required courses in math, science, basic engineering (besides BE 2550). Also, complete ENG 1020, the CT test, and the EP test.

Engineering Science Breadth Requirements (8 cr.)

CE 2400 and ECE 3300 are shown for illustrative purposes. Any 2 courses from this list will serve. Prerequisites vary - check bulletin.

- ECE 3300 / ECE 3310 – Circuits + Lab (4 cr.)
- ECE 2620 – Introduction to Microcomputers (4 cr.)
- ME 2210 – Thermodynamics + Lab (4 cr.)
- ME 3300 – Fluid Mechanics (4 cr.)
- ME 3400 – Dynamics (4 cr.)
- BME 5010 – Engineering Physiology (4 cr.)
- CE 3250 – Applied Fluid Mechanics (4 cr.)
- CE 4600 – Transportation Engineering (4 cr.)
- ME/CE 2400 – Statics (4 cr.)

Technical Electives

Any course in with the IE designation from the 0000-6999, that is not otherwise required (see exceptions below) is a candidate for IE technical elective credit. Some courses at the master's level, including IE 6210, IE 6260, IE 6442 and IE 6560 may not be taken for undergraduate credit because their content overlaps with undergraduate required courses. Additionally, some 6000-level courses require graduate standing and are thus not eligible for undergraduate technical elective credit.

The following is a partial list of technical electives. In addition to these courses, other courses in the college of engineering may be eligible for IE technical elective credit if their content is highly relevant to IE research and practice.

IE 3450 – Manufacturing Processes I Cr. 3

Prereq: ME 2400. A study of the field of manufacturing processes from a mechanical engineering design standpoint. Topics include: processing of metals, polymers, and ceramics, and computer-aided manufacturing.

IE 4410 – Computer Aided Manufacture Cr. 4

Prereq: BE 1010. The use of microprocessors in the design of computer-aided manufacturing systems. A design project involving software development and the construction of a physical simulation is required.

IE 4450 – Concurrent Engineering Design Cr. 4

Prereq: IE 3450. Integration of product and process design. Topics include: design for manufacture, design for assembly, material selection, and producibility. Introduction to a strategic approach to product design that integrates technical aspects of product design with basic issues of manufacturing system design.

IE 4990 – Directed Study Cr. 1-6

Prereq: senior standing; consent of chairperson; outline of proposed study approved by instructor and chairperson prior to election of course. Supervised study and instruction in a field selected by the student.

IE 5100 (BME 5010) – Engineering Physiology. (CHE 5100) (ECE 5100) (M E 5100) Cr. 4

Prereq: senior standing. The basic principles of human physiology presented from the engineering viewpoint. Bodily functions, their regulation and control discussed in quantitative terms and illustrated by simple mathematical models when feasible. (F)

IE 5170 (BME 5570) – Design of Human Rehabilitation Systems. (ECE 5170) (M E 5170) Cr. 4

Prereq: senior standing. Design, fabrication and testing of customized hardware to aid handicapped patients. (F)

IE 5995 – Special Topics in Industrial Engineering: Cr. 1-4

Prereq: Consent of instructor. Covers current topics in industrial engineering research and practice.

IE 6000 – Digital Automation. Cr. 4

Prereq: graduate standing in engineering or consent of instructor. Fundamentals of digital control and logic; integration and automation solution technologies (barcode systems, vision systems, etc.); data acquisition. (W)

IE 6240 – Quality Management Systems. Cr. 4

Prereq: B E 3220 or placement exam. Design of quality management systems. Topics include: QFD, quality planning, business operating systems, TQM, standards, and auditing. Quality management tools such as PDCA and root cause analysis. (W)

IE 6250 – Maintenance Engineering. Cr. 2

Prereq: I E 6210. Proven aspects of maintenance and asset management. Principles of measurement and analysis. Case studies and projects are emphasized. Topics include: maintenance strategy, organization, methodologies, information systems, training programs. (W)

IE 6270 – Engineering Experimental Design. Cr. 4

Prereq: I E 6210. The design of engineering experiments for manufacturing process analysis, human factors experimentation, societal systems analysis and life testing; basic experimental design models, blocking, factorial experiments, nested designs, covariance analysis, response surface analysis, estimation of effects. (F)

IE 6310 – Lean Operations and Manufacturing. Cr. 2

Fundamental theories and concepts in lean manufacturing, six-sigma, mistake proofing, problem solving, process management. Students develop competency in identifying causes and sources of waste in manufacturing, industrial, and business operations. (F)

IE 6441 – Advanced Facilities Design and Logistics. Cr. 2

Prereq: I E 6442, 6560. Qualitative approaches for making facility location, layout, vehicle routings, and inventory management decisions. Applicability of various algorithms to real world applications; case studies. (F)

IE 6450 (M E 6450) – Advanced Manufacturing Processes and Methods. Cr. 4

Prereq: 5010 or equiv. Review of novel manufacturing processes, methods and systems; emphasis on optimum design for manufacturability, technical, economic, and industrial limitations. Elements of computer-aided manufacturing, and numerical methods application. (W)

