INDUSTRIAL ENGINEERING ACADEMIC PROGRAM GUIDE

UNIVERSITY OG HA'IL
COLLEGE OF ENGINEERING
DEPARTMENT OF INDUSTRIAL ENGINEERING

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FOREWARD BY THE CHAIRMAN INDUSTRIAL ENGINEERING DEPARTMENT

Welcome to Industrial Engineering Department website, College of Engineering, University of Ha'il.The Industrial Engineering Department was established in the College of Engineering at University of Ha'il in the academic year 2012 – 2013. The Department had its first graduates in 2016.The Department of Industrial Engineering plays an important role in the preparation of Industrial Engineers in the following core areas:

- Design and management of factories.
- Design and management of production lines.
- Design of quality systems.
- Design improvement of production process.
- Design and improvement of industrial devices and equipment.

Our core areas rely on a knowledge-based economy. The Department of Industrial Engineering also encourages scientific research and provides advisory and technical services to government and private institutions.Department of Industrial Engineering offers programs at undergraduate as well as graduate level. At the undergraduate level, it offers B.Sc. in Industrial Engineering, while at the graduate level, the department offers an Executive Master program in Occupational Health & Safety.Our undergraduate program. i.e., Bachelor of Science in Industrial Engineering is accredited by the Engineering Accreditation Commission (EAC) of ABET: http://www.abet.org under the General Criteria and Industrial Engineering Program Criteria.I invite you to explore our homepage and contact me if you have any questions.

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VISION AND MISSION OF UNIVERSITY OF HA'IL

Hail University is an innovative institution, and it is one of the fastest growing academic institutions in the Kingdom of Saudi Arabia, where groups of talented people meet to exchange knowledge and develop a better future. The vision is to maintain an advanced academic, administrative and research environment blended with.

Vision

Local and regional leadership in spreading knowledge, research excellence, and sustainable community partnership.

Mission

Providing academic programs to prepare qualified graduates for the labor market, producing scientific research that serves the community by applying the highest quality standards, and making use of the university's human and technical resources to reach the knowledge society.

VISION, MISSION & GOALS OF COLLEGE OF ENGINEERING

A Brief History of the College of Engineering

In the recent years, the education sector in Saudi Arabia shows a remarkable development, this occurs as a result of the expansion in the establishment of universities, colleges and attention to rehabilitation and attraction of qualified faculty members.

The College of Engineering at the University of Hail was established in 1426H (2006) to be the source of science and applied engineering in the region, and to contribute to advancing development and renaissance in our country.

The college consists of six academic departments for males, which are Electrical, Mechanical, Civil, Chemical, Architectural and Industrial Engineering, and Decoration and Interior Design Engineering department for females.

The student can join the College of Engineering after passing the preparatory year and meet the college requirements, where students spend at least four years (eight levels for each study plan) to be qualified for a bachelor's degree in engineering.

There are also graduate programs through which the student can get a Master's degree in engineering.

Vision

The College of Engineering at the University of Hail aspires to be a leading college in the fields of engineering education, technological innovation, scientific research, transfer and application of knowledge locally and regionally, and to prepare qualified engineers to work on improving the quality of engineering.

Mission

To build an academic environment of firmness and accomplishment and to cultivate a team of highly qualified scholars in the field. In addition, the college is committed to offer a rich, supportive academic environment for our students and faculty alike and facilitate their continuous professional development. We believe this is the only way forward to keep our faculty abreast of the advancement of technology and for our graduates to meet future challenges in order to better serve the community.

Goals

1. Cooperating with governmental and non-governmental organizations to serve the development process.
2. Attracting distinguished teachers in the field of teaching and scientific research.
3. Developing scientific research and teaching methods in line with local and international requirements.
4. Providing outstanding education to the people of the region in line with the needs of the labor market of engineering specialties.
5. Graduating qualified national cadres in the scientific and technical fields needed by the industrial sectors.
6. Serving the community by holding engineering courses and workshops in applied and engineering fields.

1. INTRODUCTION

The Department of Industrial Engineering is one of the six departments of the College of Engineering at the University of Hail. The department was established in 2009. The Department is committed to the preparation of distinct industrial engineers in the fields of industrial engineering and its applications in accordance with international standards to meet the needs of industry, government and the private sector. It is also keen that the graduates are fully aware of the ethics of the profession and the requirements of environmental protection. Furthermore, the graduates are encouraged to contribute to the development of industrial sectors by carrying out research projects.

Industrial engineers are concerned with the design, improvement, and installation of integrated systems of people, materials, and energy in production of either goods or services. They engineer processes and systems that improve quality and productivity. They are primarily interested in problems that involve economizing the use of money, materials, time, human effort, and energy. They are more concerned with the big picture of industrial management and production – rather than with detailed development of processes.

The Department of Industrial Engineering offers an undergraduate program in industrial engineering. The program focuses on the science and technology of industrial systems. It emphasizes the analysis and design of systems to produce goods and services efficiently. Particular attention is devoted to both the physical processes involved and the environment.

The program is only offered as a Co-op option. Co-op programs are implemented in many technical universities worldwide. The student usually leaves the school for one or more semesters and joins a relevant industry, where he is exposed to real life applications of what has been taught at the university. This exposure provides the student with a more mature outlook and has a significant effect on his understanding of his role as a practicing engineer.

Our undergraduate program. i.e., Bachelor of Science in Industrial Engineering is accredited by the Engineering Accreditation Commission (EAC) of ABET: *http://www.abet.org* under the General Criteria and Industrial Engineering Program Criteria.

