UNDERGRADUATE HANDBOOK

INDUSTRIAL ENGINEERING PROGRAM

Department of Mechanical and Industrial Engineering

THE UNIVERSITY OF IOWA

3131 Seamans Center for the Engineering Arts and Sciences
Iowa City, Iowa 52242-1527, USA

Tel: +1 319 335-5939 Fax: +1 319 335-5669

Email: indeng@engineering.edu
World Wide Web: http://www.mie.engineering.uiowa.edu

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This handbook describes features of the undergraduate program in Industrial Engineering offered by The University of Iowa. For those who are already accepted in our I.E. program of studies, this booklet serves as a reference to procedures, policies, and regulations and an introduction to the faculty. This handbook, however, is by no means an authoritative interpretation of College of Engineering policies. For those students interested in I.E., this handbook will serve as a sampler of the I.E. program. Copies of this handbook are available to all students in the Mechanical and Industrial Engineering Department office in the Seamans Center. It is also available on the web at www.mie.engineering.uiowa.edu/.

Revised 4-04

UNDERGRADUATE STUDENT HANDBOOK

THE INDUSTRIAL ENGINEERING CURRICULUM

Course No	Course Title	Sess.	SH	Σ SH	Pre- and /Co-Requisites
1st Year	**Semester 1 (FALL)**				
22M:031	Engineering Mathematics I	All	4		H.S. Alg. & Trig.
59:005	Engineering Problem Solving I	F	3		
4:011	Principles of Chemistry I	All	4		
10:003	Accel. Rhetoric (or 10:001 & 10:002)	F, S	4		
59:090	First-Year Engineering Seminar	F	0		
	Total		**15**	**15**	
	Semester 2 (SPRING)				
22M:032	Engineering Mathematics II	All	4		22M:031 or AP credit (AB-4)
59:006	Engineering Problem Solving II	S	3		/22M:031
29:081	Introductory Physics I	F, S	4		/22M:031
22M:033	Engineering Mathematics III	All	2		/22M:032
*	GEC I	All	3		
	Total		**16**	**31**	
2nd Year	**Semester 3 (FALL)**				
22M:034	Engineering Mathematics IV	F, S	3		22M:033
29:082	Introductory Physics II (without Lab)	F, S	3		29:081, 22M:031
59:007	Fund. of Engineering I: Statics	All	2		22M:031, /29:081
59:008	Fund. of Eng. II: Electrical Circuits	All	3		/22M:034
59:009	Fund. of Eng. III: Thermodynamics	All	3		22M:031, 4:011, 29:081
* 31:001	Elementary Psychology (GEC II)	F, S	3		
56:020	IE Sophomore Seminar	F, S	0		Sophomore status
	Total		**17**	**48**	
	Semester 4 (SPRING)				
**	EFA I	All	3		
57:015	Materials Science	All	3		4:011, /22M:031
22S:039	Probability & Statistics for Engineers	F, S	3		22M:032
57:017	Computers in Engineering	All	3		59:006, Sophomore status
56:054	Engineering Economy	S	3		/22S:039
56:020	IE Sophomore Seminar	F, S	0		Sophomore status
	Total		**15**	**63**	

Course No	Course Title	Sess.	SH	Σ SH	Pre- /Co-Requisites
3rd Year	Semester 5 (FALL)				
**	EFA II	All	3		
56:144	Human Factors	F	3		31:001
56:032	Design for Manufacturing	F, S	3		/57:015
56:171	Operations Research	F	4		22S:039, 22M:033
*	GEC III	All	3		
	Total		**16**	**79**	
	Semester 6 (SPRING)				
**	EFA III	All	3		
56:131	Manufacturing Systems	S	3		56:032
22S:030	Statistical Methods and Computing	S	3		
56:147	Ergonomics	S	3		
56:150	Information Systems Design	S	3		59:006, 57:017
*	GEC IV	All	3		
56:091	Professional Seminar: IE	F, S	0		Junior status
	Total		**18**	**97**	
4th Year	Semester 7 (FALL)				
**	EFA IV	All	3		
**	EFA V	All	3		
56:134	Process Engineering	F	3		56:171
56:178	Digital Systems Simulation	F	3		22S:039, 22S:030
*	GEC V	All	3		
56:091	Professional Seminar: IE	F, S	0		Junior status
	Total		**15**	**112**	
	Semester 8 (SPRING)				
**	EFA VI	All	3		
**	EFA VII	All	3		
56:160	Operational Systems Design	S	4		56:134, 56:054, Senior status
56:162	Quality Control	S	3		22S:039, 22S:030
56:166	Production Systems	S	3		56:171, 56:032
	Total		**16**	**128**	

* GEC – General Education Component (15 SH total). Social Science and Humanities courses selected in Plan of Study to satisfy College of Engineering requirements. See guide from Student Development Center for a list of acceptable courses. Among the GEC courses, at least 3 SH must be Social Science courses and another 3 SH must be Humanities courses. At

least 6 SH must be intermediate (100) level courses, at least one of which is a 100 level course in the same department as the lower level course completed by the student.

** EFA – Elective Focus Area (21 SH total). Courses selected in Plan of Study to satisfy departmental requirements. At least 3 SH of EFA courses must be a mathematics/science elective. See EFA guide from MIE Department Office.

128 SH of specific coursework are required for graduation. Students may take additional coursework that will not be applicable toward degree requirements.

FOREIGN LANGUAGE REQUIREMENT: Satisfactory completion of 2 years of one high school foreign language or 1 year of one college-level foreign language is required for first year students graduating from high school in 1990 and after; transfer students, 1991 and after.

INTRODUCTION

Industrial Engineering started early in the twentieth century with the application of the scientific method in factories. Because of its initial factory orientation, this engineering discipline became known as industrial, production, or management engineering. Industrial Engineering is frequently defined as: "the integration of machines, people, materials, money, and methods." While these key components still play an extremely important role in I.E., the applications of I.E. tools and techniques have expanded beyond factories to hospitals and other health-care operations, transportation organizations, media operations, service companies, such as banking and utilities and divisions of local, regional, and national governments. With this expansion also came specialization within the discipline and a generation of engineers with narrower scope but greater depth in particular skills and application areas. The Department of Mechanical and Industrial Engineering (MIE) allows students to balance the development of both general and specialized skills through Elective Focus Areas (EFAs).

ELECTIVE FOCUS AREAS

The EFA is a set of 21 semester hours (sh) of elective courses taken during the sophomore to senior years that provide undergraduate students in the MIE department with a unique opportunity to acquire advanced education in an area of their choice. EFAs are not only intended to spark the interest of students in a specialty, but they can also make a student more attractive to future employers.

