Pharos University in Alexandria
Faculty of Engineering

CHAPTER 5

COURSE DESCRIPTION

FOR FACULTY DEPARTMENTS

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5.1 BASIC SCIENCE DEPARTMENT

The Department of Basic Engineering Sciences offers a range of basic sciences courses relating to the major scientific engineering disciplines, to prepare the students to all educational programs of the faculty.

The Basic Engineering Sciences Department provides courses including engineering mathematics, engineering mechanics, engineering physics, chemistry, geometrical projection (descriptive geometry) and engineering drawing. The department provides, also, the practical studies in the fields of engineering physics and chemistry.

Courses of human and social sciences are offered under the supervision of the Basic Science Department, and they will be coded with the abbreviation "HU" for human courses.

5.1.1 DESCRIPTION OF MATHEMATICS COURSES

5.1.1.1 EB101"ENGINEERING MATHEMATICS (1)": 3Cr [2-2-1]

Pre-requites: none

Course Catalogue Description:

This is the first of several mathematics courses which cover most of the basic mathematics needed for engineering degree programs. This course contains the well recognized elements of classical engineering mathematics which universally underpin the formation of the professional engineer. The main sections are: Algebra (partial fractions, binomial theorem), Analytical Geometry, Differential Calculus (continuity, limits, differentiation, and related applications).

5.1.1.2 "EB102" ENGINEERING MATHEMATICS (2): 3Cr [2-2-1]

Pre-requites: EB101

Course Catalogue Description:

This Course covers Calculus of one Variable and includes Introduction of integration with applications to area and volumes of revolution, transcendental functions, inverse trigonometric and logarithmic functions, techniques of integrations, and applications that include Centroids. Other topic covered are introduction to differential equations, change of axes and conic sections.

5.1.1.3 "EB103" ENGINEERING MATHEMATICS (3): 3Cr [2-2-1]

Pre-requites: EB102

Course Catalogue Description:

This course covers more advanced techniques of integration, improper integrals, infinite series (arithmetic series, geometric series, as well as Taylor and Maclaurin series), brief introduction to functions of several variables and their applications, ordinary equations (first and higher orders with constant and variable coefficients) and also systems of differential equations with relevant physical applications.

5.1.1.4 "EB204" ENGINEERING MATHEMATICS (4): 3Cr [2-2-1]

Pre-requites: EB103

Course Catalogue Description:

This course covers the fundamental concept of functions of several variables, the calculus of vector function, line integrals, multiple integrals, volume integrals and surface integrals, concept of conservative fields, the definition and theory of Laplace transformation, applying the above concepts and techniques in fluid mechanics and electric fields, application of Laplace transform in solving initial-value problems, and Fourier series.

5.1.1.5 "EB104" LINEAR ALGEBRA: 3Cr [2-2-1]

Pre-requites: EB102

Course Catalogue Description:

This course covers the fundamentals on matrix theory and linear algebra. Emphasis is given to topics that will be useful in other disciplines, including systems of equations, vector spaces, determinants, Eigen values and Eigen vectors, similarity, and positive definite matrices, Linear Transformations, and Matrix Decomposition.

5.1.1.6 "EB207" NUMERICAL ANALYSIS USING MATLAB: 4Cr [3-1-2]

Pre-requites: EB102

Course Catalogue Description:

This is a realization of the necessity of numerical methods in order to simulate technological and scientific processes based on mathematical models. Basic concepts and ideas include: algorithm, local linearization, iteration, extrapolation, discretization, convergence, stability, condition number. Numerical methods for: linear systems of equations, nonlinear equations and systems of equations, interpolation, model-fitting with the method of least squares, optimization, quadrature, integration, differential equations. The application of mathematical software as MATLAB in the solution of scientific and engineering problems, numerical experimentation, and the presentation of effective algorithms.

5.1.1.7 "EB205" PROBABILITIES AND RANDOM VARIABLES: 3Cr [3-1-0]

Pre-requites: EB204

Course Catalogue Description:

This course covers most of the basic concepts and definitions of probability needed for engineering degree programs. It also covers the concepts of random variables and their distributions, and the basic probabilistic and statistical analysis.

5.1.1.8 "EB206" SPECIAL FUNCTIONS: 3Cr [3-1-0]

Pre-requites: EB204

Course Catalogue Description:

This course is designed to introduce the students of Engineering Faculty to the bases of solving differential equations by means of infinite series and of Special Functions such as Legendre, Hermit, Laguerre and Chebyshev Polynomials, as well as Bessel, Elliptic and Unit-step Functions.

