Ministry of Higher Education and Scientific Research
University of Technology
Building and Construction Engineering Department
Sanitary and Environmental Eng. Division
Undergraduate Study Syllabus 2015/2016

Second Year- First Semester

Subject		Hrs./week			Units
		Theo.	Tut.	Lab.	
B.E 2220	Strength of Materials (1)	3	1		3
B.E 2218	Concrete Technology (1)	2		2	3
B.E 2222	Fluid Mechanics (1)	2	1	1	3
B.E 2216	Engineering Surveying (1)	2		2	3
B.E 2214	Mathematics (3)	3	1		3
B.E 2227	Building Construction (1)	2	1	1	3
B.E 2224	Computer Aided Eng. Drawing Concrete	1		2	2
B.E 2108	English Technical Language	2			2
Total		**17**	**4**	**8**	**22**
		29			

Second Year - Second Semester

Subject		Hrs./week			Units
		Theo.	Tut.	Lab.	
B.E 2221	Strength of Materials (2)	3	1		3
B.E 2219	Concrete Technology (2)	2		2	3
B.E 2223	Fluid Mechanics (2)	2	1	1	3
B.E 2217	Engineering Surveying (2)	2		2	3
B.E 2215	Mathematics (4)	3	1		3
B.E 3315	Construction of Sanitary Structures	2	1		2
B.E 2225	Computer Programming	1		2	2
B.E 2226	Engineering Statistics	2	1		2
Total		**17**	**5**	**7**	**21**
		29			

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B.E. 2220 Strength of Materials (1)	**Theory: 3hrs./ Week** **Tutorial: 1hr./ Week**
1-Forces in strength of materials - Design considerations. - Elements of structure. - Kinds of supports. - Classification of structures (Beams, Frames, Trusses). - Types of loadings (Self-weight load, External loads (Joint load, Member load)). - Sign conventions (Axes, Forces and moments, Forces and moments of slender beam, Forces truss bar element). - Review: Statics (Equations of equilibrium, Calculation of support reactions).	**8**
2-Shear force and Bending moment diagrams -Section method. -Area summation method. -Differential equations method.	**20**
3-Axial loads and Axial stresses. - Shells: thin walled vessels. - Deformations of members under Axial loading, and Temperature effects.	**20**
4- Torsion: -Stresses for solid circular sections and non-circular sections. - Torsion for thin sections.	**12**

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B.E. 2218 Concrete Technology (1)	**Theory: 2hrs./ Week** **Practical 2hrs./ Week**
1- Cement: Manufacturing, Chemical composition, hydration of cement, properties of cement, effect cement compound on its properties.	**10**
2- Types of cement: Ordinary Portland cement**,** Rapid-Hardening Portland Cement , Low Heat Portland Cement , Sulfate- resisting Cement , Portland Blastfurnace Cement , Pozzolanic Cement , White Cement , Special types of cement(Colored Portland Cement , Anti-bacterial Portland Cement , Hydrophobic Cement , Expansive Cement)	**6**
3- Aggregate: General classification, sampling, properties and tests of aggregate, bulking of sand, deleterious substances in aggregate, soundness of aggregate, sieve analysis, grading curves and requirements, practical grading, maximum size of aggregate, gap-graded aggregate.	**8**
4- Fresh concrete: Consistency, workability and factors affecting workability, methods of workability test, segregation and bleeding, mixing, compaction, concreting in hot weather, ready mixed concrete, pumped concrete.	**6**
Laboratory tests	
Introduction to the instruments and equipment in concrete lab.	**2**
1- Cement: - Consistency, initial and final setting times tests. - Soundness test, compressive strength test.	**16**
2- Aggregate: - Sampling test. - Specific gravity and absorption tests. - Crushing strength test. - Sieve analysis of fine and coarse aggregates.	**12**