An EFA must be rigorous, well focused, in-depth, and consistent with a student's career plan. A collection of lower level courses in a number of disparate areas will not satisfy this EFA requirement. Consequently, approval of a student's EFA by the department is generally required. A Plan of Study form, described in greater detail below, facilitates the process of choosing and obtaining approval for the EFA courses.

In order to maintain some technical rigor and depth, EFAs must contain at least 9 sh of 100-level College of Engineering courses. However, this requirement may be waived if the EFA consists of an in-depth program in mathematics, computer science, the physical and natural sciences, or business.

Due to program accreditation issues, at least 3 sh of courses must be mathematics or basic sciences courses (as defined by ABET) in a different area or at a more advanced level than those required in the regular curriculum.

An EFA does not need to consist entirely of technical courses. For example, part or all of the UI Technological Entrepreneurship Certificate program can be completed as an EFA. If the majority of EFA courses is from outside of the College of Engineering, an official UI Minor or UI Certificate program should generally be completed.

Students are urged to integrate their EFA with internships or cooperative education experiences they may be taking as part of their undergraduate studies. Furthermore, an EFA may be complemented by courses taken as part of the General Education Component (GEC) requirement. If a focus in the humanities or social sciences is desired in an EFA, up to 12 sh of GEC courses should be used. The remaining balance of EFA courses may be used as technical electives or toward a second focus area, consistent with the above EFA requirements.

There are two types of EFAs:

- **Standard EFAs (S-EFA)** are programs that are designed and pre-approved by the department. Currently offered S-EFAs in MIE are listed below; they are periodically reviewed by the department. Descriptions of each S-EFA can be obtained from the departmental web site or office. Each S-EFA has a faculty member as a coordinator who can advise a student in more detail.
- **Tailored EFAs (T-EFA)** are individualized and career specific programs designed by the student and approved by the department.

The Plan of Study facilitates the process of choosing and obtaining approval for the courses for the EFA. During the first academic year on campus, all undergraduate students consult with their advisor and begin to develop a tentative Plan of Study. The Plan of Study is finalized and submitted to the department during the third semester. The Sophomore Seminar (third semester) is used to explain EFA choices. The Plan of Study:

- identifies the career goal;
- identifies the courses to be taken as the 21 sh of EFA electives;
- presents the rationale for how the electives support the career goal; the student should provide any necessary supporting material;
- is signed by the student and the advisor; if a student is pursuing a T-EFA or deviating from the approved courses for an S-EFA, the Plan of Study must also be approved by the department chair;
- must be completed in advance of taking any EFA courses;
- is placed in the student's official file;
- may be altered at any time during the undergraduate program; any changes must be approved by completing a new Plan of Study.

There are five standard elective focus areas in the industrial engineering program:

- Computers & Information Systems
- Human Factors
- Management
- Medical Systems
- Product Design & Manufacturing

Each area and its EFA are described below in detail.

THE COMPUTER AND INFORMATION SYSTEM ELECTIVE FOCUS AREA

The demand for Computer and Information System Analysts is projected to grow as computer technology continues to revolutionize our society. Employment in this area is expected to increase by 35% or more during the period from 2001 and 2010. Industrial Engineers have a natural role to play in this field by using quantitative system analysis, manufacturing system knowledge and human factors skills to help to design and refine computer systems that are becoming ever more complex. The field offers substantial opportunities for technical skill development, travel, and interaction with a diverse range of professionals.

This Focus Area completes all the requirements for a minor in computer science.

Semester	Course	**Session**	**SH**	**Pre-/Co-Requisites**
4 (Spring)	22M:072 Elementary Numerical Analysis	F,S	3	22M:032
5 (Fall)	55:033 Introduction to Software Design	F,S	3	59:006
6 (Spring)	22C:034 Discrete Structures	All	3	22M:031, /22C:020
7 (Fall)	22C:030 Computer Science III	All	3	55:033, /22C:034
7 (Fall)	Any 100-level Engineering Course		3-4	
8 (Spring)	Technical Elective (choose from Table below)		3	
8 (Spring)	Technical Elective (choose from Table below)		3-4	

Technical Electives	**SH**	**Pre-/Co-Requisites**
22C:034 Discrete Structures	3	22M:021 or 22M:025 or 22M:031 , /22C:020
22C:040 Computer Organization and Hardware	4	22C:020 22C:034
22C:044 Algorithms	3	22C:030 22C:034
22C:050 Introduction to Software Systems	3	22C:030 22C:034 22C:040
22C:054 Programming Language Concept	3	22C:030 22C:034 22C:040*

For further information, please contact: Professor Geb Thomas, Department of Mechanical and Industrial Engineering, University of Iowa, Iowa City, IA 52242, Tel. (319) 335-5936, e-mail: Geb-Thomas@uiowa.edu

THE HUMAN FACTORS AND ERGONOMICS ELECTIVE FOCUS AREA

Human Factors and Ergonomics (HFE) represent increasingly important engineering specialties. The dramatic increase in computer technology makes system performance increasingly dependent on the match between system characteristics and human capabilities. Opportunities to apply HFE are very broad and graduates with this focus area find employment in diverse industries that include vehicle systems (e.g., GM, Ford, Delphi, Visteon, DaimlerChrysler, Caterpillar), healthcare (e.g., GE, Medtronics, Guidant), computer systems (e.g., Microsoft, Intel, IBM), and consulting (e.g., Accenture, Battelle). Human Factors considers cognitive characteristics and ergonomics considers physical characteristics.

The HFE EFA builds on the required coursework for undergraduate students in Industrial Engineering and provides advanced education in psychology, systems, statistics, and biomechanics. The EFA consists of 21 semester hours (SH) as listed below. Students who take 15 semester hours from the department of psychology (031:XX) receive a minor in psychology. This requirement can be met with the three required courses (31:001, 31:016, 31:120) and two electives from the table below. The first four courses in the table provide a general background and the three elective courses allow for an emphasis in human factors (HF) or ergonomics (E).

