



جامعة الفيصل
Alfaisal University

 Study Plan

Industrial Engineering Program

Alfaisal University, College of Engineering

Curriculum Structure and Study Plan

The Industrial Engineering curriculum is composed of **143** Credit Hours (CRHs) divided as follows:

I. General Education Requirements (53 CRHs)

1. Mathematics & Statistics (21 CRHs)
2. Basic Sciences (12 CRHs)
3. Humanities (20 CRHs)

II. Core Requirements (90 CRHs)

1. Industrial Engineering Courses (43 CRHs)
2. College of Engineering Courses (41 CRHs)
3. College of Business Courses (3 CRHs)
4. Technical Electives (3 CRHs)
5. Summer Internship (0 CRHs)

I. General Education Requirements (53 CRHs)

1. Mathematics & Statistics (21 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect.	Lab	Tut		
MAT 101	Calculus I	3	3	0	2		
MAT 112	Calculus II	3	3	0	2	MAT 101	
MAT 211	Calculus III	3	3	0	0	MAT 112	
MAT 212	Linear Algebra	3	3	0	0	MAT 112	
MAT 213	Differential Equations	3	3	0	0	MAT 112	MAT 212
MAT 224	Numerical Methods	3	3	0	0	MAT 212, CSC 112 or equivalent	
STA 212	Probability and Statistics for Engineers	3	3	0	0	MAT 112	

2. Basic Sciences (12 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
CHM 102	Introduction to Chemistry	3	3	0	1		
CHM 102 L	Introduction to Chemistry Lab	1	0	2	0		CHEM 102
PHU 103	Mechanics and Waves for Engineers	3	3	0	1		MAT 101
PHU 103 L	Mechanics and Waves for Engineers Lab	1	0	2	0		PHU 103
PHU 124	Electromagnetism and Optics for Engineers	3	3	0	1	PHU 103 & MAT 101	
PHU 124 L	Electromagnetism and Optics for Engineers Lab	1	0	2	0	PHU 103 & MAT 101	PHU 124

3. Humanities (20 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
ENG 101	Freshman English I	3	3	0	0		
ENG 112	Freshman English II	3	3	0	0	ENG 101	
ENG 222	Technical Writing	3	3	0	0	ENG 112	
PHL 101	Engineering Ethics	3	3	0	0		
ISL 101	Islamic Studies I	2	2	0	0		
ISL 112	Islamic Studies II	2	2	0	0	ISL 101	
ARB 101	Arabic Language and Literature I	2	2	0	0		
ARB 112	Arabic Language and Literature II	2	2	0	0	ARB 101	

II. Core Requirements (90 CRHs)

1. Industrial Engineering Courses (43 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
IE 301	Operations Research I	3	3	0	1	MAT 212	
IE 302	Operations Research II	3	3	0	1	IE 301, STA 212	
IE 304	Production and Service Systems Planning I	3	3	0	1		IE 301
IE 305	Production and Service Systems Planning II	3	3	0	1	IE 304	
IE 307	Work System Analysis & Design	3	3	0	1	STA 212	
IE 307L	Work System Analysis & Design Lab.	1	0	2	0		IE 307
IE 309	Human Factors and Ergonomics	3	3	0	1	STA 212	IE 307
IE 309L	Human Factors and Ergonomics Lab	1	0	2	0		IE 309
IE 315	Engineering Economy and Cost Analysis	3	3	0	1	Department Approval	
IE 330	Simulation	3	3	0	0	SE 100, STA 212	
IE 330L	Simulation Lab.	1	0	2	0		IE 330
IE 401	Network Models and Project Management	3	3	0	1	IE 301	
IE 406	Quality Engineering	3	3	0	1	IE 305	
IE 415	Production Information Systems	3	3	0	0	IE 305	
IE 450	Management for Engineers	3	3	0	0	Department Approval	
IE 490	Industrial Engineering Capstone Project	4	0	8	0	Department Approval	