5.1.1.9 "EB208" APPLIED PROBABILITY & STATISTICS: 3Cr [3-1-0]

Pre-requites: EB204

Course Catalogue Description:

This course covers descriptive statistics, random variables, probability, probability distributions, estimation, hypothesis testing, Chi-Square, correlation, and simple regression. It also covers review of probability theory; introduction to random walks; counting and Poisson processes; Markov chains in discrete and continuous time; renewal and regenerative processes; introduction to Brownian motion. Selected

applications such as queuing and inventory systems, data/communications networks, production planning, computer systems/algorithms, financial/risk management, genetic and epidemic models, and decision analysis.

5.1.1.10 "EB209" COMPLEX VARIABLES: 3Cr [3-1-0]

Pre-requites: EB204

Course Catalogue Description:

The course covers the basic principles of differentiable complex-valued functions of a single complex variable. Topics include the complex number system, Cauchy-Riemann conditions, analytic functions and their properties, special analytic functions including linear fractional transformations, roots, exponential, Log, trigonometric and hyperbolic functions of a complex variable; Complex integration and line integrals, Cauchy's theorem conformal mapping, Taylor and Laurent Series expansions; the calculus of residues and various applications.

5.1.2 DESCRIPTION OF ENGINEERING MECHANICS COURSES

5.1.1.11 "EB111" ENGINEERING MECHANICS (1): 3Cr [3-1-0]

Pre-requites: none

Course Catalogue Description:

This is a basic subject on Engineering Statics. Emphasis is given to topics that will be useful in other disciplines, including statics of particles, friction, and statics of rigid body, centers of gravity, and introduction to analysis of structures.

5.1.1.12 "EB112" ENGINEERING MECHANICS (2): 3Cr [3-1-0]

Pre-requites: EB111

Course Catalogue Description:

This is a basic subject on Engineering Dynamics. Emphasis is given to topics that will be useful in other disciplines, including Kinematics of Particles, Kinetics of Particles, and energy and momentum methods.

5.1.1.13 "EB113" ENGINEERING MECHANICS (3): 3Cr [3-1-0]

Pre-requites: EB111 & EB112

Course Catalogue Description:

This is a subject on Statics and Dynamics of rigid bodies. Emphasis is given to topics that will be useful in other disciplines, including systems of particles, Kinematics of rigid Body, Moments of Inertia, Kinetics of rigid Bodies.

5.1.1.14 "EB114" STATICS & DYNAMICS: 3Cr [3-1-0]

Pre-requites: EB111 & EB112

Course Catalogue Description:

This course covers advanced topics on statics and dynamics of rigid bodies. It extends the knowledge covered in earlier courses and addresses the statics of suspended bodies in particular bridges and catenaries. The concept of virtual work and related applications are also covered.

5.1.3 *DESCRIPTION OF ENGINEERING PHYSICS COURSES*

5.1.3.1 "EB121" ENGINEERING PHYSICS (1): 3Cr [2-1-2]

Pre-requites: EB111 & EB112

Course Catalogue Description:

This course contains the well-recognized elements of classical engineering physics that universally underpin the formation of the professional engineer. It involves the study of: Units and Dimensions, Rotational Motion of Rigid Bodies, Moment of Inertia, Torque; Rotational Energy, Work and Power; Angular and Linear velocity and accelerations, Elasticity: Stress; Strain; Modulus of Elasticity; stored Energy in Strained Solids. Fluid mechanics: Equation of Continuity; Bernoulli's Equation. Viscosity, Poiseuille's Law. Wave motion: types of waves, Sound waves: Doppler Effect. Thermal properties and heat transfer techniques: thermal expansion, heat and internal energy, heat capacity and specific heat. Thermal energy transfer mechanisms. Work and heat in thermodynamic processes. The first law of thermo dynamics.

5.1.3.2 "EB122" ENGINEERING PHYSICS (2): 3Cr [2-1-2]
Pre-requites: EB121

Course Catalogue Description:

This course is to introduce electricity and further develop fundamental ideas of Electricity and Optics. Lecture topics include: electrical current and resistance, EMF, D.C. circuits and electrical measurements, electric charge, electric field and potential, magnetic fields and their origin, electromagnetic induction. Geometric optics, curved surfaces and Lenses.

5.1.3.3 "EB123" MODERN PHYSICS: 3Cr [2-2-1]
Pre-requites: EB122

Course Catalogue Description:

The course covers principles and concepts of Special and General Relativity; origins of Quantum Mechanics; quantum structure of atoms, molecules, solids; applications to lasers and microelectronics; nuclear and particle physics; and cosmology.

