



وزارة التعليم

Ministry of Education



جامعة المستقبل

Mustaqbal University

أول جامعة أهلية بمنطقة القصيم

كلية الهندسة وعلوم الحاسب

قسم الهندسة الصناعية

توصيف مقررات

برنامج الهندسة الصناعية

العام الجامعي 1443 هـ

📁 ENGL 101 Introduction to Academic Discourse

This course is designed to enable students to recognize and interpret the various modes of spoken and written academic discourse and to produce written documents related to what they have read. The main writing skills component of the course teaches students to make use of the principal modes of exposition and various types of academic correspondence common in English to write well-organized texts. The course's reading skills element focuses on ways to improve students' reading of scientifically-oriented college-level text books and specialist articles and to familiarize them with the organizational and typographical features (glossaries, indices, headings, boldface, italics, etc.) of such texts. The course's oral skills element introduces students to academic oral communication in classroom and tutorial interaction. The electronic skills taught are intended to complement the written and oral skills by enabling students to use state-of-the-art internet and database search techniques to locate the information they require for expository composition writing and class-related tasks. Students will also be required to maintain a portfolio (including a reflective journal) exhibiting their efforts, progress, and achievement throughout the course.

Prerequisite: ENGL 002

📁 ENGL 102 Introduction to Report Writing

This course sets out to develop students' spoken and written communication skills in English, particularly with regard to the production of a researched academic/professional type report. The writing skills component includes paraphrasing and synthesis of ideas from several different sources for expository composition and term report writing; training in composing various types of formal correspondence to enable students to function well in the university setting; the researching (library and internet), organizing, and writing of an academic term report in which students must be especially sensitive to their particular audience, introducing them to oral presentations in which they must communicate information to an audience using a variety of presentational media. Electronic skills are taught to complement the written and oral skills by enabling students to use state-of-the-art internet and database search techniques to locate the information they require in order to produce written reports or presentations. Students will also be required to maintain a portfolio (including a reflective journal) exhibiting their efforts, progress, and achievement throughout the course.

Prerequisite: ENGL 101

📁 ENGL 214 Academic & Professional Communication

The purpose of this course is to further develop students' spoken and written communication skills in English in order to prepare them for future academic and professional life. The writing skills component includes training in composing various types of business correspondence to enable students to function well in the world of work. It also deals with the researching, organizing, and writing of technical reports in which students must be especially sensitive to their particular audience. The course's orals skill component enhances students' oral presentation skills as they will practice communicating a technical subject to a lay audience using a variety of presentational media. The electronic skills taught are intended to complement the written and oral skills by enabling students to use state-of-the-art internet and database search techniques to locate the information they require in order to produce written reports or presentations. Students will also be required to maintain a portfolio (including a reflective journal) exhibiting their efforts, progress, and achievement throughout the course.

Prerequisite: ENGL 102

📁 IAS 201 Writing for Professional Needs

Characteristics and types of formal writing: reports; scientific research; summaries; forms resume; evaluations and minutes of meetings.

Prerequisite: IAS 101

📁 IAS 212 Professional Ethics

Importance of ethics in Islam and the integration of worship and aspects of professional life. Suitability criteria for employment in Islam. Standards for professional behavior. Employee interaction with others.

Application of Islam to professional violations. Saudi Laws and professional behavior.

Prerequisite: IAS 111

📁 IAS 311 Islamic Shariah

This course is important for the student to act well in like. The course includes: (i) Good manners in life of Muslims in general; (ii) The state of Arabs before Islam in terms of marriage, divorce, and inheritance; (iii) The merits and characteristics of Islamic Sharia; (iv) A short study of the four Islamic jurisprudence schools, and (v) A short study of Islamic jurisprudence branches.

Prerequisite: IAS 111

📁 MATH 102 Calculus II

Definite and indefinite integrals of functions of a single variable. Fundamental Theorem of Calculus. Techniques of integration. Hyperbolic functions. Applications of the definite integral to area, volume, arc length and surface of revolution. Improper integrals. Sequences and series: convergence tests, integral, comparison, ratio and root tests. Alternating series. Absolute and conditional convergence. Power series. Taylor and Maclaurin series.