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B.E. 2222 Fluid Mechanics (1)	**Theory: 2hrs./ Week** **Tutorial: 1hr./ Week** **Practical 1hr./ Week**
1-Introduction, History, Fluid properties.	**3**
2-Units, fluid properties	**3**
3-Viscosity & shear stress, surface tension, capillary – application	**3**
4-Fluid statics, pressure, density	**3**
5-Gage pressure, absolute pressure, pressure devices	**3**
6-Forces on plane & curved surfaces	**3**
7-Kinematics of fluid motion, steady and unsteady flow, uniform and non-uniform flow	**3**
8-Basic law, continuity equation, energy equation, Euler's equation	**3**
9-Streamline, energy line, hydraulic line – applications	**3**
10-Pumps & Turbines, momentum law	**3**
11-Momentum equations, pipe bends, structures in open channel flow	**3**
12-flow of real fluid, fluid flow of solid boundaries, velocity distribution	**3**
13-Shear stress in laminar & turbulent flow, drag force.	**3**
14-Boundary layers, established flow, boundary layer thickness	**3**
15-Laminar & turbulent boundary layer	**3**
Laboratory tests	
1-Calibration of pressure gauge	**2**
2-Hydrostatic force on submerged plane surface: a- partially b- fully	**4**
3-Calibration of venture meter: a- discharge coefficient b- pressure distribution(ideal) c- pressure distribution(actual)	**5**
4-Hydraulic coefficient of an orifice and jet trajectory: a- Hyd. Coeff. b- Jet trajectory .	**4**

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B.E. 2216 Engineering Surveying (1)	**Theory: 2hrs./ Week** **Practical 2hrs./ Week**
1- General concepts of surveying: - General definition of surveying, basic principles of surveying, types of surveying. - Basic principles and steps of surveying and setting out of constructions.	4
2- Measurements and errors: - Types of measurements, units of measurements, scale. - Errors; types of errors, sources of errors, mistakes, precision and accuracy.	4
3- Adjustment of measurements: - Most probable value and the standard error for direct measurements. - Most probable value and the standard error for indirect measurements; law of error propagation, weight of measurements. - Basic principles of the least squares method, adjustment of one indirect measurement by the least square method.	6
4- Linear measurements: Taping methods; systematic error in taping, measuring obstructed distances, other uses of tape.	4
5- Leveling: - Direct leveling; level, basic parts and principles. - Direct differential leveling; systematic errors, field procedure, types of differential leveling. - Adjustment of differential leveling by the least squares method. - Direct profile leveling; field procedure, adjustment of profile leveling, computation of cut and fill.	8
6- Vertical curves: - Basic concept and uses of vertical curves. - Equal-tangent vertical parabolic curve; equation of the curve, location and elevation of high or low point on the curve, staking a vertical parabolic curve.	4

Experiments	
1- Basic principles of surveying and setting out of constructions; determination the location of a point.	4
2- Basic principles of surveying and setting out of constructions; establishing the location of a point.	4
3- Measuring obstructed distance using tape.	4
4- Level; basic parts and principles, setting up, reading level rods.	4
5- Differential leveling using level; starting and closing at the same benchmark.	4
6- Differential leveling using level; starting from a benchmark and closing at another one.	4
7- Profile leveling using level.	4
8- Staking vertical curves using level.	2

B.E. 2214 Mathematics (3)	**Theory: 3hrs./ Week** **Tutorial: 1hr./ Week**	
1- Partial Differentiation: a) Functions of two or more variables. b) Chain rule for partial derivatives. c) Total differential. d) Higher order derivatives. e) Maxima, minima, and saddle points of functions of two variables. f) Directional derivatives.		**24**
2- Differential Equations: a) First order; separable, homogeneous, linear & exact. b) Second order equations reducible to first order. c) Linear second order homogeneous equations with constant coefficients. d) Linear second order nonhomogeneous equations with constant coefficients: variation of parameters, and undetermined coefficients method. e) Higher order linear equations with constant coefficients.		**20**
3- Vector Analysis: a) Equations of Lines, Line Segments and Planes. b) Products of Three Vectors: Triple Scalar Product, Triple Vector Product. c) Tangent Vectors, Velocity & Acceleration. d) Arc Length for Space Curves. e) Curvature and Radius of Curvature, Normal Vectors. f) The Binormal Vector (B).		**16**