5.1.4 *DESCRIPTION OF BASIC ENGINEERING COURSES*

5.1.4.1 "EB141" ENGINEERING DRAWING& DESCRIPTIVE GEOMETRY (1): 3Cr [2-3-0]

Pre-requites: none

Course Catalogue Description:

i) Engineering Drawing: Introduction, types of lines and lettering, drawing equipments and use of instruments, geometric constructions, the theory of projection, multi view representation, and deduction of the third view.

ii) **Descriptive Geometry:** Introduction, Mongean Projection: Representation of points, lines, planes. Representation of line intersection of two planes, Representation of point of intersection of a line and a plane, auxiliary planes

5.1.4.2 "EB142" ENGINEERING DRAWING& DESCRIPTIVE GEOMETRY (2): 2Cr [1-2-1]

Pre-requites: EB141

Course Catalogue Description:

i) Engineering drawing: The course covers the basic principles of the graphic language that is used by engineers to describe the shape and size of structures and mechanisms and how to employ effectively graphic solutions of space problems.

ii) **Descriptive Geometry:** The course helps the student to learn fundamental knowledge and understanding of the Prospective, Intersection of curved surfaces and the principals of graphics whether done on the drawing board or on computer.

5.1.4.3 "EB143" ENGINEERING DRAWING FOR ARCHITECTS (1): 3Cr [2-3-0]

Pre-requites: none

Course Catalogue Description:

This studio course is an introduction to the free hand representation of nature, manufactured objects and the built environment, through introducing students to the basic concepts of two and three dimensional studio practice and visual communication. Materials will range from traditional drawing materials such as charcoal and pencil to digital photography. The course will encourage students to explore the use of diverse visual languages. Emphasis will be on both formal and conceptual issues, such as developing meaning through imagery, narrative, metaphor, and other visual modes in architecture. Projects and sheets are structured to deal with basic concepts and principles of Architecture design. Students learn to use essential media while practicing descriptive methods. They get sufficient skills and confidence required to illustrate sceneries or abstract designs.

5.1.4.4 "EB144" ENGINEERING DRAWING FOR ARCHITECTS (2): 3Cr [2-3-0]

Pre-requites: EB143

Course Catalogue Description:

The Course aims to teach the students the basics of the architectural language using different methods and techniques as a way of architectural communication, introducing them to the orthographic projection, isometrics, and axonometric drawings of basic forms. The aim of the course is to teach the students a simplified definition of architecture and the development of students' capabilities for visualization and presentation of architectural ideas

by scientific methods. The course also introduces the principles of shade and shadow and systems and methods of perspective drawing.

5.1.4.5 "EB145" DESCRIPTIVE GEOMETRY : 3Cr [2-3-0]
Pre-requites: none

Course Catalogue Description:
The Course aims to teach the students the basics of the architectural language using different methods and techniques as a way of architectural communication, introducing them to the orthographic projection, isometrics, and axonometric drawings of basic forms. The aim of the course is to teach the students a simplified definition of architecture and the development of students' capabilities for visualization and presentation of architectural ideas by scientific methods. The course also introduces the principles of shade and shadow and systems and methods of perspective drawing.

5.1.4.6 "EB131" GENERAL CHEMISTRY: 2Cr [1-1-2]
Pre-requites: none

Course Catalogue Description:
This course introduces the students to Gaseous state, Chemical Equilibrium, Ionic Equilibrium, Liquid State and Solutions, Electrochemical Corrosion, Fuels, Combustion, Water Treatment, Cement and Building materials.

5.1.4.7 "UEC01" COMPUTER SKILLS AND PROGRAMMING CONCEPTS (1): 2Cr [1-1-2]
Pre-requites: none

Course Catalogue Description:
This course tends to provide Year 1 students of all university's faculties with a brief introduction to the world of computers including: numbering systems and digital data representation, computer system architecture, storage and input/output systems, Operating systems and Utility Systems, software applications, problem solving techniques and their applications using Flow Charts. To enable students to:

i) Understand the concepts and terminologies of Computer Science.
ii) Identify the role computation can play in solving problems.
iii) Develop algorithmic thinking.
iv) Explore the various topics of basic Computer Science.
v) Write small algorithms to accomplish useful goals.