Prerequisite: MATH 101

📁 MATH 201 Calculus III

Polar coordinates, polar curves, area in polar coordinates. Vectors, lines, planes and surfaces. Cylindrical and spherical coordinates. Functions of two and three variables, limits and continuity. Partial derivatives, directional derivatives. Extrema of functions of two variables. Double integrals, double integrals in polar coordinates. Triple integrals, triple integrals in cylindrical and spherical coordinates.

Prerequisite: MATH 102

📁 MATH 260 Linear Algebra and Differential Equations

Systems of linear equations. Rank of matrices. Eigenvalues and eigenvectors. Vector spaces, subspaces, bases, dimensions. Invertible matrices. Similar matrices. Diagonalizable matrices. Block diagonal and Jordan forms. First order differential equations: separable and exact. The homogeneous differential equations with constant coefficients. Wronskian. Non-homogeneous differential equations. Methods of undetermined coefficients and variation of parameters. Systems of differential equations. Non-homogeneous systems.

Prerequisite: MATH 102

📁 MATH 360 Discrete Mathematics

Topics cover in this course include The Foundations: Logic and Proof, Sets, and Functions, Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Methods of Proof, Sets, Set Operations, and Functions. The Fundamentals: Algorithms, the Integers, and Matrices, Algorithms, Growth of Functions, Complexity of Algorithms, Integers and Division, Applications of Number Theory, Matrices. Mathematical Reasoning, Induction, and Recursion: Proof Strategy, Sequences and Summations, Mathematical Induction, Recursive Definitions and Structural Induction, Program Correctness. Counting: The Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients Inclusion-Exclusion, Applications of Inclusion-Exclusion. Discrete Probability. Relations: Relations and Their Properties, Binary Relations and Their Applications, Representing Relations, Equivalence Relations. Graphs: Introduction to Graphs, Graph Terminology, Representing Graphs and Graph Isomorphism, Connectivity. Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees. Boolean algebra: Boolean Functions, Representing Boolean Functions, Logic Gates. Modeling Computation: Languages and Grammars. The lab session to problem solving using software

Prerequisite: MATH 102

STAT 219 Probability and Statistics for Engineers and Scientists

Presentation and interpretation of data, elementary probability concepts, random variables and probability distributions, binomial, Poisson, exponential, Weibull, normal and lognormal random variables. Estimation, tests of hypotheses for the one sample problem. Simple and multiple linear regression, application to engineering problems. The lab session will be devoted to problem solving using statistics software.

Prerequisite: MATH 102

PHYS 102 General Physics II

A continuation of PHYS 101. Topics covered include: wave motion and sound; temperature, first and second law of thermodynamics; kinetic theory of gases; Coulomb's law; the electric field; Gauss' law; electric potential; capacitors and dielectrics; D.C. circuits; the magnetic field; Ampere's and Faraday's laws.

Prerequisite: PHYS 101, Co requisite: MATH 102

CHEM 101 General Chemistry I

Matter, atomic structure and the periodic table, chemical bonding, stoichiometry of pure substances, reaction in aqueous solutions, states of matter (gases, liquids, and solids), mixtures (with emphasis on some physical aspects of solutions), and thermochemistry.

Laboratory: Qualitative and quantitative aspects of general chemistry.

Prerequisite: None

IE 199 Introduction to Engineering and Design

Engineering profession, jobs, and disciplines; Elements of engineering analysis; Introduction to engineering design and team formation; Engineering problem definition; Engineering system Architecture and physical function decomposition; human factor, environment, and safety issues in design; Generation of alternative concepts; Evaluation of alternatives and selection of a concept, Design defense, performance evaluation, and reporting; Intellectual Property – Legal Factors, Engineering Ethics.

Prerequisite: None

IE 201 Computer aided Drafting

Engineering drawing types; Drawing equipment; Layout of drawings, Tangencies, Isometric drawing; Orthographic, oblique and pictorial projection, computer graphics; Basic mathematical functions for graphics, Basic of engineering drafting using computer software (such as AutoCad, Catia). CAD system examples, Generating basic sketch, layout, dimensioning, tolerance, sectioning and generating different views using computer aided drafting software,; Assembly of components and generating bill of material, Detailed drawings including sections and assemblies

Prerequisite: None

ME 201 Engineering Mechanics

Force systems; vector analysis, moments and couples in 2D and 3D. Equilibrium of force systems. Analysis of structures; plane trusses and frames. Distributed force system; centroids and composite bodies. Area moments of inertia. Analysis of beams. Friction. Kinematics and Kinetics of a particle, kinetics of a system of particles. Kinematics and kinetics of a rigid body in plane motion.