Industrial Engineering - CoE

2. College of Engineering Courses (41 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
EE 207	Foundations of Electrical Engineering	3	3	0	1	PHU 124	MAT 213
EE 207 Lab.	Foundations of Electrical Engineering Lab.	0	0	2	0	PHU 124	MAT 213
SE 100	Programming for Engineers	3	3	0	1		
SE 100 L	Programming for Engineers Lab.	0	0	2	0		SE 100
ME 201	Materials Science and Engineering	3	3	0	1	CHM 102	
ME 201 L	Materials Science and Engineering Lab.	1	0	2	0	CHM 102	
ME 203	Applied Mechanics: Statics and Dynamics I	3	3	0	1	PHU 103, MAT 112	
ME 205	Introduction to Computer Aided Design	3	3	0	0		
ME 206	Thermal Fluids Engineering I	3	3	0	1	PHU 103	
ME 206 L	Thermal Fluids Engineering I Lab.	1	0	2	0	PHU 103	
ME 208	Mechanics of Materials I	3	3	0	1	ME 201	
ME 208 Lab	Mechanics of Materials I Lab	1	0	2	0	ME 201	
ME 305	Manufacturing and Workshop Training	3	3	0	1	ME 201	
ME 305 Lab.	Manufacturing and Workshop Training Lab.	1	0	2	0	ME 201	
ME 306	Instrumentation and Control Engineering	3	3	0	1	EE 207	
ME 306 Lab	Instrumentation and Control Engineering Lab.	1	0	2	0	EE 207	
ME 308	Advanced Manufacturing Processes	3	3	0	1	ME 305	
ME 308 Lab.	Advanced Manufacturing Processes Lab.	1	0	2	0	ME 305	
ME 405	Engineering Safety and Risk Analysis	3	3	0	1	STA 212	

3. College of Business Courses (3 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
ECO 110	Economic Principles	3	3	0	0	Department Approval	

4. Technical Electives (3 CRHs)

Select from the following courses:

Course Code	Course-Title	Credit Hours (CRHs)				Pre-Requisite Course Code	Co-Requisite Course Code
		Total-CRHs	Lect	Lab	Tut		
IE 420	Reliability and Maintenance Engineering	3	3	0	1	IE 305	
IE 430	New Product Development	3	3	0	0	IE 309	
IE 435	Undergraduate Research in Industrial Engineering	3	0	6	0	Department Approval	

5. Summer Internship (0 CRHs)

Course Code	Course-Title	Credit Hours (CRHs)	Pre-Requisite Course Code	Co-Requisite Course Code
IE 390	Industrial Engineering Summer Internship	0	Department Approval	

Typical Study Plan-Industrial Engineering Program

4-Year Curriculum: 143 Credit Hours Total

Each course below follows the following format:

Course code, Course Title, and Course Credit Hours (Lecture contact hours – Lab contact hours – Tutorial contact hours)

<i>1st Year</i>			
Fall	Course Code	Course-Title	CRHs
	ENG 101	Freshman English I	3 (3-0-0)
	MAT 101	Calculus I	3 (3-0-2)
	PHU 103	Mechanics and Waves for Engineers	3 (3-0-1)
	PHU 103L	Mechanics and Waves for Engineers Lab.	1 (0-2-0)
	SE 100	Programming for Engineers	3 (3-0-0)
	SE 100L	Programming for Engineers Lab.	1 (0-2-0)
	CHM 102	Introduction to Chemistry	3 (3-0-1)
	CHM 102L	Introduction to Chemistry Lab.	1 (0-2-0)
Total			18
Spring	Course Code	Course-Title	CRHs
	PHL 101 A	Engineering Ethics	3 (3-0-0)
	ENG 112	Freshman English II	3 (3-0-0)
	MAT 112	Calculus II	3 (3-0-2)
	PHU 124	Electromagnetism and Optics for Engineers	3 (3-2-1)
	PHU 124L	Electromagnetism and Optics for Engineers Lab.	1 (0-2-0)
	ME 201	Materials Science and Engineering	4 (3-2-1)
	ME 201L	Materials Science and Engineering Lab.	1 (0-2-0)
Total			17