1.1 Program Vision

The program's vision is to excel and lead locally, regionally and globally in providing engineering courses and research and social services of high quality. Hence, the students receive theoretical and practical training to enable them to master all aspects of engineering sciences and theories and their applications in the design of experiments and systems' components to meet the required needs.

1.2 Program Mission

The specific components of the mission of the Industrial Engineering program in the Faculty of Engineering at the University of Hail are as follows:

- To prepare outstanding national cadres in the field of industrial engineering.
- To conduct basic and applied research that serve the Saudi economic sector and contribute to the economic development of the country in line with the overall development plans under the national strategy for quality.
- To achieve social responsibility by providing support and advice to local and national segments of society.
- To provide students with the best quality of engineering education and technical and professional skills.
- To provide support for local companies and factories and to contribute to the industrial renaissance.
- To understand and recognize the basic principles of industrial sciences.

2. SEMESTER SYSTEM RULES AND GUIDELINES

2.1 Admission Requirement

An applicant for admission to an undergraduate program at University of Ha'il must satisfy the following minimum requirements:

1. He should have the secondary school certificate or equivalent, from inside or outside the KSA.
2. He should have obtained the secondary school certificate in a period of less than 5 years prior to the date of application.
3. He must have a record of good conduct.
4. He must be physically fit and healthy.
5. He must successfully pass any examination or personal interviews as determined by the University Council.
6. He must satisfy any other conditions the University Council may deem necessary at the time of application.

Admission to the Foundation Year Program

All newly admitted students are required to complete the Foundation Year Program before starting their undergraduate study.

The foundation year program aims to prepare the newly admitted students for undergraduate study and university life to achieve the following goals:

a) Improve the proficiency of students in English before they undertake undergraduate study.
b) Develop and improve the students' knowledge of mathematical and analytic techniques through the medium of English.
c) To introduce students to new subject areas and techniques such as workshop and graphics, thus improving their mental and manual skills.
d) Familiarize students with the various majors available at the University.
e) Familiarize students with the requirements of undergraduate study, including study skills and discipline in all its forms.

The duration of the Foundation Year Program is one year, divided into two regular semesters and a summer session, if necessary. The following courses are offered during the foundation years:

1. English.
2. Mathematics.
3. Physical sciences.
4. Engineering technology.

2.2 Examination and Grading System

Success in a course is usually based on the combination of grades awarded to term work and final examination. Each course has a total of 100 points. Out of this, the instructor allocates 60% marks to the

term work consisting of quizzes, homework, term projects and mid-term exam or any other periodic assessments while the remainder 40% is allocated to the final examination.

The instructor awards the grade as marks out of 100. The marks are converted to a letter grade and grade points. The letter grades corresponding to the final numerical marks obtained by the student in the course are listed in Table 2-1. The passing grade for each course is "D".

Table 2-1: Possible Grades Earned by Students in a Course

Range of Marks	Grade	Letter Grade	Grade Points
95 – 100	Exceptional	A+	4.00
90 – 94	Excellent	A	3.75
85 – 89	Superior	B+	3.50
80 – 84	Very Good	B	3.00
75 – 79	Above Average	C+	2.50
70 – 74	Good	C	2.00
65 – 69	High Pass	D+	1.50
60 – 64	Pass	D	1.00
Less than 60	Fail	F	0.00

In addition to the grades listed in the above table, other administrative non-traditional grades that could be assigned to the students are listed in Table 1-3 along with their conditions:

Table 2-2: Administrative Non – Traditional Grades

Grade	Conditions
IC (Incomplete)	Grade of "Incomplete" (IC) is given to the student if the course requirements are not completed by the student. The instructor may with the approval of the Department Council give the student an IC grade provided the student has provided an acceptable reason. The student must complete the course requirements by the end of the following term. Failure to do so will automatically change the IC grade into an F grade (Fail).
IP (In Progress)	If any course of a research nature requires more than one term for its completion, the student will be assigned an IP grade, and after the completion of the course, the student will be given the grade he has earned.

Grade	Conditions
	However, if he fails to complete the course on time, the department council teaching the course may approve the assignation of an IC grade for this course in his record. If a student is registered in the Cooperative Program in summer term and is assigned an IP grade in it, the "IP" grade will be changed to: a) "No Grade-Pass (NP)" if the student passes the Cooperative Program b) "F" grade if the student fails the Cooperative Program
DN (Denial)	A regular student should attend all classes and laboratory sessions. A student may be discontinued from a course and denied entrance to the final examination if his attendance is less than the limit determined by the University Council. This limit cannot be less than 75% of classes and lab sessions assigned to each course during the term. A student who is denied entrance to the examination due to excessive absences will be considered as having failed that course. A regular student will not be allowed to continue in a course and take the final examination and will be given a DN grade if his unexcused absences are more than 20% of the lecture and laboratory sessions scheduled for the course.
W (Withdrawn)	The grade WP is given to a student who officially withdraws from all courses after the permitted withdrawal deadline. This grade does not earn the student any credit units and affect the student's cumulative GPA.
NP (No Pass) NF (No Fail)	The grades NP or NF are assigned for courses offered on the basis of pass or fail, such as thesis and summer training.

The student's overall performance is determined through the process of assignment of academic status. A student's academic status will be determined at the end of each term and will appear on the transcript that shows his achievements throughout his undergraduate study.