5.1.4.8 "UEC02E" COMPUTER SKILLS AND PROGRAMMING CONCEPTS (2): 2Cr [1-1-2]
Pre-requites: UEC01

Course Catalogue Description:
This course tends to introduce Year 1 students of all university's faculties to the concepts and terminologies of Computer Programming using HLL (Basic or C).The course gives an overview of Databases and Database Management Systems: What are the databases and the advantages for using them? Database concepts, key characteristics about the data in a database, Database classifications and models, practicing on database. The course also introduces students to the internet and the internet services, e.g. Visual Basic.Net.

5.1.5 ENGLISH LINGUISTIC COURSES

The educational system in the Faculty of Engineering depends on using the international English language as the main language for teaching all courses included in the department programs.

To enhance the level of English linguistic for all students, Pharos University offers two General English language levels. Moreover, a technical English language EGE03 course is prepared specially for the Faculty of engineering students. The following are catalogue descriptions of the English Language courses offered:

5.1.5.1 "UGE01" ENGLISH LANGUAGE (1): 2Cr [1-0-2]
Pre-requites: none

Course Catalogue Description:

This course aims to consolidate the English language skills the students acquired during their primary and secondary education. The course focuses on honing the students' Speaking, Writing, Reading and Listening abilities. These objectives are realized by providing the students with a curriculum that is commensurate with the scientific studies they have chosen to pursue. The curriculum is taught by qualified and experienced lecturers and/or instructors supported by texts, access to computers, and a library, all delivered in state of the art facilities, and a first class learning environment.

5.1.5.2 "UGE02" ENGLISH LANGUAGE (2): 2Cr [1-0-2]
Pre-requites: UGE01

Course Catalogue Description:

This course aims to consolidate the English language skills the students acquired during their freshmen tertiary education. The course focuses on perfecting the skills acquired during their English 101 studies. These objectives are realized by providing the students with a curriculum that is commensurate with the scientific studies they have chosen to pursue. The curriculum is taught by qualified and experienced lecturers and/or instructors supported by texts, access to computers, and a library, all delivered in state of the art facilities, and a first class learning environment.

5.1.5.3 "UGE03" ENGLISH LANGUAGE (3): 2Cr [1-0-2]
Pre-requites: UGE02

Course Catalogue Description:

The curriculum framework for English 3 builds on and extends the academic skills taught and practiced in English 1 and 2. The students are required to apply the target skills using materials relevant to the different disciplines at the university. Language continues to develop through the course as the students are engaged in activities which integrate the four language skills.

5.1.5.4 "UGA03" ARABIC LANGUAGE SKILLS: 2Cr [2-0-0]
Pre-requites: none

(1) وصف عام للمقرر : Course Description :

يُعنى المقرر بمهارات اللغة العربية الأساسية الضرورية لاستخدام اللغة وسيلةً للتواصل والتوظيف داخل مجالات التخصص المختلفة، مع التركيز على المهارات التنظيمية والفكرية والأسلوبية واللغوية اللازمة في استعمال اللغة وظيفيًا ، خاصةً ما تعرض منها لأخطاء شائعة في استخدامها ، ويحتاج إلى تصويب من مستخدم اللغة .

5.1.6 HUMANITIES COURSES

The various academic programs offered at the Faculty have the essential mandate to include a number of courses that provide students with general education and certain transferable and generic knowledge. These courses are grouped under the suggested above title. The following are the catalogue descriptions of these courses:

5.1.6.1 "UC01" COMMUNICATION SKILLS: 2Cr [2-0-0]

Pre-requites: none

Course Catalog Description:

The course intends to teach students the definition of effective communication and its importance, and to recognize the elements of the communication models and its barriers and filters. In addition, it introduces students to the elements of the message starting from choosing the idea and formulating it and using verbal and nonverbal expression. Also, the course exposure the effective communication skills listening, speaking questioning, writing and reading. The course review the persuading theories which is related to the communication and advertising skills, in addition to demonstrating how to prepare effective presentations in front of the target audience and how to deal with him.

5.1.6.2 "HU113" TECHNICAL REPORTS WRITING AND PRESENTATION SKILLS: 2Cr [1-0-2]

Pre-requites: none

Course Catalog Description:

This course introduces students to further knowledge of English writing skills including spelling, sentence, paragraph and basic essay and letter writing. It provides the students with tools enabling them to communicate their ideas in writing, improves their skills of how to go about researching information and producing well-structured pieces of academic writing. It introduce students to the proper way of writing and presenting a report.

5.1.6.3 "HU121" ENGINEERING PERSPECTIVES AND TECHNOLOGY: 2Cr [1-0-2]

Pre-requites: none

Course Catalog Description:

This course provides the students with a background on the development of the concept of technical engineering in the modern period. It includes definitions of art, science, technology, engineering, civilizations and their relationship with natural and human sciences. It sheds the light on the pioneers in engineering with its different branches and specializations, and their roles in the development of contemporary and modern technology. It provide historical link between science & technology.