Prerequisite: MATH 102

EE 209 Fundamental of Electrical System (For Non-EE Students Only)

DC Networks: resistance and Ohm's law, series/parallel networks, current sources, multisource networks, network theorems. AC Networks: sinusoidal (AC) waveform, effective (RMS) values, average values, the R, L, C Elements, Phasors and Complex Numbers, series and parallel (AC) networks. Polyphase Systems and Resonance: multisource (AC) Networks, network theorems, Polyphase Systems. Electromagnetism: transformers. Generators and Motors: DC generators, DC Motors, AC generators

Prerequisite: MATH 102, PHYS 102.

CS 101 Computer Programming I

Overview of computers and computing. Introduction to a typical programming language, such as Java. Basic data types and operators. Basic object-oriented concepts. Wrapper classes. Console input/output. Logical expressions and control structures. Memory models and methods. Arrays and strings. More object-oriented concepts.

Suggested Lab work (Closed Lab): Programming assignments to exercise the use of the various features of the object oriented programming language taught in the course. This may include the implementation of basic applets, numerical algorithms such as finding the average, standard deviation etc., as well as non-numerical algorithms such as basic recursive methods used in sorting and searching techniques.

Co requisite: MATH 101

IE250 Manufacturing Materials

Engineering materials properties testing and processing parameters; Material compositions and structures; physical and mechanical properties of materials; Ferrous materials; Heat treatment; Non-Ferrous alloys; Ceramics, Polymers, Composites; introduction to Nano materials; Material selection.

Prerequisite: CHEM 101, PHYS 102

IE 311 Operation Management I

Introduction to operation management and productivity; Forecasting methods and analysis; Capacity planning; Inventory management; Material requirement planning.

Prerequisite: STAT 219

IE 312 Operation Management II

Aggregate planning; machine scheduling; line balancing; Project planning, JIT and lean operations; Supply chain management; Decision making methods.

Prerequisite: IE 311

IE 321 Operation Research I

Introduction to mathematical programming and optimization; Characteristics of linear programs; Modeling of various industrial programs as linear programs; Graphical solutions; Introduction to the theory of simplex methods; Big M method, Unbounded and infeasible solutions; Sensitivity analysis and introduction to the duality theory; Transportation and assignment problems and solution techniques; Shortest path, Minimum spanning tree, and maximum flow problems; Goal Programming.

Prerequisite: MATH 260, CS101

IE 322 Operation Research II

Deterministic dynamic programming; Forward and backward procedures; Integer programming; Branch and Bound methods; Nonlinear programming; Single and multi-variable unconstrained optimization; KKT conditions and quadratic programming; Markov chains; Queuing Theory.

Prerequisite: IE 321

IE 331 Design of Experiment

Introduction to design of experiments and its applications in industry; Hypothesis testing; Analysis of variance; Residual analysis; Block design; Randomized complete and incomplete designs; Two and multi factor factorial design; Introduction to response surface methodology.

Prerequisite: STAT 219

IE 332 Engineering Economy

Cost concepts; Time value of money operations; Measuring the worth of investments; Comparison of alternatives; Depreciation; Economic analysis of public projects; Inflation, Breakeven analysis; Manufacturing costing.

Prerequisite: MATH 102

IE 333 Engineering Reliability

Introduction to the concept of reliability; Failure distributions; Reliability characteristics; Estimation of system reliability both for the independent and dependent cases.

Prerequisite: STAT219

IE 334 Quality Engineering I

An understanding of the basic concepts of quality; An appreciation of the functions served by a quality management system; the ability to design quality into products so as to satisfy both internal and external customer; The study of frequency distributions and probability models in quality control; Preparation and use various control charts; Construction of different sampling plans; Quality improvement Methods and analysis of quality costs; Application of computer in the above areas.