2.3 Program Curriculum

FIRST YEAR (Freshman)

FIRST SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
MATH 101	Calculus 1	4	4	0		PHYS 101
PHYS 101	General Physics 1	4	3	3		MATH 101
CHEM 101	General Chemistry 1	4	3	4		
ENGL 100	English Language	2	2	0		
ARB 100	Arabic Language Skills	2	2	0		
PE 101	Physical Education 1	1	0	2		
TOTAL (CREDIT)		**17**				

SECOND SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
MATH 102	Calculus 2	4	4	0	MATH 101	PHYS 102
PHYS 102	General Physics 2	4	3	3	PHYS 101	MATH 102
ICS 103	Computer Programming in C	3	2	3	MATH 101	
ENGL 102	English Composition 2	3	3	0	ENGL 100 or ENGL 101	
IC 111	Islamic Culture	2	2	0		
PE 102	Physical Education 2	1	0	2	PE 101	
TOTAL (CREDIT)		**17**				

SECOND YEAR (SOPHOMORE)

FIRST SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
MATH 201	Calculus 3	3	3	0	MATH 102	
CRCL 115	University Life Skills	3	3	0		
EDUC 115	Work Values and Ethics	2	2	0		
CE 101	Engineering Graphics	2	1	3	ICS 103	
ME 215	Materials Science for ME	4	3	3	CHEM 101 & PHY 102 & MATH 102	
ISE 201	Intro. To Industrial Eng.	2	2	0	MATH 102	
EE 202	Fundamental of Electric Circuits	3	2	3	MATH 102 & PHYS 102	
TOTAL (CREDIT)		**19**				

SECOND SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
MATH 260	Introduction to DE and LA.	3	3	0	MATH 201	
ENGL 214	Technical Report Writing	3	3	0	ENGL 102	
ETEC 115	Computer and Information	2	2	0		
ME 206	Manufacturing Processes I	4	3	3	ME 215 & (CE 101 or ME 210)	
ISE 205	Engineering Prob. & Stats.	3	3	0	MATH 201	
ISE 301	Numerical Methods	3	3	0	MATH 201 & ICS 103	
TOTAL (CREDIT)		**18**				

THIRD YEAR (Junior)

FIRST SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
ISE 302	Linear Control Systems	3	2	3	MATH 260 & EE 202	
ISE 303	Operations Research I	3	3	0	ISE 201 & ISE 205	
ISE 307	Engineering Economics	3	3	0	Junior Standing	
ISE 323	Work and Process Improvement	3	2	3	ISE 205	
ISE 325	Engineering Statistics	3	3	0	ISE 205	
ISE 361	Fundamental of Database Systems	3	2	3	Junior Standing	
TOTAL (CREDIT)		**18**				

SECOND SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
ISE 304	Principles of Industrial Cost	3	3	0	ISE 205	
ISE 320	Industrial Quality Control	3	3	0	ISE 205	
ISE 390	Seminar	1	1	0	Junior Standing	
ISE 391	Industrial Eng. Design	2	1	3	ISE 205 & ENGL 214	
ISE 402	Production Systems	3	3	0	ISE 205	
ISE 405	Stochastic Systems Simulation	3	2	3	ISE 205	
EDUC 125	Entrepreneurship	2	2	0		
TOTAL (CREDIT)		**17**				

SUMMER TRAINING

CODE	COURSE TITLE	CRED
ISE 350	Cooperative Work Program	**0**
TOTAL (CREDIT)		**0**

FOURTH YEAR

FIRST SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
ISE 351	Coop. Work Program (Cont .)	9	0	9	Remaining hours less than or equal to 23 credit hours and Completion of all 1xx and 2xx courses	
TOTAL (CREDIT)		**9**				

SECOND SEMESTER						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
ISE 421	Operations Research II	3	3	0	ISE 303	Senior Standing
ISE 422	Facility Layout and Location	3	3	0	ISE 303	Senior Standing
ISE 490	Senior Design Project	3	1	6	ISE 390 & ISE 351	Senior Standing
ISE 4xx	ISE Elective	3	3	0	Senior Standing	
ISE 4xx	ISE Elective	3	3	0		
XXX xxx	Free Elective	3	3	0		
TOTAL (CREDIT)		**18**				

ELECTIVE COURSES (6 Hours)						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
Student has to select any two of the following Courses for ISE Electives (6 Hours)						
ISE 411	Productivity Engineering & Management	3	3	0	Senior Standing	
ISE 420	Quality Improvement Methods	3	3	0	ISE 320 & Senior Standing	
ISE 425	Queuing Systems	3	3	0	ISE 405 & Senior Standing	
ISE 443	Human Factors Engineering	3	2	3	ISE 205 &Senior Standing	
ISE 447	Decision Making	3	3	0	ISE 205 & Senior Standing	
ISE 448	Sequencing & Scheduling	3	3	0	ISE 303 & Senior Standing	
ISE 461	Computer Aided Manufacturing	3	3	0	ME 206 & Senior Standing	
ISE 463	Theory of Stochastic Processes	3	3	0	ISE 325 & Senior Standing	
ISE 464	Industrial Information Systems	3	2	3	ISE 361 & Senior Standing	
ISE 465	Industrial Safety	3	3	0	Senior Standing	
ISE 470	Supply Chain Systems Modeling	3	3	0	ISE 402 & Senior Standing	
ISE 480	Reliability and Maintainability	3	3	0	ISE 325 & Senior Standing	
ISE 491	Special Topics in Operations Research	3	3	0	Dept. Approval & Senior Standing	
ISE 492	Special Topics in Production and Quality Control	3	3	0	Dept. Approval & Senior Standing	
ISE 496	Industrial Strategic Planning	3	3	0	Dept. Approval & Senior Standing	
TOTAL (CREDIT)		**3 × 2 = 6**				

Free ELECTIVE COURSE (3 Hours)						
CODE	**COURSE TITLE**	**CRED**	**LECT**	**LAB**	**PRE-REQUISITE**	**CO-REQUISITE**
Student has to select one of the following Courses for Free Electives (3 Hours)						
ISE 429	Maintenance Planning and Control	3	3	0	Dept. Approval & Senior Standing	
ISE 493	Special Topics in Reliability and Maintenance	3	3	0	Dept. Approval & Senior Standing	
ISE 499	Energy Efficiency	3	3	0	Dept. Approval & Senior Standing	
TOTAL (CREDIT)		**3 × 1 = 3**				

2.4 Courses Description

The following section gives a brief description of the contents of core industrial engineering courses.