Semester	Course	Session	SH	Pre-/Co-Requisites
4 (Spring)	31:016 Introduction to Cognitive Psychology	All	3	31:001
5 (Fall)	31:120 Experimental Psychology I	All	3	31:016
6 (Spring)	59:012 Linear Systems Analysis**| Elective	All	3	59:008
7 (Fall)	55:180 Fund. of Software Eng** | Elective	All	3	56:150
7 (Fall)	22S:152 Applied Linear Regression	Fall	3	22S:030
8 (Spring)	Elective			
8 (Spring)	Elective			

Electives*	SH	Pre-/Co-Requisites	Emphasis
56: 240 Human Perf in Engineering Systems	3	56:147	HF
56:242 Human-Computer Interaction	3	56:147	HF
56:098 Individual Investigations: IE	1-3	varies	General
55:060 Control Systems	3	59:012	General
22S:158 Experimental Design and Analysis	3	22S:152	General
31:012 Introduction to Brain and Behavior	3	31:001	HF
31:015 Introduction to Social Psychology	3	31:001	HF
31:019 Psychology in Business and Industry	3	31:001	HF
31:043 Evaluating Psychological Research	4	31:001, 22S:030	HF
31:122 Experimental Psychology II	4	31:120	HF
31:113 Language Processing	3	31:016	HF
31:130 Psychology of Thinking	3	31:016	HF
31:131 Cognitive Science	3	31:016	HF
31:133 Sensation and Perception	3	31:016	HF
31:134 Cognition and the Brain	3	31:016	HF
31:154 Psychology of Decision Making	3	31:016	HF
72:154 Biomedical Engineering Physiology*	4		E
51:050 Biomechanics*	3		E
51:152 Ergonomics of Occupational Injuries	3	51:050	E
175:190 Occupational Ergonomics	3	56:147	E
175:192 Occupational Safety	3	56:147	E

**One of these courses is required OR the student must take two upper level psychology courses (31:1XX).

*Pre-requisites may require enrollment in additional courses.

For further information, please contact: Professor J. D. Lee, Department of Mechanical and Industrial Engineering, University of Iowa, Iowa City, IA 52242, Tel. (319) 384-0810, e-mail: jdlee@engineering.uiowa.edu

THE MANAGEMENT ELECTIVE FOCUS AREA

Industrial Engineers are often tasked with managerial tasks, project management, and financial assessments as they relate to project budgets, cost calculations, and optimizations. The Management EFA prepares students for a career in management for engineering. By following this EFA, students will be able to obtain a Minor in Business Administration. Information on the Business Administration Minor can be found at http://www.biz.uiowa.edu/upo/programs/minor.html. The following table explains the requirements for a Business Minor, and how they can be satisfied by undergraduate students in the Industrial Engineering (IE) program. It can be seen that four courses for the Business Minor can be satisfied by courses already required in the IE curriculum. Another two should be taken as part of the General Education Component (GEC), and five courses should be taken as part of the 21 semester hours of classes reserved for the EFA.

Required Courses for Business Minor	SH	Equivalent Courses for IE Majors	SH
22M:017 Calculus & Matrix Algebra for Business	4	22M:031 Engineering Mathematics I	4
22S:008 Statistics for Business	3-4	22S:039 Probab. & Statistics for Engrs.	3
6E:001 Principles of Microeconomics	4	Take as *part* of GEC	4
6E:002 Principles of Macroeconomics	4	*Take as part of GEC*	4
6A:001 Introduction to Financial Accounting	3	Take *as* part of EFA	3
6A:002 Managerial Accounting	3	*Take as part of EFA*	3
6J:047 Introduction to Law	3	*Take as part of EFA*	3
6J:048 Introduction to Management	3	*Take as part of EFA*	3
6K:070 Computer Analysis	3	59:006 Engineering Problem Solving II	3
6M:100 Introduction to Marketing	3	*Take as part of EFA*	3
6F:100 Introductory Financial Management	3	56:054 Engineering Economy	3
Total hours required:	**36-7**		**36**

An EFA schedule accommodating the Business Minor could thus be designed as shown in the following table. **This schedule assumes that 6E:001 and 6E:002 are taken as part of the GEC.** The Math/Science Elective is required for any EFA and suitable courses are listed in the last table. The 100-level course in Semester 8 allows students to gain advanced knowledge in an engineering topic of their choice.

Semester	Course	Session	SH	Pre-/Co-Requisites
4 (Spring)	6A:001 Introduction to Financial Accounting	All	3	Sophomore standing
5 (Fall)	6A:002 Managerial Accounting	All	3	6A:001, 6E:001, 22M:031
6 (Spring)	Math/Science Elective		3	
7 (Fall)	6J:047 Introduction to Law	All	3	Sophomore standing
7 (Fall)	6J:048 Introduction to Management	All	3	Sophomore standing
8 (Spring)	6M:100 Introduction to Marketing	All	3	6E:001, Junior standing
8 (Spring)	100-level Engineering course		3	

Math and Science Elective Courses	SH	Pre-/Co-Requisites
29:083 Modern Physics	3	029:082
4:012 Principles of Chemistry II	4	4:011
22S:150 Regression, Time Series, & Forecasting	3	22S:120 or equiv.
22S:152 Applied Linear Regression	3	22S:039
22M:072 Elementary Numerical Analysis	3	22M:032, 59:006
22M:035 Engineering Mathematics V	3	22M:034
2:010 Principles of Biology I	4	4:011

For further information, please contact: Professor T. Schnell, Department of Mechanical and Industrial Engineering, University of Iowa, Iowa City, IA 52242, Tel. (319) 384-0811, e-mail: tschnell@engineering.uiowa.edu.

THE MEDICAL SYSTEMS ELECTIVE FOCUS AREA

Healthcare makes up some 20% of the US economy and is expanding. The need for increased productivity and quality in healthcare is apparent especially as the society is aging. Most processes in healthcare are data and information driven, e.g., patient diagnosis, treatment selection, and administrative processes, yet the healthcare system has not seen the benefits of the information "revolution". Many predict that medical technology will be the largest and most vibrant area of the economy in this century. A large number of new jobs will be created in medically related areas. The latest genetic discoveries have begun fueling this growth. Numerous graduates from the Industrial Engineering Program at the University of Iowa have already joined the healthcare market, by taking key technical and managerial positions in clinical departments of the largest hospitals, insurance companies, biotechnology companies, high technology medical equipment manufacturers, pharmaceutical corporations, medical software industry, and government agencies. The growing healthcare sector fueled by the developments in biotechnology, genomics, proteomics, and computer technology will create new job opportunities for engineers trained in medical systems. The EFA in medical systems builds on the regular courses required for a B.S. degree in Industrial Engineering and provides students with advanced education in models, tools, and methods for the growing healthcare market.

Semester	Course	Session	SH	Pre-/Co-Requisites
4 (Spring)	2:010 Principles of Biology I	All	4	4:013
5 (Fall)	2:011 Principles of Biology II	All	4	2:010
6 (Spring)	4:012 Principles of Chemistry II	All	4	4:011
7 (Fall)	Elective			
7 (Fall)	Elective			
8 (Spring)	Elective			

Electives	SH	Pre-/Co-Requisites
56:138 Knowledge Discovery and Management	3	22S:030 and 59:006
58:181 Internet Systems Design	3	59:006
56:186 Health Informatics II	3	59:006
56:287 Health Informatics I	3	59:006
22C:036 Elementary Numerical Analysis	3	22M:032, 59:006
55:033 Introduction to Software Design	3	057:017
22C:034 Discrete Structures	3	22C:020
22C:030 Computer Science III	3	22C:016 and 020
2: 128 Fundamental Genetics^	4	002:010, 011, and 004:014
4: 021 Basic Measurements	3	004:016 or 004:020
51:040 Biological Systems Analysis I	3	22M:034 or 059:006
51:070 Biomaterials I	3	004:112, Co-r 072:154
51:080 Biomedical Measurements I	3	051:140 and 59:008
51:140 Biomedical Systems Analysis II	3	Co-r. 72:154
55:148 Digital Image Processing	3	55:042
4:121 Principles of Organic Chemistry I^	3	004:012 or 004:019
4: 122 Organic Chemistry II^	3	004:121
072:154 Biomedical Engineering Physiology	4	Instructor consent

^ this course satisfies the Pre-Med requirement

For further information, please contact Professor Andrew Kusiak, Andrew-Kusiak@uiowa.edu, Department of Mechanical and Industrial Engineering, University of Iowa, Iowa City, IA 52242, Tel. (319) 335-5935.