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B.E. 2227 Building Construction (1)	**Theory: 2hrs./ Week** **Tutorial: 1hr./ Week** **Practical 1hr./ Week**
1- Introduction to development of building construction.	1
2- Methods of load bearing in buildings: Load bearing buildings, frame buildings.	1
3- Clay Brickworks: Types of bricks, stages of construction by bricks, brick walls, bonding, pointing.	8
4- Stone works: Types of stones used in construction, type of stone walls, other uses of stone in construction, bonding, cladding and pointing.	4
5- Block works (Concrete and cellular blocks): Types of blocks used in building, type of block walls, other uses of blocks in building, bonding, pointing.	6
6- Binding materials: Types and uses of binding materials.	4
7- Damp-preventing materials: Types of materials, and methods of their uses in buildings.	4
8- Building joints: Types of joints, finishing methods.	2
Tutorial	
1-Types of building	1
2-Bonding of brick English, single Flemish, Double Flemish and pointing	4
3- Cladding with stone	2
4-Concrete block walls	2
5-Cellular block wall	1
6-Gypsum board	3
7-Types of joints	2
Practical	
1- Introduction to development of building construction.	1
2-Types of clay brick	2
3-Bonding of Clay bricks	4
4-Types of Stone finish	2
5-Types of block	2
6-Types of binding material	1
7-Visit to one or more project	3

B.E. 2224 Computer Aided Eng. Drawing	**Theory: 1hr/ Week** **Practical 2hrs./ Week**
1- Introduction to AutoCAD: Definition of the AutoCAD graphics window and the way of determining point through window, explain the commands.	2
2- draw(Line, Rectangle, Circle, Arc, Arrays etc.) , copy, Delete	3
3- Limits, Status, Zoom, Pan, Snap, Grid, Osnap, Ortho, Trim , offset, move, Dimensions, Text, Hatch	4
3 – layers	2
4- project	4

B.E. 2108 English Technical Language	**Theory: 2hrs./ Week**
مركز اللغة الانكليزية	

Second Year - Second Semester

B.E. 2221 Strength of Materials (2)	**Theory: 3hrs./ Week** **Tutorial: 1hr./ Week**
1- Bending stresses in beams (single and several materials)	**12**
2- Shearing stresses in beams	**16**
3- Thin-Walled members	**4**
4- * Compound stresses * Transformation of stresses and strains *Principal stresses and Mohr's circle for stresses	**12**
5- Deflection of beams (Direct integration method, Moment area method)	**16**

B.E. 2219 Concrete Technology (2)	**Theory: 2hrs./ Week** **Practical 2hrs./ Week**
1- Admixtures; mode of action, effects of accelerated admixtures on concrete properties. -Accelerating admixtures -Retarding admixtures -Plasticizers and superplasticizers admixtures -Air entraining admixtures -Water proofing admixtures	**4**
2- Strength of concrete: Types of strength, factors affecting strength, factors affecting results of concrete tests, curing of concrete, bond strength between concrete and steel reinforcement.	**8**
3-Concrete mix design: Basic considerations, British method of mix design, American method of mix design.	**10**
4- Durability of concrete: Permeability of concrete, resistance of concrete to sulfate and acid attacks, effects of frost on fresh and hardened concrete, corrosion of reinforcement.	**8**
Laboratory tests	
1-- Fresh concrete: - Slump test. - Compaction factor test. - V-B time test.	**10**
2- Hardened concrete: - Compressive strength. - Splitting tensile strength - Flexural strength	**10**
3-- Admixtures: Tests for the effect of superplasticizers on properties of fresh and hardened concrete.	**6**
4- Design of concrete mixes:	**4**

- Making trial mixes designed by British method. - Making trial mixes designed by American method.	