IE 6470 – Stochastic System Modeling: Queuing and Simulation. Cr. 2

Description of queuing systems; analytical solutions; discrete events systems; modeling framework and object models; terminating and non-terminating systems; statistical analysis; case studies. (Y)

IE 6510 – Information Systems for the Manufacturing Enterprise. Cr. 2

Methods for information flow modeling. Information needs of global manufacturer: design, testing, manufacture, and delivery. Partnership relation to suppliers via information. (W)

IE 6840 (MGT 6840) – Project Management. Cr. 1-4

Principles of successful project management including: time and cost management, risk analysis, human resource management. Consideration of both operational and conceptual issues. Introduction to project management tools. (W)

IE 6850 – Manufacturing Strategies. Cr. 2

Prereq: graduate standing in engineering. Strategic approach to the management of manufacturing including: relationship to corporate strategy, operationalizing manufacturing concepts, impact of new technology and manufacturing concepts, impact of new technology and manufacturing as a competitive resource; case-studies approach. (Y)

Non-IE Engineering Electives (Engineering Science Breadth)

IE students are required to take 2 courses (8 cr.) from the following list of courses.

- ECE 3300 / ECE 3310 – Circuits + Lab (4 cr.)
- ECE 2620 – Introduction to Microcomputers (4 cr.)
- ME 2210 – Thermodynamics + Lab (4 cr.)
- ME 3300 – Fluid Mechanics (4 cr.)
- ME 3400 – Dynamics (4 cr.)
- BME 5010 – Engineering Physiology (4 cr.)
- CE 3250 – Applied Fluid Mechanics (4 cr.)
- CE 4600 – Transportation Engineering (4 cr.)
- ME/CE 2400 – Statics (4 cr.) (a 3 credit Statics transfer course may be considered in lieu of this option)

Directed Electives

The following is a list of currently approved courses for Directed Elective credit. This list is not comprehensive. If you want to take a course for Directed Elective credit that is not on this list, please submit an Academic Petition form with the course and your rationale for its inclusion in your plan of work. Courses may not count for both Non-IE Engineering Elective and Directed Elective credit.

- ACC 3010 Elementary Financial Accounting Theory
- ANT 3150 Anthropology of Business (IF FC covered by another course - can't double count as general education and directed elective)
- BME 5010 Engineering Physiology (ME 5100)
- BME 5570 Design of Human Rehabilitation Systems (ME 5170, ECE 5170)
- CE 4600 Transportation Engineering
- CE 5810 Legal Aspects of Engineering Problems
- CE 6010 Construction organization and management
- CE 6050 Construction estimating
- CHE 2800 Material and Energy Balances
- CHE 3300 Thermodynamics
- CSC 1100 Problem Solving and Programming
- ECE 2620 Introduction to Microcomputers
- ECE 3330 Electrical Circuits II
- ISM 4630 Business Information Systems
- ISM 5820 Systems Analysis and Design
- ISM 5860 Data Communications and Networks
- LBS 4500 Applied Labor Studies
- ME 2050 Introduction to Computer-Aided Mechanical Drafting with ME 2060 Introduction to Engineering Design and Problem Solving
- ME 2210 Thermodynamics
- ME 3400 Dynamics
- ME 5440 Industrial Noise Control
- MGT 4520 Managing Organizational Behavior
- MGT 4530 Management of Organizational Behavior
- PSY 3500 Psychology and the Workplace
- PSY 5540 Motivation in the World of Work

Note: Many of these courses have program restrictions or complicated prerequisites. Being on this list does not imply that any given student will be able to take any course listed. It will be the student's responsibility to determine the applicability of this list to their circumstances.

Academic Policies

BSIE students complete their degrees in accordance with all applicable University and College academic regulations and policies. The following items are important areas where the IME department places additional policies/regulations in place, over and above the applicable University and College policies/regulations. The following was current at the time of the last handbook update – see the College of Engineering Associate Dean for Academic Affairs for confirmation on these policies.

Transfer credits accepted

Per University policy, a maximum of 64 credits will be accepted from a 2-year institution (i.e. community college). For students transferring from a Bachelor Degree granting institution, the College requires 34 credits to be completed at WSU. Further, the IME Department requires that IE 4800/4880 Engineering Design be taken at WSU – under no circumstances will transfer credit be accepted for our capstone course. In addition, at least 4 of the remaining 8 IE core courses must be taken at WSU. A minimum of 20 IE-designated credits earned at WSU will be required (including core and technical electives) to fulfill BSIE program requirements.

Withdrawals and Repeating Courses.

The University has implemented a new grading system, effective Fall 2006. More information will be provided from the Registrar's Office on the policy changes and processes. Approvals for withdrawals do not require the approval of the Associate Dean for Academic Affairs. However, after the end of the 4th week of the semester, instructor approval is required. This will be requested through the University withdrawal system on Pipeline.

