Department of Industrial Engineering
College of Engineering
Imam Mohammad Ibn Saud Islamic University
Riyadh, Kingdom of Saudi Arabia

Industrial Engineering Program [Required Credits = 210]

University Courses	Math. & Basic Sciences	Engineering Fundamentals	Engineering Depths
26 Credits	51 Credits	31 Credits	102 Credits

FIRST YEAR (FRESHMAN) — FALL(1) WINTER(2) SPRING(3)

- UNI 1000 [2] Elective university course 1 from package 1
- MATH 1122 [5] Pre-Calculus
- ENGL 1120 [4] Technical Writing in English
- GE 1103 [4] Engineering Graphics and Design
- MATH 1115 [5] Calculus I — PRE: MATH 1122 Or MATH 122
- PHYS 1117 [4] Physics I
- PHYS 1119 [1] Physics I Lab — CO: PHYS 1117 Or PHYS 117
- CHEM 1104 [4] General Chemistry
- CHEM 1105 [1] General Chemistry Lab — CO: CHEM 1104 Or CHEM 104
- UNI 1001 [2] Elective university course 2 from package 1
- MATH 1116 [5] Calculus II — PRE: MATH 1115 Or MATH 115
- PHYS 1118 [4] Physics II — PRE: PHYS1117, PHYS 1119 Or PHYS 117, PHYS 119
- PHYS 1120 [1] Physics II Lab — PRE: PHYS 1117, PHYS 1119 Or PHYS 117, PHYS 119
- CS 1108 [4] Computer Programming — PRE: MATH 1115 Or MATH 115

SECOND YEAR (SOPHOMORE) — FALL(4) WINTER(5) SPRING(6)

- UNI 1002 [2] Elective university course 3 from package 2
- STAT 1215 [4] Probability and Statistics for Engineers — PRE: MATH 1115 Or MATH 115
- GE 1201 [5] Statics — PRE: MATH 1116, PHYS 1117
- ME 1211 [4] Materials Science and Engineering — PRE: MATH 1115, CHEM 1104
- UNI 1003 [2] Elective university course 4 from package 2
- MATH 1207 [5] Calculus III — PRE: MATH 1116 Or MATH 116
- MATH 1228 [4] Linear Algebra & Ordinary Differential Equations — PRE: MATH 1116 OR: MATH 116
- IE 1211 [4] Engineering Experiment Design — PRE: MATH 1116, STAT 1215
- UNI 1004 [2] Elective university course 5 from package 3
- MATH 1236 [4] Mathematical Methods for Engineers — PRE: MATH 1207, MATH 1228 Or: MATH 207, MATH 228
- IE 1213 [4] Manufacturing Processes — PRE: ME 1211, GE 1201
- IE 1214 [1] Manufacturing Processes Lab — PRE: IE 1213 OR CO: IE 1213
- IE 1221 [5] Engineering Management — PRE: STAT 1215

THIRD YEAR (JUNIOR) — FALL(7) WINTER(8) SPRING(9)

- UNI 1005 [2] Elective university course 6 from package 3
- MATH 1346 [4] Numerical Analysis — PRE: MATH 1236, CS 1108 Or MATH 236, CS 108
- GE 1305 [4] Fundamentals of Electrical Engineering — PRE: MATH 1116, PHYS 1118, PHYS 1120
- IE 1231 [4] Operations Research I — PRE: MATH 1228
- UNI 1006 [2] Elective university course 7 from package 4
- IE 1322 [4] Facilities Design and Material Handling — PRE: IE 1231
- IE 1312 [4] Industrial Ergonomics
- IE 1223 [5] Quality Control — PRE: STAT 1215
- IE 1334 [4] Operations Research II — PRE: IE 1231
- IE 1331 [4] Production Planning and Inventory Control — PRE: STAT 1215
- IE 1311 [5] Simulation Modeling and Analysis — PRE: IE 1231
- IE 1419 [4] Selected Topics in Design and Manufacturing — PRE: Completion of Level 6 Courses

FOURTH YEAR (SENIOR) — FALL(10) WINTER(11) SPRING(12)

- UNI 1007 [2] Elective university course 8 from package 4
- GE 1401 [4] Project Management — PRE: STAT 1215
- GE 1403 [4] Engineering Economy — PRE: MATH 1236
- IE 1303 [5] Computer Integrated Manuf. And Automation — PRE: IE 1213
- UNI 1008 [2] Elective university course 9 from package 5
- IE 1428 [4] Production Systems — PRE: IE 1231
- IE 1412 [4] Reliability and Maintenance — PRE: MATH 1236, STAT 1215
- IE 1431 [5] Logistics and Supply Chains — PRE: IE 1331
- FRC 1001 [2] Elective free course 1
- IE 1466 [4] Industrial and Environmental Safety
- IE 1411 [4] Work Processes and Design — PRE: IE 1312
- IE 14X1 [4] Technical Elective I — PRE: Depending on the Course
- IE 1493 [2] Graduation Project I — PRE: Complete 130 CrH.