ISE 201 Introduction to Industrial Engineering (2-2-0)

This course is an introduction to and overview of the profession of industrial engineering (IE), including the multifaceted roles of an IE engineer, the different skills he/she should possess and sectors of employment. In addition, selected areas of IE, such as operations research, productivity, manufacturing techniques and systems, supply chain, decision making, quality and ethics, will be introduced.

Prerequisites: MATH 102

ISE 205 Engineering Probability and Statistics (3-3-0)

Data description and presentation. Basic concepts in probability. Random variables and probability distributions. Sampling distribution. Point estimation of parameters. Statistical intervals for a single sample. Statistical intervals for two samples. Laboratory projects consisting of selected applications.

Prerequisite: MATH 201

ISE 301 Numerical Methods (3-3-0)

Roots of nonlinear equations. Solutions of systems of linear algebraic equations. Numerical differentiation and integration. Interpolation. Least squares and regression analysis. Numerical solution of ordinary and partial differential equations. Introduction to error analysis. Engineering case studies.

Prerequisite: MATH 201 & ICS 103

ISE 302 Linear Control Systems (3-2-3)

Linear systems, Modeling of physical systems, Ordinary Differential equations models, Laplace Transform, transfer functions, block diagram manipulation. Open loop and close loop systems, time domain analysis, response of systems to different test signals, Steady state analysis. Concept of stability, Routh-Hurwitz criteria, controller design. Laboratory activities include modeling, analysis and simulation of physical processes.

Prerequisite: MATH 260 & EE 202

ISE 303 Operations Research I (3-3-0)

This course is an introduction to the application of Operations Research (OR) in industrial engineering. It explains the need for and importance of OR for rational decision-making in industrial activities. It introduces the basic OR concepts and techniques to identify and apply appropriate solutions to particular problems.

Students will acquire the essential tools of OR that enable them to model and make scientifically based decisions in economic and production environments.

Prerequisite: ISE 201 & ISE 205

ISE 304 Principles of Industrial Costing (3-3-0)

Introduction to basic costing concepts and behavior, with emphasis on manufacturing optimization through labor and materials cost analysis, operation and overhead cost calculations, product cost estimating, and finally setting product selling price. Study of the principles of costing systems and techniques of analysis and cost control. Emphasis on interpretation and use of costing principles for decision making.

Prerequisite: ISE 205

ISE 307 Engineering Economics (3-3-0)

Introduction to concepts of economic decision-making from a cash flow viewpoint. It includes present worth analysis, cash flow equivalence, rates of return, replacement analysis, benefit-cost analysis, depreciation and taxes, and projects break-even point, selection, and sensitivity analysis.

Prerequisite: Junior Standing

ISE 320 Industrial Quality Control (3-3-0)

The main purpose of this course is to provide the student with a clear and thorough understanding of quality control tools and statistical methods used in industries and manufacturing. The course covers the following subjects: Introduction to quality control and process improvement. Concepts of variation. Statistical process control (SPC tools). Control charts for variables and Control charts for attributes and their applications in process control. Process capability studies. Acceptance sampling. Cost of quality and the effects of quality on productivity.

Prerequisite: ISE 205

ISE 323 Work and Process Improvements (3-2-3)

Introduction to Process and Process Capability, Process analysis, Work Measurement standard data work sampling, Operations Analysis, Methods Engineering, Term Project, Predetermined Motion Time Systems, Methods design, The introduction to human engineering and Standardization.

Prerequisites: ISE 205

ISE 325 Engineering Statistics (3-3-0)

Review for estimation. Test of hypothesis for single and two samples. Applications of test of hypothesis in engineering. Simple and multiple linear regression and their applications. Design and analysis of single-factor experiments: analysis of variance. Design of experiments with several factors. Case studies in engineering statistics.

Prerequisite: ISE 205

ISE 350 Coop Work Progress (0-0-0)

Students are required to work in an Industrial setup during the summer semester.

ISE 351 Cooperative Work Program (9-0-0)

The Cooperative Work Program accounts for nine (9) credit hours, involves either a team based or a single student-based project that is geared toward an integrated application of several pieces of Systems Engineering knowledge learned by the student in his undergraduate education thus far. The co-op project must address technical aspects of the practice of Systems Engineering, including analysis, experimentation and design, by utilizing the problem-solving techniques covered in the various required (core) and elective courses offered at the Systems Engineering Department.

Prerequisite: Remaining hours less than or equal to 23 credit hours and Completion of all 1xx and 2xx courses.

ISE 361 Fundamentals of Database Systems (3-2-3)

This is a first course in database management systems, teaching database concepts, data modeling and database design. Fundamental database concepts, Relational Data Manipulation, Data modeling, Capturing Business Rules, Normalization, Database system development process, Transaction, Processing, Distributed Processing, Data Warehouses, and Databases on the Web. Concepts and tools will be integrated in a small-group term project by designing and implementing an actual information system.

Prerequisites: Junior standing

ISE 390 Seminar (1-1-0)

The purpose of this course is to raise students' awareness of contemporary issues in their discipline and otherwise. The student has to attend a required number of seminars, workshops, professional societal meetings or governmental agency conferences; at least half of these should address issues in his discipline. The student has to attend a required number of industrial visits.

