INDUSTRIAL AND SYSTEMS ENGINEERING

Industrial and Systems Engineering deals with the optimization of complex processes or systems. It typically focuses on the development, improvement, implementation, and evaluation of integrated systems of people, money, knowledge, information, equipment, energy, materials, etc. Industrial and systems engineering often relies on, among others, the analysis and synthesis of mathematical, physical, social sciences, and the principles and methods of engineering design to specify, predict, and evaluate results from such systems or processes.

About this Program

- **College:** Herbert Wertheim College of Engineering (http://catalog.ufl.edu/UGRD/colleges-schools/UGENG/)
- **Degree:** Bachelor of Science in Industrial and Systems Engineering
- **Credits for Degree:** 125
- **More Info**

To graduate with this major, students must complete all university, college, and major requirements.

Department Information

The Department of Industrial and Systems Engineering strives to be a resource for comprehensive ISE education and research training; a department with research thrusts and coursework covering a breadth of disciplines; a department making use of advanced computing technology, cutting-edge programming languages, social media, data mining, AI, etc. to best support needs, interests, and training of students.
Website (https://www.ise.ufl.edu/)

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Curriculum

- Combination Degrees
- Industrial and Systems Engineering

Industrial and systems engineering prepares students for industrial practice in process design, efficiency planning with technical operation research component, data analytics for Industry 4.0, human and systems analysis, production and quality control and economic analysis of operational systems.

Students are prepared to use engineering principles to solve problems that require a quantitative basis for decision making and the application of operations research, statistics, economics, mathematics and engineering analysis, with dependence on the computer. The curriculum also provides the preparation necessary for graduate study.

Admission Requirements

The minimum requirements for admission to the undergraduate program are an overall 2.5 grade point average and a 2.5 grade point average in the designated pre-engineering technical courses. Students who have not met these requirements at 60 credits may be admitted on probation with successful petition.

Department Requirements

Students must complete each required course with a minimum grade of C in at most three attempts. Grades of H, I, N, U, and W are considered attempts. Registration cancelled for non-payment is also considered an attempt.

The discipline-specific courses offered by the Industrial and Systems Engineering Department fall into two distinct categories:

1. ISE Core
2. Restricted Electives

The courses in the *ISE Core* cover the fundamentals of Industrial and Systems Engineering and introduce students to different sub-disciplines within the profession. These courses provide the essential knowledge necessary for every graduating engineer in ISE and therefore are required for all students.

In addition, the ISE core lays the foundation for different focus areas within the field represented by restricted electives. These courses prepare students to make an informed decision when selecting a specific ISE area (within the restricted electives) in which they would like to focus.

Restricted Electives

In order to facilitate an in-depth study of specific areas within the ISE discipline, the department of Industrial and Systems Engineering offers restricted electives in:

1. Operations Research and Data Analytics
2. Human Systems Engineering
3. Production and Logistics

Grouping of courses into these areas (sets of restricted electives) enable a layered approach, where a specific area is explored by several courses in a thorough and progressive fashion. This allows for not only exploration of topics at a deeper level but also employment of application-focused teaching techniques.

Students must select one of the restricted elective areas listed above. The deadline to make the selection is one week before the start of advance registration preceding the student's final semester. Students are always encouraged to discuss their decisions with their advisors.

There are two graduation requirements associated with respect to restricted electives:

Depth Requirement

Students must take at least three (3) courses in their selected area. Since some of the courses may have pre-requisites from the same area, course planning must be done carefully to ensure timely graduation.

Breadth Requirement

Students must take at least one (1) course from each of the other two areas. Since most restricted elective courses are offered once a year, course planning must be done carefully to optimize scheduling.

Educational Objectives

The objective of the industrial and systems engineering program is to produce graduates who:

- will be successful professionals in industrial and systems engineering or other disciplines
- can acquire advanced knowledge through continuing education or advanced degree programs
- can become active leaders in their profession and/or community

Mission

The mission of the undergraduate program is to provide a top quality, state-of-the-art education and student research training in industrial and systems engineering and to foster leading-edge instruction and cutting edge research. The program seeks national recognition by peer institutions and key employers of industrial and systems engineering graduates.

Critical Tracking

Critical Tracking records each student's progress in courses that are required for progress toward each major. Please note the critical-tracking requirements below on a per-semester basis.

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites (https://cpm.flvc.org/advance-search/) may be used for transfer students.

