

INDUSTRIAL AND SYSTEMS ENGINEERING MAJOR

Program Curriculum

Code	Title	Credits
Degree Core Requirements		
ISE 2004	Introduction to Industrial and Systems Engineering (C-)	1
ISE 2014	Engineering Economy (C-)	2
ISE 2214	Manufacturing Processes Laboratory (C-)	1
ISE 2024	Probability Foundations for Industrial and Systems Engineers (C-)	3
ISE 2034	Data Management for Industrial and Systems Engineers (C-)	3
ISE 2404	Deterministic Operations Research I (C-)	3
ISE 3614	Human Factors Engineering and Ergonomics (C-)	3
ISE 3214	Facilities Planning and Logistics (C-)	3
ISE 3414	Probabilistic Operations Research (C-)	3
ISE 3424	Discrete-Event Computer Simulation (C-)	3
ISE 3624	Industrial Ergonomics (C-)	3
ISE 4204	Production Planning and Inventory Control (C-)	3
ISE 4005	Project Management and Systems Design (C-)	2
ISE 4404	Statistical Quality Control	3
ISE 4006	Project Management and Systems Design	2
Subtotal		38
Major Requirements		
Select one of the following:		3
CS 1044	Introduction to Programming in C (C-)	
or CS 1064	Introduction to Programming in Python	
or CS 1114	Introduction to Software Design	
MATH 2114	Introduction to Linear Algebra (C-)	3
MATH 2204	Introduction to Multivariable Calculus (C-)	3
PHYS 2306	Foundations of Physics	4
ESM 2104	Statics	3
STAT 4706	Probability and Statistics for Engineers	3
Electives		
<i>ISE Technical Electives</i> ¹		
Select nine credits from the following:		9
ISE 3004	Industrial Cost Control	
ISE 3204	Manufacturing Processes	
ISE 3434	Deterministic Operations Research II	
ISE 4004	Theory of Organization	
ISE 4015	Management Systems Theory, Applications, and Design	
ISE 4214	Lean Manufacturing	
ISE 4264	Industrial Automation	
ISE 4304	Global Issues in Industrial Management	
ISE 4414	Industrial Quality Control	
ISE 4424	Logistics Engineering	
ISE 4434	Supply Chain and Operations Engineering	
ISE 4624	Physical Work Assessment	

ISE 4644	Risk and Hazard Control		
ISE 4654	Principles of Industrial Hygiene		
ISE 4804	System Dynamics Modeling of Industrial Systems		
ISE 4974	Independent Study		
ISE 4984	Special Study		
ISE 4994	Undergraduate Research		
<i>Technical Electives</i> ²			
Select six credits ³			6
<i>Engineering Science Electives</i> ⁴			
Select one of the following:		3	
ECE 3054	Electrical Theory		
ESM 2204	Mechanics of Deformable Bodies		
ESM 2304	Dynamics		
MSE 2034	Elements of Materials Engineering		
<i>Free Electives</i> ^{5, 6, 7}		2-3	
Pathways to General Education			
<i>Pathways Concept 1 - Discourse</i>			
ENGL 1105	First-Year Writing (1F)	3	
ENGL 1106	First-Year Writing (1F)	3	
ISE 3034	Technical Communication for Engineers (1A)	3	
<i>Pathways Concept 2 - Critical Thinking in the Humanities</i>			
Select six credits in Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02)		6	
<i>Pathways Concept 3 - Reasoning in the Social Sciences</i>			
Select six credits in Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03)		6	
<i>Pathways Concept 4 - Reasoning in the Natural Sciences</i>			
CHEM 1035	General Chemistry	4	
& CHEM 1045	and General Chemistry Laboratory		
PHYS 2305	Foundations of Physics	4	
<i>Pathways Concept 5 - Quantitative and Computational Thinking</i>			
MATH 1225	Calculus of a Single Variable (5F)	4	
MATH 1226	Calculus of a Single Variable (5F)	4	
MATH 2214	Introduction to Differential Equations (5A)	3	
<i>Pathways Concept 6 - Critique and Practice in Design and the Arts</i>			
Select three credits in Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A)		3	
ENGE 1215	Foundations of Engineering	4	
& ENGE 1216	and Foundations of Engineering (6D)		
<i>Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States</i>			
Pathways 7 should be double-counted with either Pathways 2, 3 or 6a to avoid taking any additional credit hours			
Subtotal			
Total Credits		124-125	

¹ The purpose of this requirement is to enable student to develop expertise in a particular area of the ISE discipline.