THE PRODUCT DESIGN AND MANUFACTURING ELECTIVE FOCUS AREA

Many graduates of the Department of Mechanical and Industrial Engineering at The University of Iowa seek employment in manufacturing companies, such as John Deere, Caterpillar, Amana, Maytag, HON, and automotive companies. Manufacturing engineering jobs in these companies typically involve the design of new products, development of manufacturing processes, and the application of advanced microprocessor-based technologies such as industrial robots, industrial control systems, and design analysis and process planning software.

The Product Design and Manufacturing (PDM) EFA builds on the required coursework for undergraduate students in Industrial Engineering and provides advanced education in manufacturing and materials processing operations, systems, modeling, and control. The PDM EFA consists of 21 semester hours (SH) of classes as listed in the table below. The specified classes in the table provide general background important to both design and manufacturing. The three elective classes allow for a further emphasis in either area:

- **Product Design (PD):** design and development of new products; feature extraction & recognition; intelligent systems; information systems;
- **Manufacturing Engineering (MfgE):** manufacturing process design & selection; tooling design; manufacturing equipment design; manufacturing process control; robotics.

Semester	EFA Course	Session	SH	Pre-/Co-Requisites
4 (Spring)	Engineering Science Course (see list below)	All	3	
5 (Fall)	56:153 Engineering Administration I	F	3	56:054
6 (Spring)	Elective course		3	
7 (Fall)	Math/Science Course (see list below)	S, F	3	
7 (Fall)	58:086 Mechanical Engineering Design Project	F	3	Junior status
8 (Spring)	Elective course		3	
8 (Spring)	Elective course		3	

Engineering Science Course	SH	Pre-/Co-Requisites	Emphasis
57:010 Dynamics	3	22M:032, 59:007	PD, MfgE
57:018 Princ. of Electronics Instrumentation	4	29:082, 59:008	MfgE
57:019 Mechanics of Deformable Bodies	3	59:007, /22M:034	PD, MfgE

Math/Science Course	SH	Pre-/Co-Requisites	Emphasis
22M:072 Elementary Numerical Analysis	3	22M:032	N/A
22S:150 Regression, Time Series, & Forecast.	3	22S:120 or equiv.	N/A
22S:152 Applied Linear Regression	3	22S:039	N/A
002:010 Principles of Biology I	4	004:011	N/A
004:012 Principles of Chemistry II	3	004:011	N/A

Elective course	SH	Pre-/Co-Requisites	Emphasis
56:132 Introduction to Industrial Robotics	3	56:031 or 56:032	MFgE
56:138 Knowledge Discovery & Management	3	56:171	PD
56:163 Quality Engineering I	3	56:162	MFgE
56:181 Internet Systems Design	3	/57:017	PD, MfgE
58:052 Mechanical Systems	3	57:019, /22S:039	PD, MfgE
58:055 Mechanical Systems Design	4	58:052	PD, MfgE
58:110 Computer Aided Engineering	3	57:019, 58:052	PD, MfgE
58:131 Feedback Control Systems	3	57:012	PD, MfgE
58:151 Planar Kine. & Dyn. of Machines	3	57:010, 58:052	PD, MfgE
58:115 Finite Element I	3	57:019, 58:052	PD, MfgE
6K:292 Management of Logistics Systems	3		MfgE

For further information, please contact: Professor G. Fischer, Department of Mechanical and Industrial Engineering, The University of Iowa, Iowa City, IA 52242, Tel. (319) 335-6333, e-mail: gfischer@engineering.uiowa.edu

COURSE DESCRIPTIONS

Program courses are shown on the following pages in moderate detail for your information. There are modifications made each semester so some differences are to be expected. Courses of the 200 level are shown because undergraduate students can be given special permission to take them.

056:010 INDUSTRIAL ENGINEERING FRESHMAN SEMINAR

Course Objectives: Students learn about curriculum and career development in Industrial Engineering. Students learn about the roll of professionalism and ethics in engineering. Students learn about the roll of current issues in industrial engineering in the global community. Students learn about the importance of lifelong learning and continuing education in career development.

056:020 INDUSTRIAL ENGINEERING SOPHOMORE SEMINAR

Course Objectives: Students learn about curriculum and career development in Industrial Engineering. Students learn about the roll of professionalism and ethics in engineering. Students learn about the roll of current issues in industrial engineering in the global community. Students learn about the importance of lifelong learning and continuing education in career development.

056:032 DESIGN FOR MANUFACTURING

Course Objectives: Students learn to develop and demonstrate an understanding of the fundamentals of design, engineering graphics, and manufacturing process. They are introduced to the fundamentals of manufacturing, design, and design for manufacturing; they learn the phases of the product life cycle and product design process; they are introduced to engineering drawing and graphics, 3D modeling, pictorial projections, sectional views, and dimensioning and tolerancing practice; they learn about the mechanical and physical properties of metals and polymer processing; and they learn how to better integrate design and manufacturing.

056:091 PROFESSIONAL SEMINAR: INDUSTRIAL ENGINEERING

Course Objectives: Students learn about issues involved in leadership development and teamwork. Students learn about the roll of professionalism and ethics in engineering. Students learn about the roll of current issues in industrial engineering in the global community. Students learn about the importance of lifelong learning and continuing education in career development. Students are exposed to the roll of research in the evolution of industrial engineering.

056:131 MANUFACTURING SYSTEMS

Course Objectives: Students learn about manufacturing, supply chain and logistics systems consisting of globally distributed enterprises. The course covers industrial enterprises, production systems and the role of inventory, electronics manufacturing, forecasting systems, concurrent engineering and design for assembly. In addition, students learn about supply chain management, Quality Function Deployment and Materials Requirements Planning/ERP systems. Students also learn about lean manufacturing and Six Sigma.

056:132 INTRODUCTION TO INDUSTRIAL ROBOTICS.

Course Objectives: Students learn the fundamentals of operation and applications of industrial robots. They learn how to select the best robot for an application based on its technical merits and cost justification. They learn about industrial controls and how to design a successful robot

implementation, including consideration of environmental and safety issues. They learn how to program robots and PLC's.