Semester 1

- Complete 1 of 8 critical-tracking courses with a minimum grade of C within two attempts: COP 2271 (VB.NET), ESI 3327C, MAC 2311, MAC 2312, MAC 2313, MAS 3114, PHY 2048, PHY 2049
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 2

- Complete 2 additional critical-tracking course with minimum grades of C within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 3

- Complete 2 additional critical-tracking courses with minimum grades of C within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 4

- Complete 2 additional critical-tracking courses with minimum grades of C within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 5

- Complete 1 additional critical-tracking course with a minimum grade of C within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 6

- Complete ESI 4356 and ESI 4523
- Complete 2 additional required courses
- 2.0 UF GPA required

Semester 7

- Complete 2 restricted ISE electives
- Complete 2 additional required courses
- 2.0 UF GPA required

Semester 8

- Complete all remaining required ISE courses
- 2.0 UF GPA required

Model Semester Plan

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.

Course	Title	Credits
Semester One		
Quest 1 (Gen Ed Humanities) [1,2]		3
Select one:		3
CHM 2045	General Chemistry 1 (State Core Gen Ed Physical Sciences (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext)) [1]	
CHM 2095	Chemistry for Engineers 1 [1]	
EIN 2002	Introduction to Industrial and Systems Engineering [1]	1
ENC 1101	Expository and Argumentative Writing (State Core Gen Ed Composition (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext); Writing Requirement: 6,000 words) [1]	3
MAC 2311	Analytic Geometry and Calculus 1 (**Critical Tracking**; State Core Gen Ed Mathematics) [1,3]	4
State Core Gen Ed Humanitieswith Diversity or International (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext), Writing Requirement: 6,000 words [1,2]		3
	Credits	**17**
Semester Two		
Quest 2 (Gen Ed Physical or Biological Sciences OR Gen Ed Social and Behavioral Sciences) [1,2]		3
EGN 2020C	Engineering Design & Society (Gen Ed Physical Sciences) [1]	2
ECO 2013	Principles of Macroeconomics (State Core Gen Ed Social and Behavioral Sciences (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext)) [1,2]	4
PHY 2048	Physics with Calculus 1 (**Critical Tracking**; Gen Ed Physical Sciences) [1,3,4]	3

MAC 2312	Analytic Geometry and Calculus 2 (**Critical Tracking**; Gen Ed Mathematics) [1,3]	4
	Credits	**16**
Semester Three		
COP 2271 & 2271L	Computer Programming for Engineers and Computer Programming for Engineers Laboratory (**Critical Tracking**; VB .NET) [1,3]	3
MAC 2313	Analytic Geometry and Calculus 3 (**Critical Tracking**; Gen Ed Mathematics) [1,3]	4
ENC 3246	Professional Communication for Engineers (Gen Ed Composition; Writing Requirement: 6,000 words) [1]	3
MAS 3114	Computational Linear Algebra [1,3]	3
PHY 2049	Physics with Calculus 2 (**Critical Tracking**) [1,3,4]	3
	Credits	**16**
Semester Four		
ECO 2023	Principles of Microeconomics [1]	4
EGM 2511	Engineering Mechanics: Statics [1]	3
EIN 3354	Engineering Economy [1]	3
ESI 3327C	Matrix and Numerical Methods in Systems Engineering [1,3]	3
Select one:		3
CGN 2328	Technical Drawing and Visualization [1]	
EML 2023	Computer Aided Graphics and Design [1]	
	Credits	**16**
Semester Five		
EGS 4034	Engineering Ethics and Professionalism [1]	1
ESI 4356	Decision Support Systems for Industrial and Systems Engineers (**Critical Tracking**)	4
ESI 3215C	Data Anal. for Indus. Apps. [1]	4
ESI 3312	Operations Research 1 [1]	3
Engineering elective [1,6]		3
	Credits	**15**
Semester Six		
EIN 4451	Lean Production Systems [1]	3
ESI 4313	Operations Research 2 [1]	3
EIN 3241	Human Factors & Ergonomics [1]	3
ESI 4523	Industrial Systems Simulation [1]	3
ESI 4610	Introduction to Data Analytics [1]	3
	Credits	**15**
Semester Seven		
Restricted elective (Breadth) [1,7]		3
Restricted elective (Depth; **Critical Tracking**) [1,7]		3
Restricted elective (Depth/Breadth; **Critical Tracking**) [1,7]		3
Technical elective [1,5]		3
Financial accounting course [1]		3
	Credits	**15**
Semester Eight		
EIN 4335	Senior Design Project [1,8]	3
Restricted elective (Depth) [1,7]		3
Restricted elective (Breadth/Depth) [1,7]		3
Technical elective [1,5]		3
General elective [1,5]		3
	Credits	**15**
	Total Credits	**125**

1 Minimum grade of C required. A C- will not satisfy this requirement.

2 The curriculum requires the completion of both the Diversity (D) component and the International (N) component. The curriculum also requires the Writing Requirement of 24,000 words to be met.