Prerequisite: IE331, Co. Pr. IE351

IE 351 Manufacturing Processes I

Engineering materials processing parameters that influence design considerations, product quality and production costs; Definition of stress, strain and mechanical properties of materials applied to metal forming processes; sheet metal forming, processes (deep drawing, stretch shearing and bending); bulk forming processes (forging, rolling, extrusion and wire drawing); basic casting techniques; Welding processes.

Prerequisite: ME201, IE250

IE 352 Manufacturing Processes II

Part specification and geometrical Tolerance; Cutting mechanics; Process-capability analysis and Decision; optimization of cutting variables for machining operations; Process planning; Principles of NC (Numerical Control), and CNC (Computer NC); Assembly design; Non-traditional machining, introduction to process planning.

Prerequisite: IE 351, EE209

IE 412 Project Management

The course covers the project management process from the beginning to the end, focusing on practical skills that make students able to immediately complete projects on time and on budget, while achieving their targets; Project Participants and Project Life Cycle. Contractual and organizational approaches; Projects Planning Processes and Bar Chart; Network Model; Scheduling using activity-on-node, precedence methods and time Scaled.; Resource levelling and allocation; Project time-cost trade-off; Financial Management: Cash flow Forecasting; Project time and cost control; Analysis of Scheduling Delay; Project risk analysis.

Prerequisite: MATH 201

IE 423 Industrial System Simulation

Introduction to the concept of simulation including modeling and simulation languages; Appropriate inputs to a simulation model; and random number generation; Analysis of the output from a simulation model; Validation of the simulation model.

Prerequisite: IE322

IE 441 Work Design and Analysis

Introduction to work analysis and design; Methods engineering; Study of the basic work measurement techniques; Applications and limitations of the stop-watch time study; pre-determined motion time systems; Reengineering management.

Prerequisite: IE 352

📁 IE 442 Human Factor and Safety Engineering

Introduction to human factors; Human-Machine Systems; Information theory; Human Capabilities; environmental and thermal factors; Workplace Design, Physical Work and Manual Materials Handling and Speech Communications; Industrial hazard avoidance concepts and techniques; Plant safety applications; Analytical trees and fault tree analysis; Risk assessment; Emergency planning.

Prerequisite: IE331, IE441

📁 IE 461 Industrial Automation

Process control fundamentals; Control theory principles; Modeling analogy; Digital control using programmable logic controller and computer. Industrial Automation and applications.

Prerequisite: EE209, CS101

📁 IE 462 Product Development and Innovation

Introduction to manage innovation; product development stages; Customer needs; Product specification; Quality function deployment; Product structure and components; Function Analysis; Value engineering principles; principle of reverse engineering; Idea generation; Theory of inventive problem solving (TIPS-TRIZ); Design for manufacturing and assembly (DFMA); Principles of robust design; Implementing prototype metrologies; product development and Entrepreneurship; product development project.

Prerequisite: IE199, IE334, IE451

📁 IE 463 Facility Design and Material Handling

Facility design stages of Industrial Factory Product, process and material handling analysis; Area allocation and space analysis; Flow analysis; Plant layout and plan; Concepts and methodologies for the analysis and design of material handling systems. Automated material handling systems. Concept of storage analysis. Location problem analysis. Computerized facility layout and allocations.

Prerequisite: IE 322, IE 441

📁 IE 464 Production System Design and Analysis

Definition and classification of production systems; Production strategies (lean manufacturing, agile manufacturing and Application of KBS in manufacturing); Design of capacity for production system, performance of production system; Modeling of manufacturing systems; High volume production systems design and analysis; Group technology and cell design; Flexible manufacturing performance analysis; automated inspection analyses.

Prerequisite: IE 312, IE352

📁 IE 498 Design Project I

Senior student selects a project applying learned tools and knowledge to understand the process and elements of a large, interdisciplinary engineering project design through experience. The course is carried out by: Choosing the topic; Establishing the project; reviewing background; Preparing for/or preliminary conducting of the experiments; Collecting the field data and developing the mathematical model if applicable; Writing the first two chapters along with any preliminary findings,

Prerequisite: Pass Successfully 129 Cr. Hr.