Prerequisites: Junior standing

ISE 391 Industrial Engineering Design (2-1-3)

Introduction to engineering design, formulation of design problems, the design process, design phases, IE and the design process, Quality function deployment for specifying design requirements, design strategies, generating alternatives, probabilistic consideration in design, communication issues, design evaluation, selection and implementation. Discussion of case studies including operations systems, manufacturing, quality, ergonomics, layout and scheduling. Includes team project with an application in manufacturing or service industry.

Prerequisites: ISE 205

ISE 402 Production Systems (3-3-0)

Element of functional organization. Forecasting in production systems. Product and process design considerations. Deterministic and stochastic inventory systems. Production scheduling and line balancing. Capacity planning. Material requirement planning (MRP). Computer applications in production control. Case studies and applications.

Prerequisite: ISE 205

ISE 405 Stochastic Systems Simulation (3-2-3)

Basic discrete-event simulation modeling, queuing models, simulation languages, review of basic probability and statistics, random-number generators, generating random variables, output data analysis, validation of simulation models. A simulation program is used in the lab to illustrate simulation models on real case studies.

Prerequisites: ISE 205

ISE 411 Productivity Engineering and Management (3-3-0)

Introduction to productivity, productivity factors, measurement of productivity, planning for productivity, total productivity model, product base productivity improvement, employer-based productivity improvement, productivity improvement programs, case studies and class project.

Prerequisite: Junior standing

ISE 420 Advanced Quality Methods (3-3-0)

Introduction to principles and philosophies of total quality management, advance methods for process control, six sigma approach to quality, Quality function deployment (QFD) and Taguchi approach to quality and parameter optimization.

Prerequisite: ISE 320 and Senior standing

ISE 421 Operation Research II (3-3-0)

Following topics from operations research with an emphasis on modeling and implementation are provided, integer programming, dynamic programming and nonlinear programming. Implementation using modeling software and spreadsheet is demonstrated on examples and case studies.

Prerequisites: ISE 303

ISE 422 Facility Layout and Location (3-3-0)

Introduction to facility planning issues. Material handling. Facility location and layout and computer-aided techniques and packages. Storage and warehousing functions, emphasizing quantitative and simulation techniques.

Prerequisite: ISE 303

ISE 425 Queuing Systems (3-3-0)

Introduction to Queuing Models and Their Applications, Elements and Characteristics of Queuing Models, Single Server queue, Birth Death Processes, M/M/1, M/M/s, M/G/l, Little Law, Priority Queues, Network of Queues.

Prerequisite: ISE 405 and Senior Standing

ISE 429 Maintenance Planning and Control (3-3-0)

Maintenance Organization, Maintenance strategy, Forecasting maintenance work, Maintenance capacity planning, Component replacement decision models, Maintenance Measurement and Standards, Scheduling of maintenance, Maintenance material control, Quality of maintenance jobs, Maintenance productivity, Maintenance audit, Maintenance management information systems, Case Studies.

Prerequisite: Department approval and Senior standing

ISE 443 Human Factors Engineering (3-2-3)

Study of human response into man-machine systems. Study of visual displays as a medium of input. Auditory and tactual displays. Human control of systems. Control tools and related devices. Applied anthropometry and workplace design. Physical space arrangement, Environment, Illumination, Atmospheric conditions and noise.

Prerequisite: ISE 205 and Senior standing

ISE 447 Decision Making (3-3-0)

Basic, decision-making model under certainty with multiple criteria as well as under pure Uncertainty, Risk, Risk with information and conflict with single criteria, Structuring decision problems as well as applications in systems engineering are emphasized through problem sets, case studies and term project.

Prerequisite: ISE 205 and Senior standing

ISE 448 Sequencing and Scheduling (3-3-0)

Scheduling problems, optimality of schedules, processing, basic single; machine results, precedence constraints and efficiency, constructive algorithms for flow-shops and job-shops, dynamic programming approaches, branch and bound methods, integer, programming formulations, hard problems and NP-completeness. Heuristic methods: general approaches and worst-case bounds, simulated annealing approach.

Prerequisite: ISE 303 and Senior standing

ISE 461 Computer Aided Manufacturing (3-3-0)

High volume discrete parts production systems. Fundamentals of CAD/CAM. Computers in manufacturing. Computer process monitoring. Systems for manufacturing support. Group

technology and integrated manufacturing systems. Case studies for robots in industry. CAD/CAM using computer graphics laboratory.

Prerequisite: ME 206 and Senior standing

ISE 463 Theory of Stochastic Processes (3-3-0)

Basic review of probability, statistical independence, conditional expectation and characteristic function. Introduction to stochastic processes, stationarity and ergodicity. Markov chains and Poisson processes. Linear models of continuous- and discrete- time stochastic processes. Engineering applications.

Prerequisite: ISE 325 and Senior standing

ISE 464 Industrial Information Systems (3-2-3)

Design of industrial information systems. Focus on the planning, control of the flow of engineering and industrial information. Information systems requirements, analysis, and design. Students are required to work on a project of applied nature.

Prerequisite: ISE 361 and Senior standing

ISE 465 Industrial Safety (3-3-0)

The scope of occupational safety: Human safety, Environmental safety, Setting safety standard: Safety administration, Legal aspect of industrial safety.

Prerequisites: Senior standing

ISE 470 Supply Chain Systems Modelling (3-3-0)

This course adopts a modelling approach to supply chains that is designed to study trade-offs between system costs and customer service. Topics covered include supply chain design, multi-location inventory-distribution models, bullwhip effect, delayed differentiation, and e-commerce and supply chain. The key insights provided by such system-wide models will be illustrated through the use of software packages, real cases discussion and presentations and term projects. In addition, the course will highlight the role of information technology in supporting supply chain operations.