FIFTH YEAR — FALL(13) WINTER(14)

- FRC 1002 [2] Elective free course 2
- UNI 1009 [2] Elective university course10 from package 5
- GE 1302 [2] Professional Ethics for Engineers — PRE: GE 1403
- IE 14X2 [4] Technical Elective II — PRE: Depending on the Course
- IE 1494 [3] Graduation Project II — PRE: IE 1493
- FRC 1003 [2] Elective free course 3
- IE 1443 [4] Information Systems — PRE: CS 1108
- IE 14X3 [4] Technical Elective III — PRE: Depending on the Course
- IE 1495 [3] Graduation Project III — PRE: IE 1494

GE 1599 Engineering Training [0] - PRE: Completion of 130 Credits

No. of Courses / Credits each Trimester:

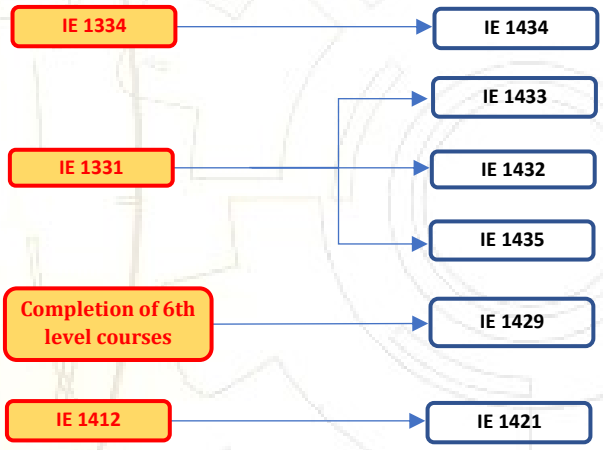
[4/ 15]	[5 / 15]	[5 / 16]	[4 / 15]	[4 / 15]	[5 / 16]	[4 / 14]	[4 / 15]	[4 / 17]	[4 / 15]	[4 / 15]	[5 / 16]	[5 / 13]	[4 / 13]

Industrial Engineering Program - Fifth Year- Elective Courses

Design and Manufacturing

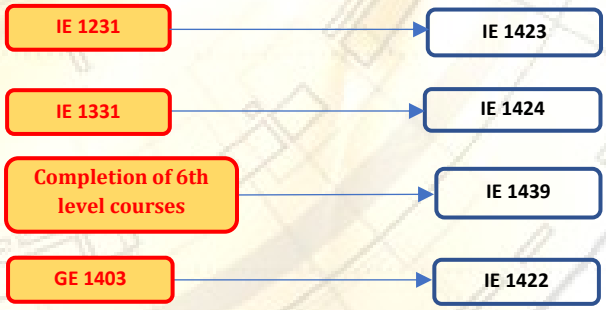
IE 1223	*Quality Control*
IE 1414	Saudi Standards and Specifications

Operations Management (Production/Quality/ Maintenance)

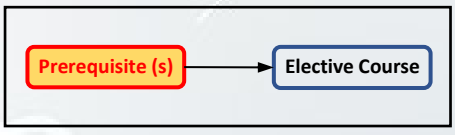


IE 1334	*Operation Research II*
IE 1434	Forecasting Methods and Applications
IE 1331	*Production Planning & inventory Control*
IE 1433	Inventory Decision Systems
IE 1432	Enterprise Resource Planning (ERP)
IE 1435	Introduction to Health Systems Management
IE 1429	Special Topics in Quality Engineering
IE 1412	*Reliability and Maintenance*
IE 1421	Maintenance Engineering and Management

Analysis and Improvement



IE 1231	*Operation Research I*
IE 1423	Data Analysis & Decision Making
IE 1331	*Production Planning & inventory Control*
IE 1424	Strategic Management
IE 1439	Special topics in Systems Engineering and OR
GE 1403	*Engineering Economy*
IE 1422	Cost Estimation