3 Critical Tracking Courses. These courses must be completed within the first five semesters. {COP 2271, ESI 3327C, MAC 2311, MAC 2312, MAC 2313, MAS 3114, PHY 2048, PHY 2049}.

4 Students with deficient backgrounds in physics should first take a lower-level course such as PHY 2020. After successful remediation, they can begin the physics sequence: PHY 2048 and PHY 2049.

5 The curriculum requires six technical elective credits and three general elective credits. Technical Electives are 3000-level or above courses with significant scientific and/or technical content. General Electives are any course 3000-level or above whose content does not overlap with another course the student has taken or plans to take as part of the ISE curriculum. Information on Pre-Approved Technical and General Electives can be

found here (https://www.ise.ufl.edu/academics/undergraduate/technical-general-electives/). Students can also elect to take additional courses within the Industrial and Systems Engineering Restricted Electives as their Technical Electives.

6 The curriculum requires students to take three credits of engineering electives. Students need to pass one of the following courses with a minimum grade of C:EEL 3003, EML 3100, and EMA 3010.

7 The Department of Industrial and Systems Engineering has three different focus areas. Information on focus area requirements and a list of all restricted elective courses is available here (https://www.ise.ufl.edu/focus-areas/).

8 As an alternative, students can participate in the Integrated Product and Process Design (IPPD) program. Multidisciplinary teams of engineering students in this program work closely with a liaison engineer to design a new product or process for an industry sponsor. The program requires students to take, typically in their senior year, a sequence of two 3-credit courses, EGN (https://catalog.ufl.edu/search/?P=EIN%204912) 4951 in Fall and EGN 4952 in Spring. The former is a course approved for a technical elective and the latter can replace EIN 4335.

Fundamentals of Engineering Exam Preparation

Approximately 10 percent of the members of the Institute of Industrial Engineers pursue a professional engineer (PE) license. A PE license is especially desirable for engineers who want to start their own businesses. The industrial and systems engineering curriculum does not require certain courses that are necessary for the Fundamentals of Engineering (FE) exam (also known as the Engineer Intern exam). The latter is also a prerequisite for pursuing a professional engineer license.

Students preparing for the FE exam should select a set of technical electives that properly prepare them for this exam, such as EGM 3520 and EGM 3400 / EGM 3401.

Approved Electives

ISE Courses

Code	Title	Credits
EGN 4912	Engineering Directed Independent Research	1-3
EIN 4905	Special Problems in Industrial and Systems Engineering (Design of Experiments)	3
EIN 4905	Special Problems in Industrial and Systems Engineering (Honors Intro to Financial Engineering)	3
EIN 4905	Special Problems in Industrial and Systems Engineering (Data Mining)	3
EIN 4905	Special Problems in Industrial and Systems Engineering (Models and Methods for Health Systems Engineering)	3
EIN 4905	Special Problems in Industrial and Systems Engineering (Occupational Safety)	3
EIN 4912	Integrated Product and Process Design 1	3
EIN 4944	Practical Work in Industrial and Systems Engineering	1-3
EGN 4641	Engineering Entrepreneurship	3
EGN 4643	Engineering Innovation	3
EGS 4038	Engineering Leadership	3
EGS 4625	Fundamentals of Engineering Project Management	3
ISE Restricted elective		3

Restricted Electives

Code	Title	Credits
EIN 4210	Occupational Safety Engineering	3
EIN 4242C	Workplace Ergonomics and Biomechanics	3
EIN 4245	Human Factors Applications	3
EIN 4343	Inventory and Supply Chain Systems	3
EIN 4360	Facility Planning and Material Handling	3
ESI 4614	Decision Analytics Design	3
ESI 4221C	Industrial Quality Control	3
ESI 4317	Advanced Topics in Operations Research	3
ESI 4611	Advanced Data Analytics	3

Other Courses

Code	Title	Credits
CAP 4621	Artificial Intelligence and Heuristics	3
CDA 3101	Introduction to Computer Organization	3
CEN 3031	Introduction to Software Engineering	3