📁 IE 499 Design Project II

This course is continuation of part I of the project and the following tasks are carried out: Running and finalizing the experimental program or the mathematical/computer model; Analyzing the results and findings and drawing the conclusions; Writing the complete project report; Presenting and defending the project.

Prerequisite: IE 498

IE 999 Practical Training

The student should gain an industrial training in the field at any governmental and or private industry for ten weeks.

Prerequisite: Junior Standing, Approval of the Department

IE Elective courses**IE 411 Industrial Information Systems**

Analysis, design and implementation of industrial information systems with special focus placed on manufacturing systems and environments; Information systems development life cycle, information systems requirements determination; Data modeling; Structured analysis and functional architecture design; Object-oriented analysis and design; E-business and web-based database.

Prerequisite: IE 312

IE 413 Supply Chain and Inventory Control

Methods of inventory control, modelling of supply chain, supply chain design, multi-location inventory-distribution models, bullwhip effect, delayed differentiation, and e-commerce and supply chain. Supply chain design: customer service, quality, logistics, inventory, business processes, system dynamics, control, design, and re-engineering. Supply chain operations: issues, opportunities, tools, approaches, inter-organizational relationships, incentives and risk factors. 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: IE 312

IE 414 Productivity Engineering and Management

Measurement of productivity. Micro and Macro analysis for engineering productivity - Process and product oriented. Effect of automation and computer integration on productivity, case studies.

Prerequisite: IE 312

IE 415 Production System Operation

Business plans to production operation systems, strategies to reach targets, production operations system's contribution to competitiveness, balancing production operations system and strategies; Production system operations performance; Advance production system operations dynamic, bottleneck rates, internal benchmarking, labor constrained production operation system; Just in time revolution and lean manufacturing, implementing just in time, pull production operation system, kanban, comparison of conwip with kanban and material requirement planning, production scheduling in pull environment; Advance aggregate and work force planning, product mix planning, combined modeling insides; Production systems operation development in the future, key areas and success factors, future production from an international perspective.

Prerequisite: IE 312

IE 433 Quality Engineering II

Introduction to principles and philosophies of total quality management (TQM), advance methods for process control, six sigma approach to quality, Quality function deployment (QFD) and Taguchi approach to quality and parameter optimization. Kaizen Methodology, 5S Methodology, 7 wastes (7Muda).

Prerequisite: IE 334

IE 434 Manufacturing Cost Analysis

Introduction to manufacturing economics; Labor cost analysis; Materials cost analysis; Overhead cost calculations; Operation cost estimating, product cost estimating, and product pricing; Costing analysis; The Enterprise Entrepreneurship.

Prerequisite: IE 332, IE352

IE 443 Safety Engineering

Introduction to regulations and standards; Management and its safety responsibilities; Safety system design; Training Methods, Management and its Responsibilities for Safety, Statistical methods, Network Analysis, Hazard Analysis, Risk Analysis, and Decision Theory.

Prerequisite: Co. Pr. IE 442

IE 444 Ergonomic Design

This course covers mainly theories/methods that influence the assessment of physical, social, and psychological human factors. Development of user needs with application to designed products that interact with human body. In addition, application of design to meet human needs. Design of fabricated products, tools/machines, software/hardware interfaces, art/culture, living environments, and complex sociotechnical systems.

Prerequisite: IE 442

IE 465 Computer Integrated Manufacturing

Introduction and manufacturing systems; Industrial Robots; Material handling systems; Automated storage and retrieval system; Automated identification and data capture; Industrial Networks and Communication Systems; Industrial Information Systems; Computer Aided Process Planning; Inspection principles and technologies.

Prerequisite: Co. Pr. IE 463

IE 466 Manufacturing Systems Modeling

Definition and classification of factory models; Process time variability; Multi stage single product factory models; Multiple product factory models; Models of various forms of batching; Serial limited Buffer models; Simulations techniques in manufacturing

Prerequisite: Co. Pr IE 464

IE 467 Automatic control Systems

The course deals with introduction to design of feedback control systems, properties and advantages of feedback systems, time-domain and frequency-domain performance measures, stability and degree of stability. It also covers root locus method, nyquist criterion, frequency-domain design, and state space methods.

Prerequisite: EE209, CS101