- Courses must be selected from the list provided. Course offerings are subject to change and the availability of sufficient resources: check the Timetable of Classes for actual course offerings each semester.

- A maximum of six (6) credits of ISE 4974 Independent Study or ISE 4994 Undergraduate Research is allowed without prior approval from the ISE Undergraduate Program Director.
- 2 The purpose of this requirements is for students to further develop technical skills and to provide the opportunity to focus on a particular technical area by taking electives with significant technical content.
- The courses must be on an A-F basis, unless prior approval (for P/F basis) has been obtained from the ISE Undergraduate Program Director.
 - Up to three (3) credits can be obtained via ISE Technical Elective courses not being used for ISE Technical Elective credit.
- 3 Courses must be selected as follows:
- Any 3000 or 4000 level course from AOE, BMES, BSE, CEE, CEM, CHE, CHEM, CMDA, CS, ECE, ESM, MATH, ME, MSE, MINE, NSEG, PHYS, STAT **except** the following: CEE 4804 Professional and Legal Issues in Civil Engineering, CHEM 4014 Survey of Chemical Literature, CS 3604 Professionalism in Computing, CS 4214 Simulation and Modeling, MATH 4044 History of Mathematics, MATH 4625 Mathematics for Secondary Teachers, MATH 4644 Secondary School Mathematics With Technology, MATH 4664 Senior Math Education Seminar, ME 4454 Engineering Leadership in Practice: Managing the Technical Design Process, STAT 3005 Statistical Methods, STAT 3006 Statistical Methods, STAT 3604 Statistics for Social Science, STAT 3615 Biological Statistics, STAT 3704 Statistics for Engineering Applications, STAT 4105 Theoretical Statistics, STAT 4604 Statistical Methods for Engineers, STAT 4705 Probability and Statistics for Engineers, STAT 4714 Probability and Statistics for Electrical Engineers
 - ENGR 3124 Introduction to Green Engineering and/or ENGR 4134 Environmental Life Cycle Assessment
 - Other courses are allowed only with prior approval from the ISE Undergraduate Program Director.
- 4 The purpose of this requirement is for students to broaden their knowledge of engineering science outside ISE.
- Courses must be selected from the list below (unless prior approval has been obtained from the ISE Undergraduate Program Director.
- 5 Two credits required if MATH 2114 Introduction to Linear Algebra is taken, three credits required if MATH 1114 Elementary Linear Algebra is taken.
- 6 Students may not use a given course to satisfy both Free Elective and Pathways requirements: any given course can satisfy one requirement only.
- 7 Only free electives and courses offered on a P/F basis only (e.g. FA 2004 Creativity and the Artistic Experience) may be taken under the P/F grading option.

Graduation Requirements

Each student must complete at least 124 semester credit hours with a minimum overall GPA of 2.00 and a minimum in-major GPA of 2.00. (In-major GPA is determined from ISE and required STAT classes.)

General Information

Course offerings are subject to change and the availability of sufficient resources. Students should confirm course offerings in advance with their department.

Pathways to General Education (Pathways)

Consult the pathways courses table: <https://www.pathways.prov.vt.edu/about/table.html>, Pathways courses need to be completed prior to graduation.

Change of Major Requirements

Please see <https://www.eng.vt.edu/em> (<https://www.eng.vt.edu/em/>)

Foreign Language Requirements

Students must have had 2 years of a foreign language in high school or one year at the college level (6 credit hours) of the same language. College-level credits used to meet this requirement do not count towards the degree.