CEN 4072	Software Testing and Verification	3
CIS 4301	Information and Database Systems 1	3
COP 3530	Data Structures and Algorithm	3
COP 4600	Operating Systems	3
COT 3100	Applications of Discrete Structures	3
ECO 3101	Intermediate Microeconomics (Only counts as 1 credit of tech)	4
ECO 3203	Intermediate Macroeconomics (Only counts as 1 credit of tech)	4
ECO 4400	Game Theory and Applications	4
EEE 3308C	Electronic Circuits 1	4
EEL 3701C	Digital Logic and Computer Systems	4
EEL 3135	Introduction to Signals and Systems	4
EEL 3872	Artificial Intelligence Fundamentals	3
EES 3008	Energy and Environment	3
EGM 3520	Mechanics of Materials	3
EGM 3400	Elements of Dynamics (Will not count if receiving tech credit for EGM 3401)	2
EGM 3401	Engineering Mechanics: Dynamics (Will not count if receiving tech credit for EGM 3400)	3
EGM 4590	Biodynamics	3
EGM 4592	Bio-Solid Mechanics	3
EML 4321	Manufacturing Engineering	3
FIN 3403	Business Finance	4
FIN 4243	Debt and Money Markets	4
FIN 4504	Equity and Capital Markets	4
FIN 4414	Financial Management	4
GIS 3072C	Geographic Information Systems	3
ISM 4113	Business Systems Design and Applications	2
ISM 4210	Database Management	2
ISM 4220	Business Data Communications 1	2
ISM 4221	Business Data Communications 2	2
MAA 4211	Real Analysis and Advanced Calculus 1	3
MAA 4212	Real Analysis and Advanced Calculus 2	3
MAA 4226	Introduction to Modern Analysis 1	3
MAA 4227	Introduction to Modern Analysis 2	3
MAA 4402	Functions of a Complex Variable	3
MAD 4203	Introduction to Combinatorics 1	3
MAD 4204	Introduction to Combinatorics 2	3
MAS 4301	Abstract Algebra 1	3
MAS 4302	Abstract Algebra 2	3
MHF 3202	Sets and Logic	3
PKG 3001	Principles of Packaging	3
PKG 3103	Food Packaging	3
PKG 4008	Distribution and Transport Packaging	3
PKG 4011	Packaging Production and Processing	3
PKG 4101C	Computer Tools for Packaging	3
STA 4183	Theory of Interest	3
STA 4210	Regression Analysis	3
STA 4211	Design of Experiments	3
STA 4222	Sample Survey Design	3
STA 4502	Nonparametric Statistical Methods	3
STA 4504	Categorical Data Analysis	3
STA 4702	Multivariate Statistical Methods	3
STA 4712	Introduction to Survival Analysis	3
STA 4853	Introduction to Time Series and Forecasting	3
SUR 3103C	Geomatics	3
TTE 4004C	Transportation Engineering	4
TTE 4106	Urban Transportation Planning	3
TTE 4201	Traffic Engineering	3
TTE 4300	Transportation Systems Analysis	3

Academic Learning Compact

Industrial and Systems Engineering prepares students for industrial practice in process design, efficiency planning with technical operation research component, data analytics for Industry 4.0, human systems analysis, production and quality control, quality control, and economic analysis of

operational systems. Students will be prepared to use engineering principles to solve problems that require a quantitative basis for decision making and the application of data analytics, production and logistics, and human systems for economics, operations research, statistics, mathematics and engineering analysis, with significant digital impact.

The Industrial and Systems Engineering BS Program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org (https://nam10.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.abet.org%2F&data=05%7C02%7Clmorrison%40registrar.ufl.edu%7C2c5eccc419304b138df008dc12c42955%7C0d4da0f84a314d76ace60a62331e1b84%7C0%7C0%7C638405880909733472%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=2zaM27aPWvW8KqLg2VZb8k2reeHvY2vsqihQfGkb2A4%3D&reserved=0), under the General Criteria, the Program Criteria for Industrial and Similarly Named Engineering Programs, and the Program Criteria for Systems and Similarly Named Engineering Programs.

Before Graduating Students Must

- Pass an assessment by two or more faculty and/or industry practitioners of performance on a major design experience.
- Pass assessment in two courses of individual assignments targeted to each learning outcome. Assessment will be provided by the instructor of the course according to department standards.
- Complete an exit interview in your final semester.
- Complete requirements for the baccalaureate degree, as determined by faculty.

Students in the Major Will Learn to

Student Learning Outcomes | SLOs

Content

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.

Critical Thinking

3. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Communication

4. Communicate effectively with a range of audiences.

Curriculum Map

I = Introduced; R = Reinforced; A = Assessed

Courses	SLO 1	SLO 2	SLO 3	SLO 4
EGN 2020C	I	I	I	I
COP 2271 and COP 2271L	I			
MAS 3114	I			
ESI 3215C	R	I		
EIN 3241	R		A	I
ESI 3312	A		I	
ESI 3327C	I			
EIN 3354	I			
ESI 4313	R		I	
EIN 4335	A	A	A	A
ESI 4356	R	R	R	R
EIN 4451	R		R	
ESI 4523	R	A	R	

Assessment Types

- Instructor's outcome scorecards
- Senior design project evaluations
- Additional assessments include:
  - Exit interviews
  - Co-op/internship evaluations
  - Alumni survey