For the purpose of determining the allowed number of repeats for a student, ANY grade of WP, WF, or WN that appears on your transcript will count as an 'attempt' (refer to the *Pre-Professional Handbook* for the specific policies on allowed number of repeats). Due to the fact that Withdrawals will count as an attempt, students should consider carefully whether or not they will withdraw from the course after the fourth week.

Students who feel that extenuating circumstances (e.g. extended illness, family emergency, out-of-town work responsibilities) justify the withdrawal should submit a petition *in writing* to the Associate Dean for Academic Affairs before the end of the semester. Supporting documentation should be included with the petition. These petitions will only be considered if submitted before the end of the semester in which the course is taken. If the petition is approved, a notation will be made in your advising record not to count the course among the allowed repeats. If you have any questions about this policy, please contact your advisor.

Academic Progress

BSIE students are expected to make academic progress in accordance with the policies of the College of Engineering. Consult the Associate Dean for Academic Affairs for a complete description of policies regarding progress, calculation of College gpa, probation, and exclusion.

The Institute of Industrial Engineers (IIE)

Professional Involvement

BSIE students are strongly encouraged to become involved in professional societies while a student. Participation in professional societies gives our students an edge in everything from professional networking to maintaining All BSIE students who join the Institute of Industrial Engineers (IIE) as a student member are entitled to a 100% dues rebate from the Department -- see Dr. Ellis for details.

IIE Student Chapter

Wayne State's BSIE program is home to a vibrant, active student chapter of the Institute of Industrial Engineers. Chapter operations are housed in Room 2042 of the Manufacturing Engineering building. The chapter office houses 2 PCs with access to the internet through WSU's network. Annual activities include the following: social gatherings, volunteering/attending local IIE workshops and symposia, public service (e.g. volunteering for Gleaner's Food bank). See the WSU IIE bulletin board (outside the chapter office) for a list of upcoming events.

Other benefits of membership include access to the IIE's online resource library, the IIE Online Career Center, IIE fellowships, and discounted conference registration fees.

Detroit Professional Chapter

Students are also encouraged to participate with your local IIE student chapter in Detroit IIE Senior Chapter events and activities. The Detroit Chapter of IIE has monthly meetings, a website, and newsletter. Aside from learning current applications of IE techniques in industry, you also get to meet individuals that have been in the field 5, 10, 15 + years. You'll make connections and contacts - but more importantly you learn first hand what it means to be a practicing IE. The Detroit Chapter makes every effort to support IE students. A scholarship is available to students - all you have to do is apply to your Faculty Advisor. Also, a Technical Paper contest is sponsored by the Detroit chapter - which puts you in line for Regional, National, and International awards. And the Detroit Chapter funds (in part) trips to Regional and National IE conferences.

Find out more on the web at <http://www.iiedetroit.org/>

CHANGE LOG

- 12/01/2004: Changed Park interests, Changed LS requirement error (was Any LS, now BIO1510 or PSY1010), Changed course number of IE 4890 (error) to what it should be IE4880.
- 01/05/2005: Changed BE course numbers
- 01/10/2005: Added list of potential IE technical electives
- 03/15/2005: Added directed electives list.
- 01/17/2006: Updated program requirements with Non-IE Engineering Electives
- 03/06/2006: Updated program objectives, BSIE program flowchart
- 05/11/2006: Updated degree requirements and model semester-by-semester curriculum to reflect engineering breadth options, recent course name changes, and credit changes.
- 09/16/2006: Updated program objectives, changed curriculum page to reflect 2+2 capstone
- 10/06/2006: Edits to reflect changes to course credit, delete listing of no-longer-required UGE, changes to grading policy effective Fall 2006.
- 11/11/2006: Added notes on ABET criteria 3, and our status as an accredited program to the section on program mission, objectives and learning outcomes.
- 02/02/2007: Changed PHI requirement to PHI 1120

Future versions of the BSIE handbook are planned to include the following material.

Concentrations – PMLP, Quality Engineering.



Chair's Welcome

Forms

Degree Checklist & BSIE Plan of Work, Change of Status, Petition for Waiver, College Scholarship Application, PMLP Application, AGRADE Plan of Work

Testing and Placement Services info

MP and CQ placement exams for admission and getting off to a fast start
EP and CT exams as part of degree requirements

Hints for Successful Planning & Frequently Asked Questions

Dual Enrollment with UM

Course Syllabi

Co-Op and Internships

Scholarships and Financial Aid

Opportunities for BSIE Students, such as the IIE Irv Otis scholarship, PMLP program, IME Scholars program

Getting started on your Masters Degree in IE
Senior Rule and AGRADE

Academic Integrity Policy

Information on Other Professional Societies
SME, ASQ, Informs, HFES, SAE

Anything you would like to see added to this? Please contact Dr. Ellis!