Curriculum Distribution according to levels and hours

Course code	Course Number	Arabic Name	English Name	Arabic code	No. of credit hours					Shared Department	Compulsory or elective
					Credits	Theoritical	Practical	Tutorials	Contact hours		
Level 1											
UNI	1000	مقرر جامعي اختياري 1 من الرزمة 1	Elective University Courses 1 from package 1	جمع	2	2	-	-	2		Elective
Math	1122	مبادئ الرياضيات	Pre-Calculus	ريض	5	4	-	2	6	Math	Compulsory
ENGL	1120	الكتابة الفنية باللغة الإنجليزية	Technical Writing in English	نجل	4	3	-	2	5	Language	Compulsory
GE	1103	الرسم والتصميم الهندسي	Engineering Graphics and Design	هعم	4	3	-	2	5	Mech. Eng.	Compulsory
					15	12	-	6	18		
Level 2											
MATH	1115	حساب التفاضل والتكامل 1	Calculus I	ريض	5	4	-	2	6	Math	Compulsory
PHYS	1117	فيزياء 1	Physics I	فيز	4	3	-	2	5	Physic	Compulsory
PHYS	1119	مختبر فيزياء 1	Physics Lab I	فيز	1	-	2	-	2	Physic	Compulsory
CHEM	1104	كيمياء عامة	General Chemistry	كيم	4	3	-	2	5	Chemistry	Compulsory
CHEM	1105	مختبر كيمياء عامة	General Chemistry Lab	كيم	1	-	2	-	2	Chemistry	Compulsory
					15	10	4	6	2-		
Level 3											
UNI	1001	مقرر جامعي اختياري 2 من الرزمة 1	Elective University Courses 2 from package 1	جمع	2	2	-	-	2		Elective
MATH	1116	حساب التفاضل والتكامل 2	Calculus II	ريض	5	4	-	2	6	Math	Compulsory
PHYS	1118	فيزياء 2	Physics II	فيز	4	3	-	2	5	Physic	Compulsory
PHYS	1120	مختبر فيزياء 2	Physics Lab II	فيز	1	-	2	-	2	Physic	Compulsory
CS	1108	برمجة الحاسب الآلي	Computer Programming	عال	4	2	2	2	6	Computer Science	Compulsory
					16	11	4	6	21		
Level 4											
UNI	1002	مقرر جامعي اختياري 3 من الرزمة 2	Elective University Course 3 from Package 2	جمع	2	2	-	-	2		Elective
STAT	1215	الاحتمالات والإحصاء للمهندسين	Probability and Statistics for Engineers	احص	4	3	-	2	5	statistical	Compulsory
GE	1201	إستاتيكا	Statics	هعم	5	4	-	2	6	Civil Eng	Compulsory
ME	1211	علم وهندسة المواد	Materials Science and Engineering	هعم	4	3	-	2	5	Mechanical Engineering	Compulsory
					15	12	-	6	18		

Curriculum Distribution according to levels and hours

Course code	Course Number	Arabic Name	English Name	Arabic code	No. of credit hours					Shared Department	Compulsory or elective
					Credits	Theoritical	Practical	Tutorials	Contact hours		
Level 5											
UNI	1003	مقرر جامعي اختياري 4 من الرزمة 2	Elective University Course 4 from Package 2	جمع	2	2	-	-	2		Elective
MATH	1207	حساب التفاضل والتكامل 3	Calculus III	ريض	5	4	-	2	6	Math	Compulsory
MATH	1228	الجبر الخطي والمعادلات التفاضلية الأولية	Linear Algebra and Ordinary Differential Equations	ريض	4	3	-	2	5	Math	Compulsory
IE	1211	تصميم التجارب الهندسية	Engineering Experiment Design	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
					15	12	-	6	18		
Level 6											
UNI	1004	مقرر جامعي اختياري 5 من الرزمة 3	Elective University Course 5 from Package 3	جمع	2	2	-	-	2		Elective
MATH	1236	طرق الرياضيات للمهندسين	Mathematical Methods for Engineers	ريض	4	3	-	2	5	Math	Compulsory
IE	1213	أساليب التصنيع	Manufacturing Processes	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	1214	مختبر أساليب التصنيع	Manufacturing Processes Lab	صنع	1	-	2	-	2	Industrial Eng.	Compulsory
IE	1221	إدارة هندسية	Engineering Management	صنع	5	4	-	2	6	Industrial Eng.	Compulsory
					16	12	2	6	20		
Level 7											
UNI	1005	مقرر جامعي اختياري 6 من الرزمة 3	Elective University Course 6 from Package 3	جمع	2	2	-	-	2		Elective
MATH	1346	التحليل العددي	Numerical Analysis	ريض	4	3	-	2	5	Math	Compulsory
GE	1305	مبادئ الهندسة الكهربية	Fundamentals of Electrical Engineering	هعم	4	3	-	2	5	Elaecrical Eng.	Compulsory
IE	1231	بحوث عمليات 1	Operation Research I	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
					14	11	-	6	17		