5.1.6.4 "HU131" PROJECT MANAGEMENT: 2Cr [2-1-0]

Pre-requites: none

Course Catalog Description:

This course introduces students to the following topics: The importance of project management. Project success factors. Strategic management of projects. Estimating project costs and duration. Network Scheduling techniques: Graphical evaluation and review techniques (GERT), and total PERT/CPM planning. Project graphics. Reducing Project duration. Managing quality on projects.

5.1.6.5 "HU134" ENGINEERING ECONOMY: 2Cr [2-1-0]

Pre-requites: none

Course Catalogue Description:

This course introduces the basic concepts of micro and macroeconomics. It familiarizes students to applications of such concepts on real life and practical situations.

5.1.6.6 "HU135" SALES, MARKETING & COMMUNICATION TECHNIQUES: 2Cr [2-1-0]

Pre-requites: none

Course Catalogue Description:

A three-dimensional course dealing with sales, marketing and communication with individuals and organizations. It deals with the planning, collection, organization, interpretation and presentation of marketing information to aid market decision makers. It includes research methods, types of data, and sources of data and communication techniques in local & international industry.

5.1.6.7 "HU141" ETHICS AND HUMAN RIGHTS: 2Cr [2-0-0]

Pre-requites: none

Course Catalogue Description:

Theories and development of ethical issues in society; philosophical theories of moral responsibility and moral virtue; philosophical ideas behind ethics debates in society; cognitive status of judgment about what is right and good, about the ground of ethical judgment, and about role and rules and principles of ethical disputes.

5.1.6.8 "HU142" LEGALIZATION AND CONTRACTS: 2Cr [2-1-0]

Pre-requites: none

Course Catalogue Description:

This course introduces a general introduction to the theories of contracting and governing laws and addresses the concept of legal responsibilities. It gives an overview of the construction business and governing rules. It introduces students to the different relevant binding responsibilities such as insurance and risks involved.

5.1.6.9 "HU151" INDUSTRIAL SAFETY: 2Cr [2-1-0]

Pre-requites: none

Course Catalogue Description:

This course introduces the concepts underlying the issues related to safety in the different work places. It introduces students to the different relevant industrial safety programs and related systems. It covers an introduction to the implementation of such practices in real situations.

5.1.6.10 "HU161" ENVIRONMENT AND SOCIETY: 2Cr [2-0-0]
Pre-requites: none

Course Catalogue Description:

This course addresses the human role towards the environment. It defines environment, the world's different types of environments, the natural life, human lives, the changes that occur to the environment and their effects on the present and future lives of the societies.

5.1.6.11 "HU162" HUMAN COMPUTER INTERACTION: 2Cr [1-0-2]
Pre-requites: none

Course Catalogue Description:

This course is to provide students with knowledge about the main issues involved in the process of interaction between humans and computers. The process of interaction design is discussed as well as ways for evaluating different designs for different software products or devices used in every day life. The course introduces the study of ergonomics , cognition and discusses conceptual models . It also introduces data gathering ways and how to deal with persons

5.1.6.12 "HU164" RESEARCH METHODOLOGY AND TECHNIQUES: 2Cr [2-1-0]
Pre-requites: none

Course Catalogue Description:

This course introduces students to the different ways of thinking. It fosters the students' skills and motivations toward critical and analytical thinking. It discusses the scientific approach to data collection and analysis.

5.1.6.13 "HU170" RISK MANAGEMENT : 2Cr [2-0-0]
Pre-requites: none

Course Catalogue Description:

The course introduces the basic risk and humanity concepts, factors in safety and reliability; safety legislation and role of regulatory bodies; safety quality and risk management; statistical and probabilistic methods; reliability theory and risk analysis; process control and safety; fire and expulsion risks and control reliability analysis of large engineering systems. Major business risks that are caused by changes in economic variables, such an inflation input prices, wage rates, foreign exchange rates, stock prices, and economic growth are addressed.

5.1.6.14 "HU175" HISTORY OF ARCHITECTURE (1) : 2Cr [2-0-0]
Pre-requites: none

Course Catalogue Description:

This course introduces students to the history of different engineering disciplines. The Course is to teach the students all about the history of architecture of the Ancient Civilizations. It introduces the student to the history of the major civilizations, architecture found in the valley of the Nile (Egyptian civilization).