B.E. 2223 Fluid Mechanics (2)	**Theory: 2hrs./ Week** **Tutorial: 1hr./ Week** **Practical 1hr./ Week**
1-Flow in closed conduits, established flow, Bernoulli's equation	**1.5**
2-Major and minor losses	**1.5**
3-Darcy equation	**3**
4-Laminar flow in pipes	**3**
5-Turbulent flow in pipes	**3**
6-head losses in non- circular pipes, Hazen William equation	**3**
7-flow in commercial pipes – applications	**3**
8-Divided flow – applications	**3**
11-Flow in open channels, steady uniform flow	**3**
12-Design section, Chezy & Manning equation	**3**
13-Optimum section	**3**
14-Specific energy & critical depth in rectangular channel	**3**
15-Specific energy & critical depth in nonrectangular channel	**3**
16-Properties of Non uniform flow	**3**
Laboratory tests	
1-Impact of jet	**2**
2-Reynold experiment	**2**
3- Friction loss in pipes: a- Laminar b- transition c- turbulent	**7**
Calibration of sharp crested weirs: a- rectangular b- V-shape	**4**

B.E. 2217 Engineering Surveying (2)	**Theory: 2hrs./ Week** **Practical 2hrs./ Week**
1- Angles and directions: - Angles; types of angles, types of horizontal angles. - Directions; direction of a line, meridian, azimuth, bearing.	2
2- Angles measuring instruments: - Basic parts and principles, optical-reading theodolites, digital theodolite, total station. - Measuring horizontal angles; repetition method, direct method. - Measuring vertical angles, double centering.	4
3- Traversing: - Introduction; methods of control survey, accuracy standards and specifications, basic concept of traversing, types of traverses. - Field procedure of traversing; measuring the length of traverse sides; using tape, using EDM or total station, measuring the horizontal angle of the traverse; traversing by angle to the right, traversing by deflection angles. - Computation of horizontal coordinates of the traverse stations. - Adjustment of horizontal coordinates of the traverse stations.	4
4- Areas: Methods of measuring area, area by coordinators method, area by trapezoidal rule, area by Simpson's rule, area by planemeter.	2
5- Topographic surveying: Basic concept of topographic surveying - Contour lines; contour interval, representation of earth topography by contour map. - Characteristics of contour lines. - Basic methods for contouring; direct method, indirect methods, grid method, irregular method. - Locating topographic details by radiation methods (radial traversing, trigonometric leveling); radiation by total station, radiation by stadia method, radiation by tangential method.	8
6- Volume of earthwork: - Fields of application in civil engineering; routs survey, land leveling, borrow-pit, construction of pipelines. - Volumes using cross-sections; types of cross-sections, area of cross-sections, volume by end-area method, volume by prizimoidal method. - Volumes using the grid method (borrow-pit). - Land leveling; land leveling for construction project, agricultural Land leveling.	6
7- Horizontal curves: - Introduction, types of horizontal curves, types of circular curves, simple circular curves; degree of the curve, basic elements of simple circular curve. - Circular curve formulas. - Circular curve stationing. - Field procedure of circular curve layout by deflection angles using total station or (theodolite and tape).	4

Experiments	
1- Theodolite/ Total station.	4
2- Basic parts and principles, setting up, measurements of H.C.R. and V.C.R.	2
3- Measuring horizontal angles; repetition and direct methods.	4
4- Trigonometric leveling.	4
5- Traversing with total station (or theodolite and tape) by measuring angle to the right.	4
6- Traversing with total station (or theodolite and tape) by measuring deflection angles	4
7- Measurement of area from map; by planimeter, trapezoidal rule and coordinate method, Simpson rule, and coordinate method.	2
8- Locating topographic details by radiation methods (radial traversing, trigonometric leveling); radiation by total station, radiation by stadia method, radiation by tangential method.	2
9- Staking out a building using total station (or theodolite and tape).	2
10- Setting out of horizontal curves by deflection angles using total station (or theodolite and tape).	2