Satisfactory Progress Towards Degree

University Policy 91 outlines university-wide minimum criteria to determine if students are making satisfactory progress towards the completion of their degrees. The ISE Department fully supports this policy. In addition, upon completion of two semesters as an ISE major, students must have:

- a minimum in-major GPA of 2.00 or better (in-major GPA is determined from all ISE and required STAT classes);
- completed ISE 2004 Introduction to Industrial and Systems Engineering and ISE 2014 Engineering Economy (with a C- or better in each).

Statement of Hidden Prerequisites

Prerequisites for each course are listed after the course title. Students must earn a C- or better in ISE, STAT, and MATH courses which are prerequisites for subsequent ISE courses. Prerequisites may change from what is indicated. Be sure to consult the University Catalog or check with your advisor for the most current requirements. There are no hidden pre-requisites in this program of study.

Course Availability

Course offerings are subject to change; students should consult an ISE academic advisor or the University Timetable for course offerings each semester.

Roadmap

Course	Title	Credits
First Year		
Fall Semester		
CHEM 1035	General Chemistry	3
CHEM 1045	General Chemistry Laboratory	1
ENGL 1105	First-Year Writing	3
MATH 1225	Calculus of a Single Variable (C-)	4
ENGE 1215	Foundations of Engineering (C-)	2
Select three credits in Pathways 2, 3, 6A, or 7		3
		Credits
		16
Spring Semester		
ENGL 1106	First-Year Writing	3
MATH 1226	Calculus of a Single Variable	4
PHYS 2305	Foundations of Physics (w/lab)	4
ENGE 1216	Foundations of Engineering (C-)	2

Select three credits in Pathways 2, 3, 6A, or 7	3
Credits	16
Second Year	
Fall Semester	
Select one of the following:	3
CS 1044 Introduction to Programming in C	
CS 1064 Introduction to Programming in Python	
CS 1114 Introduction to Software Design	
MATH 2114 Introduction to Linear Algebra (C-)	3
MATH 2204 Introduction to Multivariable Calculus (C-)	3
PHYS 2306 Foundations of Physics (w/lab)	4
ISE 2004 Introduction to Industrial and Systems Engineering (C-)	1
ISE 2014 Engineering Economy (C-)	2
ISE 2214 Manufacturing Processes Laboratory (C-)	1
Credits	17
Spring Semester	
MATH 2214 Introduction to Differential Equations (C-)	3
ESM 2104 Statics	3
ISE 2024 Probability Foundations for Industrial and Systems Engineers (C-)	3
ISE 2034 Data Management for Industrial and Systems Engineers (C-)	3
ISE 2404 Deterministic Operations Research I (C-)	3
ISE 3614 Human Factors Engineering and Ergonomics (C-)	3
Credits	18
Third Year	
Fall Semester	
STAT 4706 Probability and Statistics for Engineers (C-)	3
ISE 3034 Technical Communication for Engineers (C-)	3
ISE 3214 Facilities Planning and Logistics (C-)	3
ISE 3414 Probabilistic Operations Research (C-)	3
Select three credits in Pathways 2, 3, 6A, or 7	3
Credits	15
Spring Semester	
Engineering Science Elective	3
ISE 3424 Discrete-Event Computer Simulation (C-)	3
ISE 3624 Industrial Ergonomics (C-)	3
ISE 4204 Production Planning and Inventory Control (C-)	3
ISE Technical Elective	3
Credits	15
Fourth Year	
Fall Semester	
ISE 4005 Project Management and Systems Design (C-)	2
ISE 4404 Statistical Quality Control	3
ISE Technical Elective	3
Technical Elective	3
Select three credits from Pathways 2, 3, 6A or 7	3
Credits	14
Spring Semester	
ISE 4006 Project Management and Systems Design	2
ISE Technical Elective	3
Technical Elective	3
Free Elective	2-3
Select three credits from Pathways 2, 3, 6A or 7	3
Credits	13-14
Total Credits	124-125