<i>2nd Year</i>			
Fall	Course Code	Course-Title	CRHs
	MAT 212	Linear Algebra	3 (3-0-0)
	MAT 211	Calculus III	3 (3-0-0)
	EE 207	Foundations of Electrical Engineering	3 (3-0-1)
	EE 207L	Foundations of Electrical Engineering Lab.	1 (0-2-0)
	MAT 213	Differential Equations	3 (3-0-0)
	ME 203	Applied Mechanics: Statics and Dynamics I	3 (3-0-1)
Total			16
Spring	Course Code	Course-Title	CRHs
	MAT 224	Numerical Methods	3 (3-0-0)
	STA 212	Probability and Statistics for Engineers	3 (3-0-0)
	ME 305	Manufacturing and Workshop Training	3 (3-0-0)
	ME 305	Manufacturing and Workshop Training Lab.	1 (0-2-0)
	ME 208	Mechanics of Materials I	3 (3-0-1)
	ME 208 L	Mechanics of Materials I Lab.	1 (0-2-0)
	ME 205	Introduction to Computer Aided Design	3 (3-0-0)
	ME 206	Thermal Fluids Engineering I	3 (3-0-1)
ME 206 L	Thermal Fluids Engineering I Lab.	1 (0-2-0)	
Total			21

3rd Year			
Fall	Course Code	Course-Title	CRHs
	ISL 101	Islamic Studies I	2 (2-0-0)
	IE 301	Operations Research I	3 (3-0-1)
	ECO 110	Economic Principles	3 (3-0-0)
	IE 309	Human Factors and Ergonomics	3 (3-0-1)
	IE 309L	Human Factors and Ergonomics	1 (0-2-0)
	IE 307	Work Systems Analysis & Design	3 (3-0-1)
	IE 307L	Work Systems Analysis & Design Lab.	1 (0-2-0)
	IE 304	Production and Service Systems Planning I	3 (3-0-1)
Total			19
Spring	Course Code	Course-Title	CRHs
	ARB 101	Arabic Language I	2 (2-0-0)
	IE 302	Operations Research II	3 (3-0-1)
	ME 308	Advanced Manufacturing Processes	3 (3-0-0)
	ME 308 L	Advanced Manufacturing Processes Lab.	1 (0-2-0)
	IE 330	Simulation	3 (3-0-0)
	IE 330L	Simulation Lab.	1 (0-2-0)
	ME 306	Instrumentation and Control Engineering	3 (3-0-0)
	ME 306	Instrumentation and Control Engineering Lab.	1 (0-2-0)
	IE 305	Production and Service Systems Planning II	3 (3-0-1)
Total			20
Summer	Course Code	Course-Title	CRHs
	IE 390	Industrial Engineering Summer Internship	0
Total			0

<i>4th Year</i>			
Fall	Course Code	Course-Title	CRHs
	ISL 112	Islamic Studies II	2 (2-0-0)
	ENG 222	Technical Writing	3 (3-0-0)
	IE 401	Network Models and Project Management	3 (3-0-1)
	IE 415	Production Information Systems	3 (3-0-0)
	ME 405	Engineering Safety and Risk Analysis	3 (3-0-0)
Total			14
Spring	Course Code	Course-Title	CRHs
	ARB 112	Arabic Language II	2 (2-0-0)
	IE 4xx	Industrial Engineering Technical Elective	3 (3-0-0)
	IE 450	Management for Engineers	3 (3-0-0)
	IE 315	Engineering Economy and Cost Analysis	3 (3-0-1)
	IE 406	Quality Engineering	3 (3-0-1)
	IE 490	Industrial Engineering Capstone Project	4 (0-8-0)
Total			18

Technical Electives

Course Code	Course Name	CRHs	Pre-Requisite Course Code
IE 420	Reliability and Maintenance Engineering	3 (3,0,0)	IE 305
IE 430	New Product Development	3 (3,0,0)	IE 309
IE 435	Undergraduate Research in Industrial Engineering	3 (0,6,0)	Department Approval

Course Descriptions

IE 301 Operations Research I

3 (3-0-1)

The course includes deterministic operations research modelling concepts; linear programming modelling, simplex theory, duality and sensitivity analysis with economic interpretation; transportation and assignment problems; integer programming; branch and bound techniques; nonlinear optimization problems; multi-criteria decision making.