Prerequisite: ISE 402 and Senior standing

ISE 480 Reliability and Maintainability (3-3-0)

Introduction to Reliability Engineering, hazard and reliability functions, analyzing reliability data, reliability prediction and modeling, fault tress construction and decision tables, maintainability, maintenance and availability, reliability improvement.

Prerequisite: ISE 325 and Senior standing

ISE 490 Senior Design Project (3-3-0)

A design course that draws upon various components of the undergraduate curriculum. The project typically contains problem definition, analysis, evaluation and selection of alternatives. Real life applications are emphasized where appropriate constraints are considered. Oral presentation and a report are essential for course completion. The work should be supervised by faculty member(s). Team projects are acceptable wherever appropriate.

Prerequisite: ISE 390, ISE 351 and Senior standing

ISE 491 Special Topics in Operations Research (3-3-0)

A course in an area of operations research reflecting current theory and practice.

Prerequisite: Department approval and Senior standing

ISE 492 Special Topics in Production and Quality Control (3-3-0)

A course in an area of production and quality control reflecting current theory and practice.

Prerequisite: Department approval and Senior standing

ISE 493 Special Topics in Reliability and Maintenance (3-3-0)

A course in an area of reliability and maintenance reflecting current theory and practice.

Prerequisite: Department approval and Senior standing

ISE 496 Industrial Strategic Planning (3-3-0)

Introduction to Strategic Planning and BSC, development of strategy plans, Creating the Strategy Focused Organization, Building Strategy Map, Building Strategy Map for Private sectors, Building Strategy Map for non-profit organizations, Develop Balanced Scorecard Cooperate, Creating Business Unit Synergy (Department BSC), Individual BSC (Defining Personal and Team Objectives).

Prerequisite: Department approval and Senior standing

2.5 Assessment

The IE department uses many sources of data for the continuous improvement process. Various assessment methods used by the program are:

2.5.1. Direct Assessment

Direct assessments provide for the direct examination or observation of student knowledge or skills against measurable learning outcomes and may include Exams, Homework / Assignments, Presentations, Course project and Reports. Direct assessment method primarily relies upon possible components as described in Table 2-3.

Table 2-3: List of Possible Assessment Components

S-No	Possible Assessment Component	Number per course
1.	Mid Term Exam	1
2.	Final Exam	1
3.	Homework / Assignments	Varies
4.	Presentations	Varies
5.	Project	Varies
6.	Reports	Varies

Mid Term Exam

Every course can have a maximum of ONE Mid Term Exam. In this case the Mid Term Exam is of two hours duration and generally carries 30 – 35% of the total marks.

Final Examination

Final Examination is conducted in the 12th week of the term. The final exam is a comprehensive exam that covers all the material covered in the course. The final exam is of TWO hours duration. The final exam generally carries 40 – 45% of the total marks. The final exam is also required to be signed by the instructor as well as the checker.

Homework / Assignments

A course may have series of take-home assignments. It is the discretion of the faculty member to decide upon the number of homework assignments that he may give.

Presentations / Project / Reports

A faulty member may employ presentations, project or reports as part of evaluation component in his respective course.

2.5.2 Indirect Assessment Methods

Indirect assessments methods ascertain the perceived extent or value of learning experiences. They assess opinions or thoughts about student knowledge or skills and may include interviews, questionnaires and Advisory / Alumni / Faculty / Employer / Exit Student surveys.

2.6 Academic Advisory

At the beginning of the program, the newly inducted students are briefed about the program structure and other aspects that are expected from the students during their program of study at the College of Engineering.

The following arrangements are made for student support, academic and non-academic advice and counseling:

1. During each term students are allocated to academic advisors from within the faculty members of the Department. These advisors guide students about the choice of courses, advice to set career direction and other academic related matters. Around 10 – 15 students are assigned to each faculty member. The advisee students are allocated to the faculty members by the Department Advisory Committee coordinator. Academic advisors assist students in planning their academic programs, but their academic advising activities do not relieve students of this responsibility. Therefore, every student should be thoroughly familiar with all the academic regulations and the degree conferral system and remain informed about them throughout his career at the University.
2. The Department Advisory Committee includes the Head of the Department and a Department Coordinator. This committee cooperates with the College Advisory Committee to advise students on course selection at the beginning of each academic term.
3. At least 6 office hours per week are scheduled by each faculty member to provide academic support to students. The office hours along with list of Advisees are displayed on the Academic Advisor's Office door.
4. All students are made aware of any important information, dates and deadlines via Blackboard System, information and notice boards.
5. Career and non-academic counseling are also available from the UOH Deanship of Student Affairs
6. Advisory Board for IE students has been constituted to convey student requirements to the IE Council.

The advisees allocated to a faculty member are listed on his personal portal. All student requests for addition / deletion of courses, managing of conflicts etc. are also managed thru the Student Advising portal. The request from the student first comes to the respective faculty member, who then forwards it with the justification to the Head of the Department. The request finally goes to the Department Advisory Committee coordinator for final implementation.

2.7 Counseling

The Deanship of Student Affairs has established a Counseling Center. Faculty members are available to provide help if needed, however, the students may be advised to go to University Medical Centre when further professional counseling is required. It also provides transport to nearby hospitals.

3. PROGRAM INTENDED LEARNING OUTCOMES

Industrial Engineering Program Intended Learning Outcomes (ILOs)

3.1. Knowledge

The graduates of the IE program will be able to:

1.1. **Understand** the basics of mathematics, physical and engineering science.