Curriculum Distribution according to levels and hours

Course code	Course Number	Arabic Name	English Name	Arabic code	No. of credit hours					Shared Department	Compulsory or elective
					Credits	Theoritical	Practical	Tutorials	Contact hours		
Level 8											
UNI	1006	مقرر جامعي اختياري 7 من الرزمة 4	Elective University Course 7 from Package 4	جمع	2	2	-	-	2		Elective
IE	1322	تصميم المنشئات ومناولة المواد	Facilities Design & Materials Handling	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	1312	الأورجونوميا الصناعية	Industrial Ergonomics	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	1223	ضبط الجودة	Quality Control	صنع	5	4	-	2	6	Industrial Eng.	Compulsory
					15	12	-	6	18		
Level 9											
IE	1334	بحوث العمليات 2	Operation Research II	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	1331	تخطيط الإنتاج والتحكم فى المخزون	Production Planning & inventory Control	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	1311	المحاكاة والنمذجة والتحليل	Simulation Modeling and Analysis	صنع	5	4	-	2	6	Industrial Eng.	Compulsory
IE	1419	مواضيع مختارة في التصميم والتصنيع	Selected Topics in Design and Manufacturing	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
					17	13	-	8	21		
Level 10											
UNI	1007	مقرر جامعي اختياري 8 من الرزمة 4	Elective University Course 8 from Package 4	جمع	2	2	-	-	2		Elective
GE	1401	إدارة مشاريع	Project Management	هعم	4	4	-	-	4	Civil	Compulsory
GE	1403	اقتصاد هندسي	Engineering Economy	هعم	4	3	-	2	5	Mechanical Engineering	Compulsory
IE	1303	الأتمتة والتصنيع المتكامل بالحاسب	Computer integrated Manufacturing and Automation	صنع	5	4	-	2	6	Industrial Eng.	Compulsory
					15	13	-	4	17		

Curriculum Distribution according to levels and hours

Course code	Course Number	Arabic Name	English Name	Arabic code	No. of credit hours					Shared Department	Compulsory or elective
					Credits	Theoritical	Practical	Tutorials	Contact hours		
Level 11											
UNI	1008	مقرر جامعي اختياري 9 من الرزمة 5	Elective University Course 9 from Package 5	جمع	2	2	-	-	2		Elective
IE	1428	أنظمة الإنتاج	Production Systems	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	1412	الموثوقية والصيانة	Reliability and Maintenance	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	1431	الخدمات اللوجستية وسلاسل الإمداد	Logistics and Supply Chains	صنع	5	4	-	2	6	Industrial Eng.	Compulsory
					15	12	-	6	18		
Level 12											
FRC	1001	مقرر اختياري حر 1	Elective Free Course 1	مقح	2	2	-	-	2		Elective
IE	1466	السلامة الصناعية والبيئية	Industrial and Environmental Safety	صنع	4	4	-	-	4	Industrial Eng.	Compulsory
IE	1411	تصميم وإجراءات العمل	Work Processes and Design	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	14X1	مقرر اختياري تخصصي - 1	Technical Elective I	صنع	4	3	-	2	5	Industrial Eng.	Elective
IE	1493	مشروع تخرج 1	Graduation Project I	صنع	2	1	2	-	3	Industrial Eng.	Compulsory
					16	13	2	4	19		
Level 13											
FRC	1002	مقرر اختياري حر 2	Elective Free Course 2	مقح	2	2	-	-	2		Elective
UNI	1009	مقرر جامعي اختياري 10 من الرزمة 5	Elective University Course 10 from Package 5	جمع	2	2	-	-	2		Elective
GE	1302	أخلاقيات المهنة للمهندسين	Professional Ethics for Engineers	همع	2	2	-	-	2		Compulsory
IE	14X2	مقرر اختياري تخصصي - 2	Technical Elective II	صنع	4	3	-	2	5	Industrial Eng.	Elective
IE	1494	مشروع تخرج 2	Graduation Project II	صنع	3	2	2	-	4	Industrial Eng.	Compulsory
					13	11	2	2	15		
Level 14											