056:134 PROCESS ENGINEERING

Course Objectives: Students learn how to analyze system requirements and represent systems with process models. They learn the synthesis of conceptual design and how to decompose products, systems and problems. Students complete a project to demonstrate their understanding of process modeling principles and system requirements.

056:138 KNOWLEDGE DISCOVERY AND MANAGEMENT

(Catalog) Description: Introduction to data analysis methods, data mining tools and techniques, data engineering, data warehousing, and evolutionary computation. Case studies illustrating applications of knowledge discovery and management in engineering, medicine, and service applications are discussed.

056:144 HUMAN FACTORS

Course Objectives: Students learn about human performance limits and design techniques to accommodate them in engineering systems. They learn to understand the variety of human performance capabilities and limits and the consequences of not considering these factors in design.

056:147 ERGONOMICS

Course Objectives: Ability to design effective systems and processes from a human factors and ergonomics point of view, understanding principles of work design, ability to apply principles of anthropometry in the design of workspaces, reach envelopes, seating design, basic understanding of fault tolerant systems by considering human error, and human capabilities and limitations (biomechanical, sensory system, cognitive), understanding importance of worker safety and industrial hygiene, warning labels, toxicology, noise, radiation, trauma, understanding principles of hand tool design, machine interfaces, displays, knobs, levers, pedals, grips, buttons. This class requires completion of a human factors semester project.

056:150 INFORMATION SYSTEMS DESIGN

Course Objectives: Students learn a methodological approach to information system design, with emphasis on: problem definition, requirements analysis, process and data modeling, object-oriented analysis, feasibility analysis, application architectures, database design, input and output prototyping and design. Students complete a small software project and a system design based on a case study.

056:148 HUMAN-CENTERED SYSTEM DESIGN

Course Objectives: Students learn how to design interactive systems using human-centered system design guidelines and cognitive engineering tools.

056:153 ENGINEERING ADMINISTRATION

Course Objectives: Students learn about organizational structures, worker motivation theories and project management concepts. They learn how to develop work breakdown structures and use project planning software. They learn to develop and practice business writing skills, including "message first" writing and writing an executive summary.

056:160 OPERATIONAL SYSTEMS DESIGN

Course Objectives: The objective is to provide an opportunity to participate in engineering system design by solving a practical problem utilizing industrial engineering skills and tools. Teamwork, problem solving, and communication are essential elements.

056:162 QUALITY CONTROL

Course Objectives: Understanding the concept of quality in products and services, customer satisfaction, and understanding of quality initiatives such as ISO 9000, TQM, and Kaizen. Understanding fundamentals of process control, dependent and independent variables, noise, and dispersion. Understanding the basics of Designed Experiments and response surface methods (RSM). Understanding regression analysis as it relates to process control. Understanding statistical process control (SPC) and automatic process control. Exposure to real world quality control problems and case studies.

056:166 PRODUCTION SYSTEMS

Course Objectives: Students learn production system concepts and methods to analyze system performance. Students demonstrate their understanding through a semester, production planning project.

056:171 OPERATIONS RESEARCH

Course objectives: Students will be able to develop mathematical programming--linear programming (LP), integer LP, and dynamic programming (DP)--models of “real-world” optimization problems. Students will be able to develop a decision tree to model decision-making in an uncertain environment. Students will be able to develop both discrete-time and continuous-time Markov chain models of random processes. Student will have an understanding of deterministic and stochastic dynamic programming modeling approach to problem-solving.

056:178 DIGITAL SYSTEMS SIMULATION

Course Objectives: Students learn how to create discrete event simulation models. They learn how to structure a design problem and the corresponding data collection process. Students are required to build a simulation model and make a project presentation.

056:181 INTERNET SYSTEMS DESIGN

Course Objectives: Students completing this class will have an understanding of the core technologies of network computer communications.

056:098 INDIVIDUAL INVESTIGATIONS

Individual investigations allow students to study, in depth, a topic of their choice. Students collaborate with a professor who is knowledgeable on the student's topic. The individual investigation course is arranged by the student and professor and graded as arranged in the beginning of the course. Individual investigations allow students to tailor their curriculum to meet their specific interests as well as refine their research and presentation skills. Appendix I provides a form to be completed at the beginning of the investigation and Appendix II provides a form that must be submitted with the final report.

B.S./M.S. JOINT DEGREE PROGRAM

A special combined Bachelor of Science/Master of Science degree program for qualified Industrial Engineering undergraduate students is available to enable a student to complete a Master of Science degree in two or three semesters after completion of the Bachelor of Science degree. Students in the joint degree program are allowed to take up to 12 sh of 100- or 200-level graduate courses and attend one of the department's graduate seminars in place of the undergraduate seminar before the conferral of the Bachelor of Science degree. Of these courses, 6 sh may be counted towards both the B.S. and M.S. degrees.

ADMISSION

The requirements for admission to the program are (a) completion of at least 80 semester hours of credits, (b) a cumulative grade point average (GPA) of 3.25 or higher, and (c) a letter of application submitted to the Department of Mechanical and Industrial Engineering Chairperson. The letter of application should state the intended completion date for BS studies, the intended area of specialization for graduate studies and the name of the MS thesis adviser. A student enters the combined program after the junior year and receives a Bachelor of Science degree when all requirements for that degree have been completed, and then becomes a regular Master of Science level graduate student in the Department of Mechanical and Industrial Engineering. Students applying to a joint BS/MS degree program will follow the usual application procedure to the Graduate College. However, the letter of application to the BS/MS joint degree program will substitute for the Statement of Purpose and reference letters are not required. Eventual admission to the MS program is subject to satisfaction of the minimum Graduate College GPA, submission of GRE test scores and, where applicable, submission of test scores for the Test of English as a Second Language (TOEFL) exam. Each student will be required to select a faculty adviser for MS studies upon admission to a joint degree program. The adviser may be changed at the request of the student or the adviser.

CURRICULUM

The courses counting towards the MS must be 100- or 200-level Industrial Engineering elective courses. The courses that count towards both the B.S and M.S. must be taken as part of an Elective Focus Area (EFA) in an area related to the graduate degree objective. For example, a student completing 128 sh for their BS degree requirement could count 6 sh of these towards both the BS and MS degree requirements. As another example, a student with AP credit or through overloading might accumulate 134 sh as an undergraduate. In this case, 6 sh could be counted toward both the BS and MS requirements and the 6 sh beyond the BS requirement of 128 sh could be counted towards the MS, for a total of 12 sh counting towards the MS. All courses counted toward the MS program must be relevant to the MS thesis objective, as determined by the MS thesis committee. Graduate research credits cannot be taken by undergraduate students; however, students in the program may work on a Master of Science thesis research project with a faculty member starting as early as the summer of the junior year of undergraduate studies.