1.2. **Recognize** the basics of mechanical design, materials and manufacturing technologies.

1.3. **Illustrate** the components, equipment, products, projects and manufacturing systems.

1.4. **Define** the technical and financial problems in manufacturing engineering fields.

1.5. **Explain** the quality and resource productivity indicators in the different production systems.

1.6. **List** the process, maintenance and safety plans in manufacturing engineering fields.

1.7. **Tell** ethical and professional responsibilities of the Industrial Engineering profession.

1.8. **Recognize** the concepts and legal requirements of risk management and safe design and operation.

3.2. Cognitive Skills

The graduates of the IE program will be able to:

2.1. **Identify** the production and design problems in manufacturing engineering fields.

2.2. **Formulate** the problem objectives and constraints relative to production and mechanical problems.

2.3. **Find** the different solution alternatives for the production and design problems.

2.4. **Analyse** the solution alternatives and choose the optimum one.

2.5. **Prepare** the design, materials, and process and operation sheets in details.

2.6. **Create** the different products, components and equipment in manufacturing fields.

2.7. **Select** the materials and production processes in manufacturing fields.

2.8. **Use** the different measuring and control devices in manufacturing fields.

2.9. **Develop** the computer programs and software used in the production and mechanical systems.

2.10. **Conduct** the experiments, as well as to analyze and interpret data in manufacturing fields.

2.11. **Design** the production systems, projects, product, component, process or operation to meet desired needs within realistic constraints such as economical, environmental, social, political, ethical, health and safety considerations.

2.12. **Rate** engineering techniques taking into account industrial and commercial restraints.

2.13. **Interpret** Industrial Engineering problems in-depth and find innovative solutions based on a feasibility study of the economic and applicability.

2.14. **Compare** alternative designs with an understanding of their impact on the proposed solutions.

2.15. **Design** systems, components or processes that meet specified needs with appropriate consideration of functionality, public health and safety, economical design, cultural, societal, and environmental considerations.

3.3. Interpersonal Skills and Responsibility

The graduates of the IE program will be able to:

3.1. **Demonstrate** the ability of self-learning by using advanced search tools of new information.

3.2. **Judge** the need to act ethically and consistently with high moral standards in personal and public forums.

3.3. **Illustrate** the ability to work effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

3.4. **Appraise** the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3.5. **Show** creativity to find new ways to solve problems.

3.4. Communication, Information Technology and Numerical Skills

IE Graduates will have an educated view of the world including:

4.1 **Work** effectively in a team.

4.2 **Share** ideas and communicate with others.

4.3 **Deal** with others according to the rules of professional ethics.

4.4 **Demonstrate** the technical communication skills (written, verbal, and drawing).

4.5 **Understand** the roles and limitations of technology in addressing society's problems.

4.6 **Understand** the cultural, historical, and philosophical foundations of society.

4.7 **Know** the political and economic systems, particularly those that affect the planning, design, construction, and operation of the infrastructure.

4.8 **Appreciate** the aesthetics and the environmental issues.

3.5. Psychomotor Skills

The graduates of the IE program will be able to:

5.1. **Perform** experiments and operate specific equipment and tools in laboratories.

5.2. **Operate** specific equipment and tools in workplaces.

5.3. **Draw** process flow diagrams used in Industrial engineering.

4. FACILITIES

College of Engineering is located in a purpose-built modern building (Building # B14) in the main campus of University of Ha'il. College shifted to the current location in Fall 2018. The building is equipped with modern Building Management System for environment control. The Department of Industrial Engineering is housed towards the southern side of the building on the first and second floor. The new building provides much more space for offices, classrooms, laboratories, and facilities than it was available in the old building.

4.1. Laboratories

The department is also in the process of acquiring state of the art equipment to supplement the theoretical concepts with the lab experiments. At the moment Department has following labs:

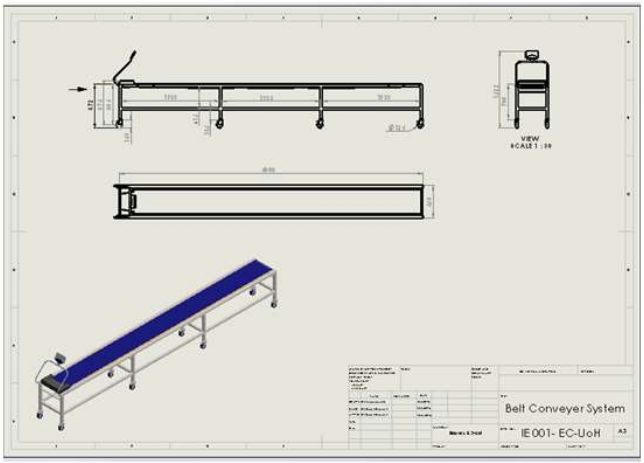
1. 3-D printing Lab
2. CNC Machine Lab
3. Six Sigma Lab
4. 3-D Scanners
5. Computer Integrated Manufacturing Lab

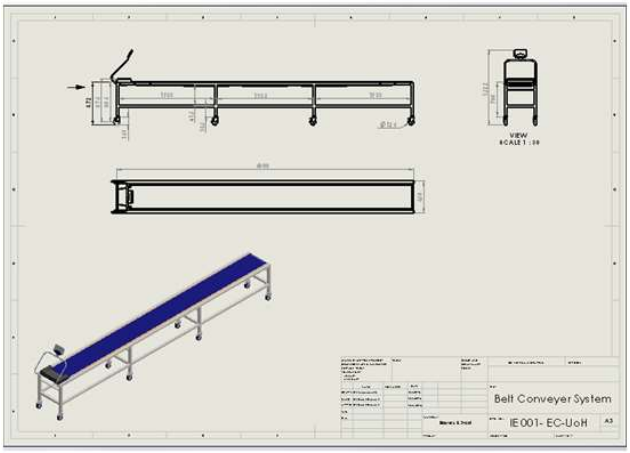
Department also utilizes latest software. Currently following software are being used with various courses:

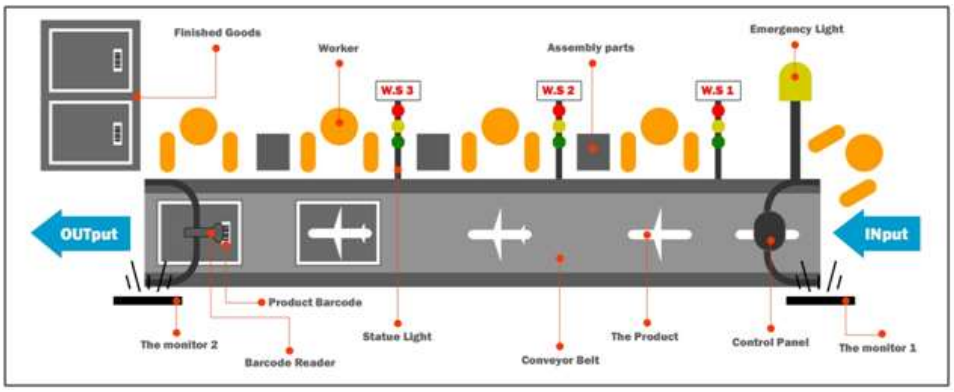
1. SolidWorks
2. Arena Simulation Software
3. Minitab
4. Production Planning Software

4.1.1. Production Systems Lab

Our Production system Just-in-time (JIT) manufacturing is a production model in which items are created to meet demand, not created in surplus or in advance of need. The purpose of JIT production is to avoid the waste associated with overproduction, waiting and excess inventory, three of the seven waste categories defined in the Toyota Production System (known in North America as the lean production model).







4.1.2. 3D Scanners Lab

Bring physical objects directly into CAD, supercharge your product development process, and automate precise 3D inspection with Go Scan - the powerful, integrated, industrial-grade 3D scanner and software system. The Capture scanners from 3D Systems deliver

accurate and fast blue light 3D scanning technology in a portable, lightweight unit that can be hand-held, static and easily combined into a multi-scanner configuration.

4.1.3. Computer Numerical Control (CNC) Lab

The heart of any manufacturing facility is the machine which produces basic mechanical parts. These machines could aid in producing a semi-finished or fully finished product. Precise machining requires extreme skill with tools, machine and the material of the job. With the inception of Computer Numerically Controlled (CNC) machines into manufacturing setup, precise and reliable machining without human intervention during the machining process has enabled reduction in operational hazards and in job time through automated machining and tool changing.

4.1.4. Computer Integrated Manufacturing (CIM) Lab

The Computer Integrated Manufacturing (CIM) Laboratory is designed for education and or research. Cell 1 is an assembly and quality control station, which has one SCORA ER 14 Robot provided by Intelitek. The robot has a pneumatic gripper and works in connection with the peripheral cell devices. The overall system is run with a supervisory host control system consisting of a set of cell work station PC's and a host computer, which allows management of FMS orders and operations via the CIM Manager – OPEN CIM software system architecture.

4.1.5. Computer Laboratory

One computer lab with 25 workstations in the Postgraduate section. The computer lab is equipped with all necessary software applications required by the students like Microsoft Office suite. The lab is also equipped with smart multimedia projector and white board.

4.2. Classrooms

All classes are held in the Postgraduate Section located on the second floor of the College of Engineering building. There are six classrooms ranging from a capacity of 25 to 40 students. All classrooms are equipped with a smart projector, screen, whiteboard and internet connection. All classrooms have control for air-conditioning system.

4.3. Library Services

The central library of UoH is maintained by the Deanship of Library Affairs and is available to all faculty members and students. The central library has wide range of books related to Industrial Engineering. In addition to main University library, College of Engineering has a small library of its own.

Library material in main University Library is shelved in open stacks using the Dewey Decimal Classification Scheme. The library collection is accessible to all faculty members and students

during the weekday work hours. Professional librarians are available during the working hours to provide any assistance.
All essential books required by the program are available in the library.

4.4. Access to Saudi Digital Library (SDL)

All faculty members and students also have access to Saudi Digital Library (SDL) where it provides access to all the major databases like, IEEE Xplore, ACM Digital Library, Science Direct, Springer, Taylor & Francis, Wiley, Oxford etc. and numerous more.

5. GRADUATES EMPLOYMENT OPPORTUNITIES

Industrial engineering has wide applications in manufacturing, service, commercial, and governmental sectors. Rapid industrial development in the Kingdom of Saudi Arabia definitely requires an increasing number of competent and well-trained industrial engineers.
Typical industries and organizations, which employ industrial engineers include:

- Oil & Gas
- Chemical industries
- Electrical power generation and distribution
- Automation and machinery manufacturers
- Food processing industries
- Health systems management
- Trading, logistics and transportation industries
- Banking and service organizations
- Training, research and development institutions

Examples of job responsibilities for industrial engineers are as follow:

- Designing floor layouts for factories
- Designing operations to improve system efficiency
- Reducing time and waste in processing
- Allocating resources to optimize system performance
- Developing safety plans for preventing work-related injuries
- Planning, analysis, and design of manufacturing methods
- Design and development of integrated physical and operational systems
- Design, development and maintenance of distribution system for goods and services.
- Productivity improvement and effective utilization of human and material resources
- Planning, inspection and maintenance engineering
- Job and work place design