Curriculum Distribution according to levels and hours

Course code	Course Number	Arabic Name	English Name	Arabic code	No. of credit hours					Shared Department	Compulsory or elective
					Credits	Theoritical	Practical	Tutorials	Contact hours		
FRC	1003	مقرر اختياري حر 3	Elective Free Course 3	مقح	2	2	-	-	2		Elective
IE	1443	نظم المعلومات	Information Systems	صنع	4	3	-	2	5	Industrial Eng.	Compulsory
IE	14X3	مقرر اختياري تخصصى - 3	Technical Elective III	صنع	4	3	-	2	5	Industrial Eng.	Elective
IE	1495	مشروع تخرج 3	Graduation Project III	صنع	3	2	2	-	4	Industrial Eng.	Compulsory
					13	10	2	4	16		
Level 15											
GE	1599	تدريب هندسي	Engineering Training	هعم	-	-	-	-	-		Compulsory
					Total Credits hours						
					210	164	16	76	256		

Courses Descriptions

1. General Engineering

ENGL 1120	Technical Writing in English	4 Credit Hours

The Course will enable students to develop the knowledge, skills and values required for effective technical writing in business. Students will learn to write clear, concise, and audiencespecific documents such as emails, memos, proposals, and reports required for business communication and needs.

GE 1103	Engineering Graphics and Design	4 Credit Hours

Use of computer drafting software (AutoCAD) to model parts and assemblies. Use of parametric and non-parametric solids, surface and wire frame models. Part editing, two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multi-view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerance techniques. Team or individual design project.

CS 1108	Computer Programming	4 Credit Hours

The course introduces students to structured programming techniques. Topics include different control statements (sequence, selection, and repetition), functions, fundamental data types, and data structures (arrays and pointers). Upon successful completion of the course, students will solve computer problems by using structured programming techniques and adequate tools (text editor, compiler, and debugger).

GE 1201	Statics	5 Credit Hours

Vector analysis, forces, moments, and couples, resultants of force systems, equilibrium analysis and free-body diagrams, analysis of forces acting on members of trusses and frames. Shear-force and bending-moment distributions, centroids, center of mass, hydrostatic pressure, moment of inertia, parallel axis theorem, polar moment of inertia, and product of inertia.

GE 1305	Fundamentals of Electrical Engineering	4 Credit Hours

Basic laws: Ohm's, KVL, KCL. Resistive networks. Circuit analysis techniques: nodal and mesh analysis. Network theorems: Thevenin's, Norton's, source transformations, superposition, maximum power transfer. Energy storage elements. phasor technique for steady-state sinusoidal response. Transient analysis of first-order circuits.

GE 1401	Project Management	4 Credit Hours

The purpose of this course is to allow the students to gain an understanding of key principles and practices of project management as employed in the industry. At the end of this course students will

be able to view a project both in terms of its lifecycle phases and key knowledge areas of scope, cost, time, quality, procurement, resource, communication and risk management

GE 1403	Engineering Economy	4 Credit Hours

This course investigates methods of economic analysis for decision making among alternative courses of action in engineering, business and government applications. Topics include: Time value of money, Money management, Equivalence calculations under inflation, Present worth analysis, Annual Equivalence Analysis, Rate of return analysis, Benefit-Cost ratio & profitability index analyses, Annual depreciation & book value.

GE 1302	Professional Ethics for Engineers	2 Credit Hours

Introduction to engineering ethics; definition of a profession, personal and professional ethics, explore many of the ethical issues, discussion of ethical theories, code of ethics, problem solving techniques. Introduce engineer's rights and responsibilities. Asses Safety, risk and accidents. Explain the Rights and Responsibilities of Engineers.

GE 1599	Engineering Training	0 Credit Hours

8 weeks training in a relevant industry under the supervision of an external supervisor from industry. Each student must submit a technical report about his learning experience during training in addition to fulfilling any other requirements as determined by the department.