B.E. 2215 Mathematics (4)	**Theory: 3hrs./ Week** **Tutorial: 1hr./ Week**
1- Multiple Integrals: a) Double integrals. b) Area by double integrals. c) Physical Applications: 1st and 2nd Moments, Geometric Figures, Radius of Gyration. d) Double Integrals in Polar Form. e) Triple integrals in Rectangular Coordinates. f) Physical Applications in Three Dimensions. g) Integrals in Cylindrical & Spherical Coordinates.	**20**
2- Matrices: a) Matrix addition & multiplication. b) Inverses of square matrices. c) Eigen values & Eigen vectors.	**12**
3- Complex Functions and Variables: a) Complex numbers. b) Functions of Complex Variables. c) Elementary Functions. d) Derivatives of Complex Functions. e) Analytic Functions. f) Cauchy-Riemann Equations.	**16**

4- Infinite Series: a) Definitions. b) Geometric series. c) Series Tests: 1) S_n Test . 2) $n^{th.}$ Term Test. 3) Ratio Test. d) Power Series: 1) Maclaurin Series. 2) Taylor Series.	**12**

B.E.3315 Construction of Sanitary Structures	**Theory: 2hrs./ Week** **Tutorial: 1hr./ Week**
Introduction: Liquid Retaining Concrete Structures, Standards for the design of water-retaining structures.	3
Concrete works, constructional aspects, cantilever wall, pre stressed concrete tanks	3
Concrete works ,Design of pre stressed concrete, Design of rectangular, Cylindrical, conical tanks	3
design and materials, Water stop in roof and wall joint reservoir, Wall thickness, Cracking	3
Wells, Well Design, Shallow Well	3
Swimming pool details	3
Sketches of pipe system, sanitary accessories and its symbols	3
Sketches of typical sections for sanitary treatment projects	3
Sludge, screening, grit chamber, sedimentation tank, trickling filter, digester tanks, drying beds, master plane (top view and section).	3
Water and sewer appurtenance including pump station	3
Sketches of typical water filtration projects, clariflocculator tanks, rapid sand filter	3
ground storage tanks, elevated tanks, chlorination tank, Design of water tower (top view and sections)	3
sanitary landfill, sanitary landfills toward sustainable development	3
Sustainability and Wastewater recycling	3
sustainable urban drainage	3

B.E. 2225 Computer Programming	**Theory: 1hr/ Week** **Practical 2hrs./ Week**
1- Introduction to Visual Basic language. , Forms: Control tools, name selection of the control tools. Explorer project, properties, events	1
2. Project, save project, applications and Files and projects, exercises.	1
3-. Writing the code (Textbox, label button ,command button & scrollbar.)	2
4- Dialogue box, message box, and input box	1
5- Main object for visual box statements, data, static data, numerical letteral, variables, direct certainty statement.	1
6- (IF-----THEN-----ELSE) statement, (IF-----THEN-----ELSE) multiple and similar statement.	2
7- check box & option button	1
8- Looping statement (FOR-----NEXT).	2
9- list box &combo box	2
10- Shapes & drawing code	2

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B.E. 2226 Engineering Statistics	**Theory: 2hrs./ Week** **Tutorial: 1hr./ Week**
1- Definitions and fundamentals: basic definition, population, sample, random sample, frequency distributions and histogram and polygon, relative and cumulative frequencies.	6
2- Measure of central location and measure of variation and dispersion.	4
3- Probability theory: Relative frequency Venn diagram, intersection, union, conditional probability, mutually exclusive events, permutations and combinations, applications.	6
4- Distributions: Discrete distribution; binomial distribution and Poisson distribution, continuous distribution; normal distribution, applications.	4
5- - Sampling theory: Sampling methods, sampling distributions, and sampling distribution of means, differences and sums, applications.	4
6 Regression and correlation: Choice of curves, least square methods, correlation, applications.	6