FINANCIAL SUPPORT

Admission to a joint degree program does not guarantee financial support. However, it is anticipated that many students in these programs will be offered appointments as part-time research or teaching assistants while they are undergraduates and as regular half-time Graduate Research or Teaching Assistants after they are formally admitted to the MS degree program. The BS/MS combined degree student will be assessed undergraduate tuition and fees during the first semester of the senior year, and assessed graduate tuition and fees during the second semester of the senior year. The student will be assessed graduate tuition and fees thereafter. If the student receives at least 1/4-time support from the Department or an advisor during any semester after the first, then the student will be assessed in-state tuition for that semester.

Students in the joint degree program are expected to continue the high degree of academic performance that was evident when they were admitted into the program. A minimum cumulative GPA of 3.25 is required for continuation in the joint degree program. Undergraduate students whose cumulative GPA at any time falls below this minimum for more than one semester will be removed from the joint degree program. Once students in the joint degree program receive the BS and are admitted to the regular MS degree program, academic probation matters will be dealt with in the same manner as for other MS students.

ACADEMIC POLICY

All academic policies of the I.E. program parallel those policies established for the College of Engineering. Information on policy can be found by referring to the University of Iowa General Catalog College of Engineering reprint, available in the Student Development Center located on the 3rd floor of the Seamans Center or by consulting the College of Engineering Web Page.

ADVISING

All new students (freshman and transfer) are advised by the Academic Counselor in the Office of Student Development Center during orientation and the early registration process. New students who have declared Industrial Engineering as their major at the time of admission will be assigned a faculty adviser in the Department of Industrial Engineering during their first semester in the College (about mid-semester time, prior to early registration for the next session.) Students who change their major to Industrial Engineering are assigned a faculty adviser at the time of the change. The assignments are made on the basis of the student's identification number but the advisee may also request a particular faculty member as an adviser.

Normally, students participate in the pre-registration process that is scheduled around mid-term in the fall and spring semesters. The sign-up sheets for appointments with faculty advisers for early registration advising are posted on the adviser's office door. A current copy of the student's grade report, degree evaluation (DELI) and curriculum sheet are maintained in the department office. A current copy of the DELI is mailed to the student prior to the advising session for each registration period.

In order to facilitate the student-adviser consultation, the student should bring their copy of the DELI to the advising appointment along with a tentative schedule plan. Examination of the DELI is a good way to verify progress toward the Bachelor of Science degree. The student must consult his or her adviser to be advised and receive the form, which has their registration number and assigned time for each student to complete the registration process. Registration is done through Iowa Student Information Services (ISIS). Changes in registration can be done through ISIS prior to the first day of classes for the semester. After that time changes are handled by using an drop/add form that requires signatures of the adviser, course instructor and if required, the dean.

FACULTY OF INDUSTRIAL ENGINEERING

Name	Rank	Office	Phone Number	Email (@uiowa.edu)
Dr. Linda Boyle	Assistant Prof.	2407 SC	354-0554	Linda-Boyle
Dr. Dennis Bricker	Associate Prof.	2138 SC	335-5935	Dennis-Bricker
Dr. Yong Chen	Assistant Prof.	2404 SC	335-6106	Yong-Chen
Dr. Gary Fischer	Associate Prof. and Associate Chair	3322 SC	335-6333	Gary-Fischer
Dr. Andrew Kusiak	Professor	2139 SC	335-5934	Andrew-Kusiak
Dr. John Lee	Associate Prof.	2130 SC	354-0810	John-D-Lee
Dr. Peter O'Grady	Professor	2132 SC	335-5938	Peter-OGrady
Dr. Thomas Schnell	Asst. Prof.	2135 SC	354-0811	Thomas-Schnell
Dr. Geb Thomas	Asst. Prof.	2404 SC	335-5936	Geb-Thomas

STUDENT ORGANIZATIONS

ALPHA PI MU

Alpha Pi Mu is the national industrial engineering honor society founded in 1949 at the Georgia Institute of Technology. Membership is based upon academic excellence as well as demonstrated leadership, sociability, and ethically skills. Juniors in the upper one-fifth and seniors in the upper one-third of their classes are eligible for membership.

HFES

The Human Factors and Ergonomics Society is comprised of over 5000 members worldwide. The society strives to further the knowledge about the assignment of appropriate functions for humans and machines, whether people serve as operators, maintainers, or users in the system. It aims to achieve compatibility in the design of interactive systems of people, machines, and environments to ensure their effectiveness, safety, and ease of performance.

Student Chapter activities include guest speakers from industry and academia, informal student research discussions, and the exchange of information that aids students in attaining a career in Human Factors/Ergonomics. In 2000 and 2002, the Student Chapter at Iowa won the "Most Outstanding Student Chapter Award" from the national HFES organization.

IIE

The Institute of Industrial Engineers is a professional engineering society of industrial engineers consisting of over 50,000 members Worldwide. The purpose of IIE is to promote the profession of industrial engineering in research, study, and discussion. The Iowa IIE Student Chapter's activities include: plant trips, technical paper presentations, and various social events.

UNIVERSITY OF IOWA NONDISCRIMINATION STATEMENT

The University of Iowa prohibits discrimination in employment or in its educational programs and activities on the basis of race, national origin, color, creed, religion, sex, age, disability, veteran status,

sexual orientation, gender identity, or associational preference. The University also affirms its commitment to providing equal opportunities and equal access to University facilities. For additional information on nondiscrimination policies, contact the Coordinator of Title IX, Section 504, and the ADA in the Office of Affirmative Action, telephone (319) 335-0705(voice) or (319) 335-0697 (text), 202 Jessup Hall, the University of Iowa, Iowa City, Iowa 52242-1316.

APPENDIX 1: INDIVIDUAL INVESTIGATION PROPOSAL

Project Title: _____

Student Name: _____

Project Faculty Advisor: _____

Educational Objectives of the Investigation:

Investigation Method:

Investigation timeline:

Method by which success or failure will be evaluated:

Will this investigation satisfy a technical elective requirement? _____

Signed:

_____ _____

Student Date

_____ _____

Project Faculty Advisor Date

_____ _____

Department Undergraduate Coordinator Date

(or Department Executive Officer, if faculty advisor is also coordinator)

APPENDIX II: INDIVIDUAL INVESTIGATION FINAL REPORT

Project Title: _____

Student Name: _____

Project Faculty Advisor: _____

Educational Objectives of the Investigation:

Investigation Method (attach a report, if necessary):

Method by which success or failure was evaluated:

Assigned Grade: _____

Does this investigation satisfy a technical elective requirement? _____

Signed:

_____ _____

Student Date

_____ _____

Project Faculty Advisor Date

_____ _____

Department Undergraduate Coordinator Date

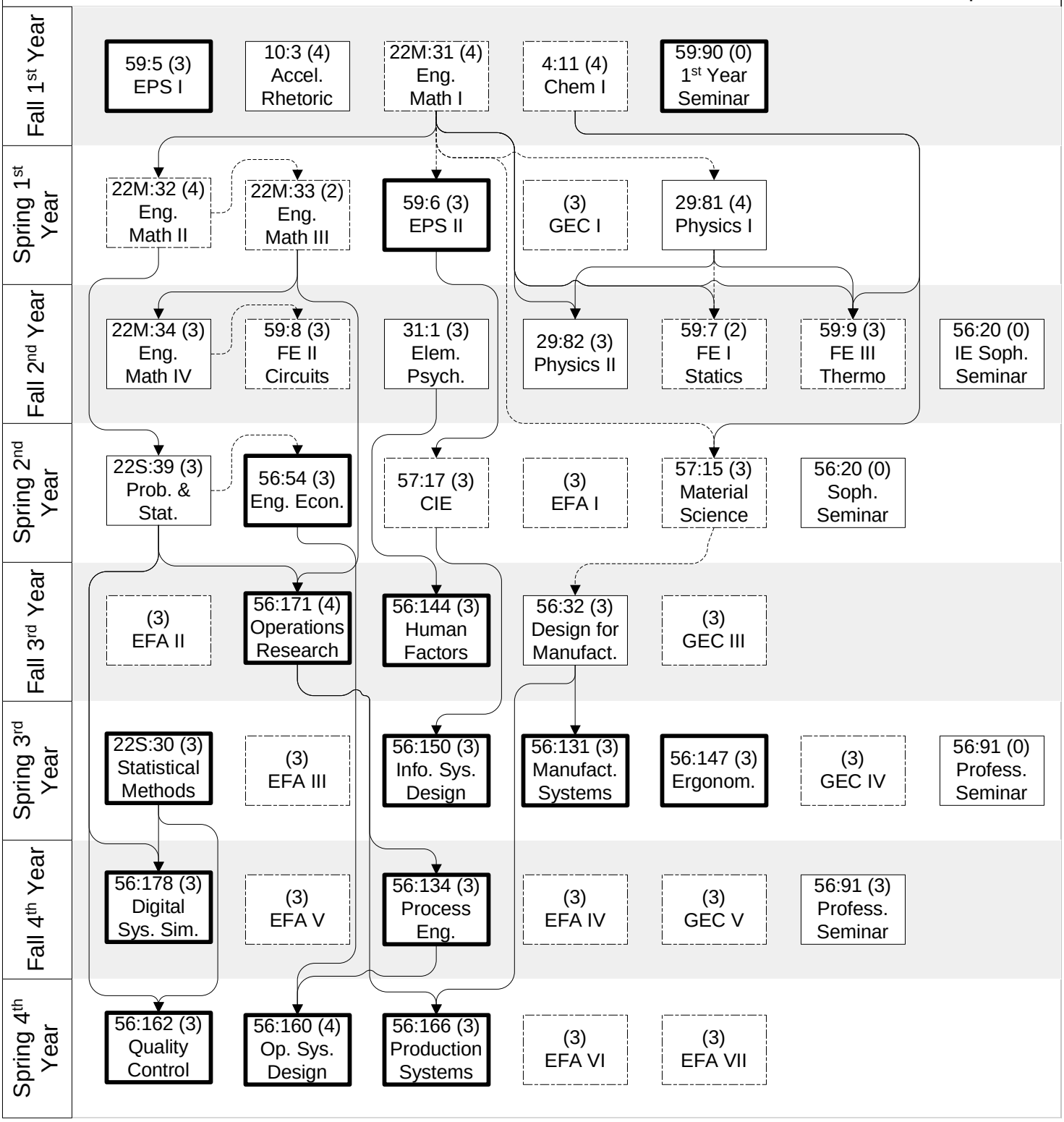
(or Department Executive Officer, if faculty advisor is also coordinator)

APPENDIX III: 4-YEAR CURRICULUM FLOW CHARTS

The following flow charts are provided to help students understand the standard course sequences and two alternate course sequences that provide the opportunity to either participate in a foreign exchange opportunity or a co-op work experience either in the Spring semester of their second or third year. In both cases the semester is illustrated with all focus area courses or general education courses. When participating in a foreign exchange program, it is often easiest to find courses at the host institution which satisfy focus area or elective courses. If a student wishes to participate in a co-op program these courses may be made up either during the summer or by deferring graduation by one semester. Note that in both cases, the student must plan ahead by taking at one course earlier than the standard sequence recommends. Also note that by taking all elective courses during the second semester of the junior year, the last semester is an unusually challenging one, filled with many challenging IE courses.

Standard IE Curriculum Flow Chart 2004-2005

Revised April 2004



Notes:

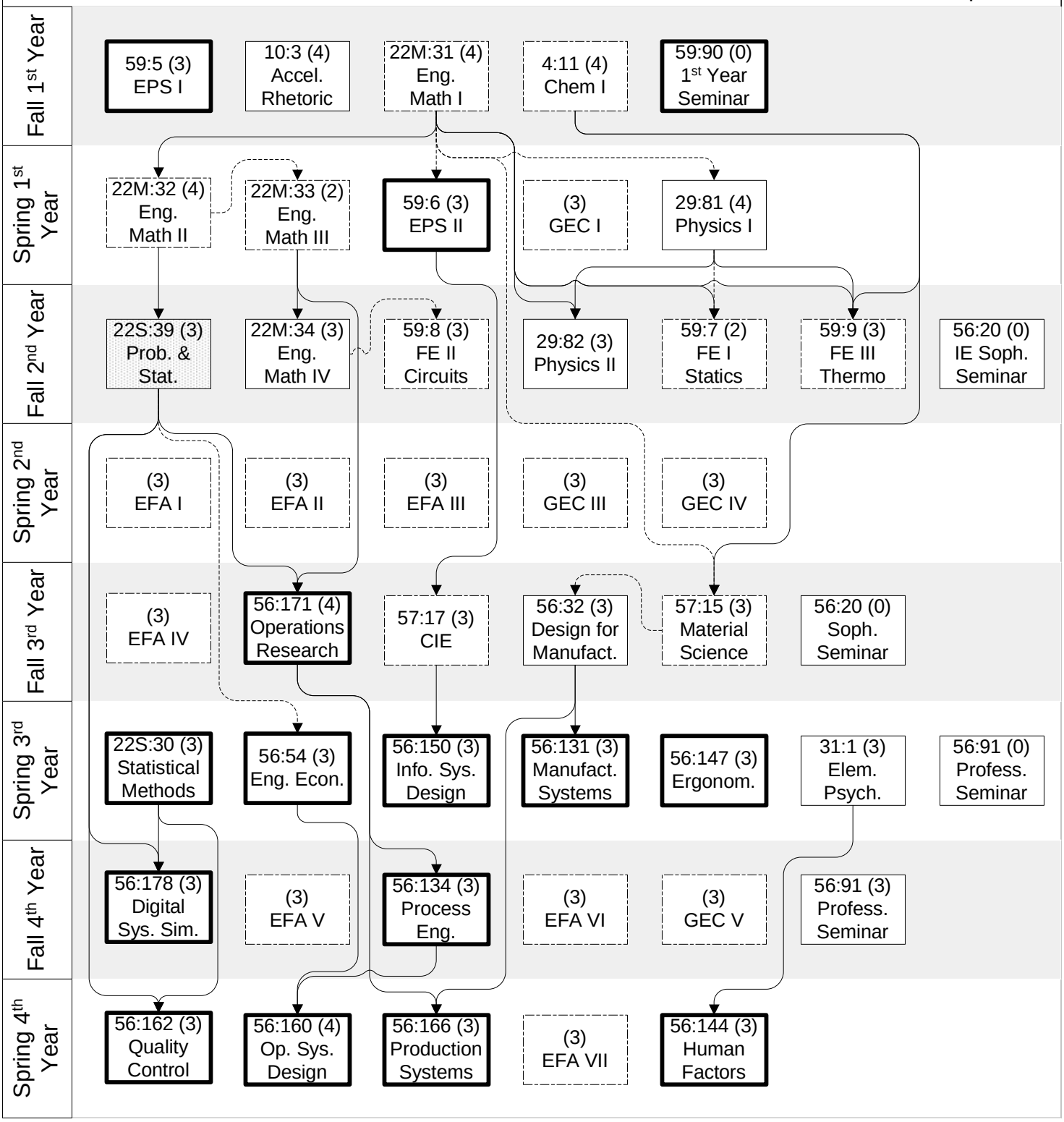
Number in parentheses after the course number indicates the number of credits.