2. Industrial Engineering Core Courses

ME 1211	Materials Science and Engineering	4 Credit Hours

Introduction to Materials Science and materials engineering, Different applied materials (metals, polymers, ceramics and composites). Atomic structure and inter-atomic bonding. Polymer structure and polymer processing and properties. Mechanical properties of metals, polymers, ceramics and composites. Material solidification, microstructures, dislocations and defects. Phase diagrams and phase transformations. Strengthening mechanisms in materials. Classification of Metal Alloys. Basics of Corrosion and corrosion prevention.

IE 1211	Engineering Experiment Design	4 Credit Hours

Design and analysis of observational and factorial experiments employing numerical and graphical methods. Topics include: Control charts; Probability plots; Multiple regression analysis; Confidence and prediction intervals; Significance tests.

IE 1213	Manufacturing Processes	4 Credit Hours

Relationship between product engineering and manufacturing engineering, Metal casting: Fundamentals and processes, Metal forming: Fundamentals and bulk deformation, Metalworking processes and sheet metal working, Shaping Process of plastics, Powder metallurgy, Theory of machining operations, Fundamentals of welding and welding processes, Cutting-tools and

machining processes, Grinding and other abrasive processes, Non-conventional machining (Electromechanical machining; Electro-discharge machining; Plasma Arc machining; Laser Beam machining; Electron Beam machining) and Heat treatment.

IE 1214	Manufacturing Processes Lab	1 Credit Hours

Practical demonstration and learning of various production processes such as metal cutting, machining, welding and sheets rolling etc. Study and familiarisation with various measuring instruments. Measuring specified dimensions such as lengths, internal and external diameters radii, angles and taper dimensions. Estimating measurement variations. Identifying typical errors. Familiar with various safety measures.

IE 1221	Engineering Management	5 Credit Hours

Organization of engineering systems including production and service organizations; Organizational design and structure; Empowering and distribution of authority; Managing organizational change and innovation; Leadership; Teams and teamwork; Inputs of human skills, capital, technology, and managerial activities to produce useful products and services; Economic analysis and construction of financial models for income, cash flow, balance sheet, valuation techniques, and replacement analysis; Innovation and technological cycles; Strategic, tactical and operational planning; Estimation of required capital and project acceptance criteria; Financial analysis, planning and control; Investment decisions; Human relations.

IE 1231	Operations Research I	4 Credit Hour

Introduction to operations research models; Linear programming; Transportation; Assignment; CPM/MSPT techniques and their applications; Construction of models appropriate to particular applications; Development of optimal solutions; Introduction to advanced analytic techniques; Computer packages for problem solving.

IE 1322	Facilities Design & Materials Handling	4 Credit Hours

Facility design concept and industrial feasibility study, Facility design stages of Industrial Factory design product and production analysis; capacity analysis of material, machines, assembly stations, and labour. Concepts and methodologies for the analysis and design of material handling systems. Automated material handling systems. Concept of storage analysis and design, and automated storage and retrieval system. Area allocation and space analysis. Flow analysis. Plant layout and plan. Computerized facility layout. Location problem analysis.

IE 1312	Industrial Ergonomics	4 Credit Hours

Consideration of human characteristics and limitations in the requirements for design of systems, organizations, facilities and products to enable human-centered design which considers human abilities, limitations and acceptance; Applied anthropometry and biomechanics; Human performance capability when interacting with machine and work environment; Human-machine interaction and human-organization interaction; Illumination and noise; Displays; Controls; Visual feedback; Information processing; Human error; Climatic factors; Stresses and workload.

IE 1223	Quality Control	5 Credit Hours

Quality improvement and control methods with applications in design, development, manufacturing, delivery and service. Topics include: Quality management philosophies; Quality Engineering/statistical methods; Process control; Acceptance sampling; Control charts; Process capability studies; Loss functions; Experimentation for improvement.

IE 1334	Operations Research II	4 Credit Hours

Game theory; Network planning technique; Forecasting techniques; Nonlinear programming problems; Unconstrained optimization search techniques; Quadratic programming; Dynamic programming; Stochastic programming; Genetic algorithms; Heuristic methods; Markov chain; Queuing theory; Application of theoretical models and quantitative methods to solve practical problems of management using software solutions in the field of operations research.