Pre-requisites: MAT 212

Co-requisites: none

IE 302 Operations Research II

3 (3-0-1)

This course introduces probability models used to investigate the behaviour of industrial systems. It teaches decision making under uncertainty, elementary counting processes, Markov chains and Markov processes. Stochastic programming and applications. Stochastic models in queuing systems, inventories, and equipment reliability are also addressed.

Pre-requisites: IE 301, STA 212

Co-requisites: none

IE 304 Production and Service Systems Planning I

3 (3-0-0)

The course teaches theory and concepts involved in model formulation for the analysis and control of production processes, including systems for planning and controlling production and service systems to achieve productivity and efficiency. The course addresses the basic issues in production planning, including aggregate production planning, master production schedule, materials requirement planning, and capacity planning. Flexible manufacturing systems, lean manufacturing, Just-in-time (JIT), and new concepts in manufacturing are addressed. Various production systems are described, including job shops, flow shop, cellular manufacturing covering scheduling and optimization.

Pre-requisites: none

Co-requisites: IE 301

IE 305 Production and Service Systems Planning II

3 (3-0-0)

The course teaches aspects of planning and design of logistics and inventory management in production and service systems. Optimization issues in supply chain management, distribution systems and routing, inventory control and warehousing, distributed networks, centralized and decentralized networks, facility location and layout, supply chain and strategic partnerships are addressed.

Pre-requisites: IE 304

Co-requisites: none

IE 307 Work Systems Analysis and Design

3 (3-0-1)

The course teaches survey of methods for assessing and improving performance of individuals and groups in organizations. Techniques include various basic industrial engineering tools, work analysis, data acquisition and application, performance evaluation and appraisal, work measurement procedures and motion study. Layout design of work environments will include material handling systems and warehousing.

Pre-requisites: STA 212

Co-requisites: none

IE 307L Work Systems Analysis and Design Lab.

1 (0-2-0)

Laboratory experiments dealing with work systems analysis and design.

Pre-requisites: none

Co-requisites: IE 307

IE 309 Human Factors and Ergonomics

3 (3-0-1)

The course teaches analysis of tools, work spaces and activities to achieve efficiency in modern work environments are introduced. The effects of vibration, noise, illumination, control display design, age and shift work on the performance of workers are discussed. Physiological and psychological capabilities and limitations in human factors, ergonomic measurement methods and analytical techniques, design of tools and the working ergonomic environment are addressed.

Pre-requisites: STA 212

Co-requisites: IE 307

IE 309L Human Factors and Ergonomics Lab.

1 (0-2-0)

Laboratory experiments dealing with human factors and ergonomics.

Pre-requisites: none

Co-requisites: IE 309

IE 315 Engineering Economy and Cost Analysis

3 (3-0-1)

The course teaches economic analysis in an engineering environment considering the time value of money. Methods for evaluation of alternatives: present worth, annual equivalent worth, rate of return, payback method and benefit-cost ratio method. Replacement analysis, depreciation, inflation and cost estimation. Sensitivity and risk analysis are also considered.

Pre-requisites: Department Approval.

Co-requisites: none

IE 330 Simulation

3(3-0-0)

This course teaches simulation modelling and analysis of production and service systems, including simulation methodology, model building in a computer environment, analysing performance measures and assessment of different policies. It also teaches simulation languages, basic and advanced modules, and statistical aspects of simulation such as fitting of input and output distributions. Validation and verification of simulation models are also covered.

Pre-requisites: SE 100, STA 212

Co-requisites: none

IE 330L Simulation Lab.

1(0-2-0)

Laboratory experiments dealing with the implantation of discrete-event simulation models.