Heavy outline indicates that course is offered only once per year in the indicated semester.

Dashed outline indicates that the course is offered during the summer.

IE Alternate Curriculum With One Sophomore Semester of Flexible Electives

Revised April 2004

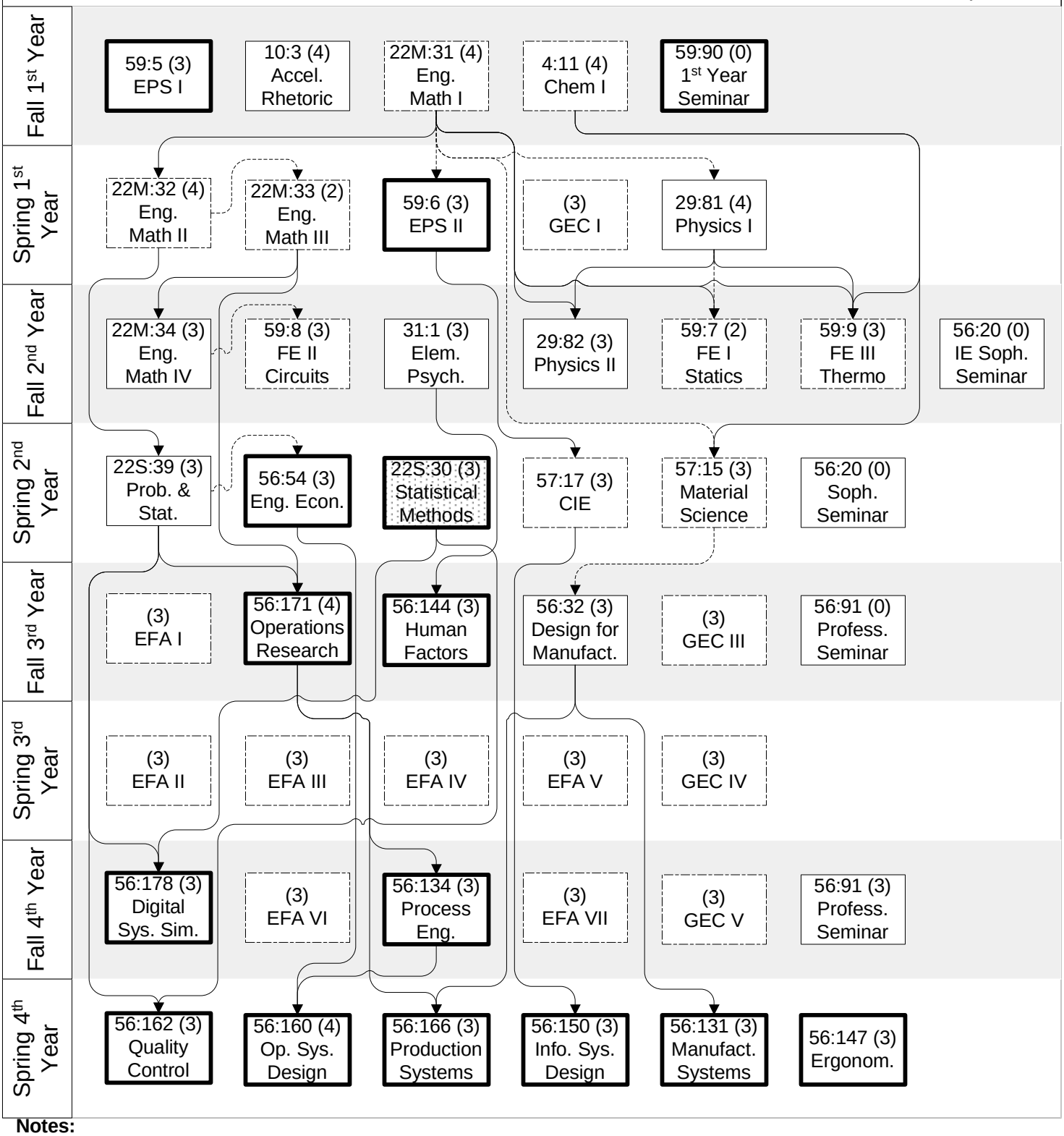


Notes:

Number in parentheses after the course number indicates the number of credits.
Heavy outline indicates that course is offered only once per year in the indicated semester.
Dashed outline indicates that the course is offered during the summer.
Solid connectors indicate pre-requisites, dotted connectors represent co-requisites.
Students must plan ahead by taking 22S:39 Probability and Statistics in their third semester.

IE Alternate Curriculum Flow With One Junior Semester of Flexible Electives

Revised April 2004



Notes:

Number in parentheses after the course number indicates the number of credits.

Heavy outline indicates that course is offered only once per year in the indicated semester.

Dashed outline indicates that the course is offered during the summer.

Students must plan head for this option by taking 22S:30 Statistical Methods by the Spring of their 2nd year.