IE 1331	Production Planning and Inventory Control	4 Credit Hours

Production systems; Quantitative methods for forecasting; Aggregate planning; Inventory control; Materials requirement planning; Production scheduling; Capacity planning; Manpower planning and facility design; Shop floor control. Enterprise resource planning systems (ERP).

IE 1311	Simulation Modeling and Analysis	5 Credit Hours

Introduction to system simulation and its applications; Simulation packages languages; Discrete and Continuous simulation; Random numbers; Data collection and distributions; Model development; Model validation and verification; Statistical analysis of simulation models; Variance reduction; Calibration of simulation models; Simulation examples; Monte Carlo simulation; Case studies of industrial and manufacturing systems using discrete event simulations

IE 1419	Seleted Topics in Design and Manufacturing	4 Credit Hours

Topics relevant to manufacturing to strengthen student's knowledge in this field. The varying course contents must be approved by the IE Department Council.

IE 1303	Computer-Integrated Manufacturing and Automation	5 Credit Hours

This course emphasizes the integration of manufacturing enterprise using computer-integrated manufacturing (CIM) technologies. It employs CAD/CAM interface and other CIM sub-systems, database management, facility layout, product documentation, process planning, production planning and control, Group technology, teamwork, and manufacturing operations and management to bring about students-designed CIM-oriented enterprise.

IE 1428	Production Systems	4 Credit Hours

Types of production systems; Analysis of manufacturing systems in terms of material flow and storage, information flow, capacities, and durations of events with emphasis on stochastic analysis; Role of variability and impact on cycle time; Push vs. pull production strategies; Discrete manufacturing systems; Process/machine selections; Cell control; Group technology; Automated

process control; Production efficiency; Lean manufacturing systems; Just-in-time production systems; Flexible manufacturing systems; Advanced manufacturing systems.

IE 1412	Reliability and Maintenance	4 Credit Hours

Maintenance concepts; Maintainability terms and definitions; Terotechnology; Preventive maintenance; Corrective maintenance; Maintenance planning; Control of maintenance activities; Materials and spare part management; Failure rate and measurements; Down time and repair time; Reliability and failure statistics; Application of waiting line theory to maintenance problem; Critical part scheduling; Measurement and evaluation of maintenance performance; Depreciation; Machine and equipment inspection; Maintenance planning; Root cause analysis of critical failures; Statistical techniques for product reliability estimation; Reliability models of components.

IE 1431	Logistics and Supply Chain	5 Credit Hours

Definition of logistics and supply chain management; Supply chain network design; Distribution networks and transportation design; Distribution and logistics strategies; Transportation economies; Warehouse operations; Production-inventory models in a supply chain; Procurement; E-procurement; Vendor selection; Sourcing; Information flow; Coordination and information technology; Integration; Customer service; Supply chain international issues; Global supply chains and logistics; Supply chain performance measurement; Statistical modelling of supply chains; Supply chain security

IE 1466	Industrial and Environmental Safety	4 Credit Hours

Accident: causes and costs. Appraising safety performance and risk assessment. Analysis of accident causes. Accident reports and records. Job safety analysis. Plant inspection. Accident investigation. Plant layout and arrangement. Plant housekeeping. Maintenance and safety. Material handling and safety. Machine guarding. Explosion and fire prevention. Noise and environmental safety, Personal protection. Planning for emergencies.

IE 1411	Work Processes and Design	4 Credit Hours

Traditional issues of work standards; principles and techniques of work measurement; Productivity analysis; methods engineering; Workplace design; Work sampling; Predetermined time systems; Process development and management; Examination of functional and organizational role of the worker; Impact of emerging computer-based technologies on work design and implementation strategies.

IE 1493	Graduation Project I	2 Credit Hours

The Graduation Project integrates the various components of the curriculum into a comprehensive design exercise. This course covers the preliminary phase of the Project. In this phase, the students choose a topic and a faculty advisor; define the project scope, which may include theoretical design, experimentation, fabrication or computer simulation and modeling. By the end of the semester, they should complete the Project Goals/Objectives, Project Execution Plan, a thorough literature review

and some initial work as defined in the Execution Plan. They must submit a preliminary report of the work done at the end of the semester.

IE 1494	Graduation Project II	3 Credit Hours

A capstone design project should be planned to provide a unified effort in developing teamwork skills, multidisciplinary interaction, communication skills, fundamentals of engineering design processes, and application of engineering design principles to a real engineering project.