Pre-requisites: none

Co-requisites: IE 330

IE 401 Network Models and Project Management

3 (3-0-1)

The course teaches the terminology of graphs and networks, network flow problems, algorithms and solutions. Project management, defining the project, scheduling issues in projects, project duration optimization, resources planning, evaluation and progress, estimating times and costs, critical processes in the projects, applications of project-planning and software in the strategy of projects, integration of organization with projects and probability issues in project planning are addressed.

Pre-requisites: IE 301

Co-requisites: none

IE 406 Quality Engineering

3 (3-0-1)

The course teaches Quality Assurance in an industrial system and compares it with the existing standards and protocols, including an introduction to quality engineering, quality standards ISO 9000 and QS 9000, TQM, quality cost analysis, process modeling and hypothesis testing, statistical process control for long and short production runs, process capability analysis, capability indexes, Weibull analysis, Six sigma acceptance sampling and design of experiments.

Pre-requisites: IE 305

Co-requisites: none

IE 415 Production Information Systems

3 (3-0-0)

The course teaches the design and analysis of production information systems, critical success factors for companies, effectiveness and efficiency through information systems usage in production and service systems, success cases in industry. Investigation of data modelling, storage, acquisition and utilization in Industrial Engineering via manual and computerized methods. Development of effective spreadsheet applications, design and implementation of relational databases via E-R modelling, relational schema, normalization, SQL (Standard Query Language), web-based database applications, interface design, the system development life cycle applied to data management applications, ERP (Enterprise Resource Planning) software and decision support systems are addressed..

Pre-requisites: IE 305

Co-requisites: none

IE 420 Reliability and Maintenance Engineering

3 (3-0-1)

This course provides an introduction to the life-cycle costing concept for equipment maintenance and replacement. Emphasis will be on the development of mathematical and simulation models for determining optimal maintenance and replacement policies for both capital equipment and components.

Pre-requisites: IE 305

Co-requisites: none

IE 430 New Product Development

3 (3-0-0)

This course presents state-of-the-art Product Development techniques focusing on the interdisciplinary nature of the product design activities.

Pre-requisites: IE 309

Co-requisites: none

IE 450 Management for Engineers

3 (3-0-0)

The course focuses on learning to see and understand the fundamental activities of businesses as practiced worldwide and how to manage them. Successfully performing these activities requires vision, passion, leadership, teamwork, and integrating the many functional disciplines of business.

Pre-requisites: Departmental Approval

Co-requisites: none

IE 435 Undergraduate Research in Industrial Engineering

3 (0-6-0)

Students participate in supervised research with a faculty member. Supervised research can be: 1) independent research undertaken by the student (thesis, independent study), or 2) assistance on a faculty member's research project. Students must find a faculty member who is willing to supervise him/her as an assistant on an existing project or as the author of an individual project. The student and the faculty supervisor will complete and sign a research contract which will be turned in to the chair of the Industrial and Mechanical Engineering Department. Drafting the contract will allow the student to develop ideas about what should be accomplished and what the faculty supervisor's expectations are. All academic requirements are at the discretion of the supervising faculty member. Students should agree on a plan for the semester with the faculty mentor before the research begins. The plan should include academic requirements, the basis for grading the experience, and a plan for student/professor meetings for the semester. It is the student's responsibility to report progress and seek guidance when needed. Students are expected to be active and reliable participants in the research experience.

Pre-requisites: Departmental Approval

Co-requisites: none

IE 490 Industrial Engineering Capstone Project

(0-8-0) 4

Students work in teams as professional engineering consultants on an independent engineering project under the supervision of a project advisor. The design process is emphasized, encompassing project definition, feasibility analysis, evaluation of alternative designs, and design computations. For each project, the scope of work is developed and negotiated between client and student consultants. The scope of work may also include fabrication, device testing, and field-testing. Projects are arranged by the students with approval of the instructor. Progress reports and a final written report are submitted to the student's project advisor. Oral presentations of reports are made before the faculty and students. A student who selects a project suggested by industry has the opportunity of working with an industry sponsor in an actual engineering experience.

Pre-requisites: Departmental Approval

Co-requisites: none