IE 1443	Information Systems	4 Credit Hours

The purpose of the course is to provide students with solid grounding in business uses of information technology in a rapidly changing environment, and to provide discussion of critical issues surrounding the use of IT in organizations.

IE 1495	Graduation Project III	3 Credit Hours

As mentioned in GP II, IE1494, the type of graduation project has to be a capstone design. A capstone design project should be planned to provide a unified effort in developing teamwork skills, multidisciplinary interaction, communication skills, fundamentals of engineering design processes, and application of engineering design principles to a real engineering project. The capstone designed test results are evaluated and conclusions are drawn from the results.

3. Electives

IE 1414	Saudi Standards and Specifications	4 Credit Hours

Study of different standards and specifications adopted by the Kingdom of Saudi Arabia and the GCC countries; Comparison among Saudi, GCC, and international standards; Standards and specifications preparation; Experimentation; Standards construction, implementation, enforcement, and monitoring; National and international quality awards and their effects on the industrial and service products; Standards and specifications effects on the industry competitiveness, product safety, and product quality.

IE 1421	Maintenance Engineering and Management	4 Credit Hours

Maintenance concept; Maintenance models; Maintenance quality; Maintenance planning and management; Maintenance cost and staffing; Total productive maintenance; Autonomous maintenance; Chronic and sporadic losses; Depreciation modeling; Maintainability prediction; Failure mode effects and criticality analysis (FMECA); Computer aided maintenance management; Design for maintainability; Maintenance staffing; Spare parts management.

IE 1422	Cost Estimation	4 Credit Hours

This course examines and applies estimating tools, techniques and software for costing construction projects in its various stages from both client and contractor perspectives. Elements of preliminary estimating, cost planning and detailed estimating will be integrated and applied to

enable informed rational cost related decisions. Applies estimating principles to price/cost superficial spaces, functional areas, elements, resources and trades and develop ethical bidding strategies.

IE 1423	Data Analysis & Decision Making	4 Credit Hours

Basic statistical analysis concepts; Data mining methods; Decision-making methods; Cluster analysis and dimension reduction; Economic decision; Multi-objective optimization, decision in uncertain environments; Practical issues in decision-data-analytics.

IE 1424	Strategic Management	4 Credit Hours

Value and process of strategic management; Integrate and apply knowledge to strategic decision making in organizations; Explore the organization's vision, mission; Principles, techniques and models of organizational and environmental analysis; Theory and practice of strategy formulation and implementation; Corporate governance and business ethics for the development of effective strategic leadership.

IE 1429	Special Topics in Quality Engineering	4 Credit Hours

Topics relevant to the industrial and service quality engineering, quality control, and quality assurance to strengthen student's knowledge in these fields using qualitative and quantitative techniques. The varying course contents must be approved by the IE Department Council.

IE 1432	Enterprise Resource Planning (ERP)	4 Credit Hours

Definitions and ERP framework; ERP architecture and design; ERP system packages and databases; Procurement and outsourcing; ERP-Internet integration; ERP system maintenance; Applications and case studies.

IE 1433	Inventory Decision Systems	4 Credit Hours

Dynamics of inventory management as they relate to the entire supply chain; Demand types; Distribution; Product transformation processes; The inter-relationships among all supply chain functions; Methods and techniques for reducing the holding cost of inventories while providing an efficient and effective service to customers; Contemporary aspects of material management; Controlling different inventory setups; Material requirements planning (MRP); Receiving; Warehousing.

IE 1434	Forecasting Methods and Applications	4 Credit Hours

Introduction to quantitative methods of forecasting; Data considerations; Model selection; Decomposition Methods; Exponential smoothing; Regression models; Autoregressive integrated moving average (ARIMA) models; Advanced forecasting models; Forecasting errors and confidence intervals; Combining forecasting results; Forecasting implementation; Long term forecasting.

IE 1435	Introduction to Health Systems Management	4 Credit Hours

Health systems; Organizational behavior; Lean concepts; Patient-flow analysis; Inference and data-driven knowledge generation; Decisions and change; Forecasting, operations, and optimization of health resources; Quality in healthcare systems; Cost and revenues in healthcare systems; Teamwork; Managing healthcare staff; Health care information systems.

IE 1439	Special topics in Systems Engineering and OR	4 Credit Hours

Topics relevant to industrial systems to strengthen student's knowledge in this field using qualitative and quantitative techniques. The varying course contents must be approved by the IE Department Council.