CRITERION 5. CURRICULUM

APPENDICES
Appendix A – Courses Syllabi
Appendix A – 1

General, Math, and Basic Science Courses Syllabi
1. Course Name and code: General Chemistry – Chem 111

Credit hours : 4 hrs

Contact hours: 4 hrs (3 hours lectures and 1 hour practical)

3. Instructor/coordinator: Dr. Karim M ElSawy

4. Text book and Other supplemental materials

Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, sheets, etc.) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description
Matter, Chemical calculations, Atomic structure, Bohr theory, Quantum theory, Quantum numbers, The Electron configuration of atoms, The periodic table, Gases, Solutions, Chemical kinetics, Chemical equilibrium, Thermochemistry.

B) Prerequisites: None

C) Co-requisites: None

D) Course Condition: Required · Elective · Selective

6. Specific goals for the course

A) Course Specific outcomes
By the end of this course, students are expected to:

1. Distinguish different forms of matter
2. Perform basic chemical calculations
3. Know the different aspects of atomic structure and relevant theories
4. Be able to correctly assign the electron configuration of arbitrary atoms and deduce related chemical properties
5. Appreciate the significance of the periodic table and be able to use it to compare the physical and chemical properties of different elements
6. Apply the gas laws to simple problems of general and chemical interest.
7. Recognize the importance of the time domain of chemical reaction through chemical kinetics and to understand factors that control progression of chemical reaction.
8. Grasp the importance of chemical equilibrium, its relation to chemical kinetics and its impact on performing chemical calculations
9. Understand the basics of thermochemistry as a subtopic of the broader field of thermodynamics.

B) Old Relation to the student outcomes

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C) New Relation to the student outcomes

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7. Brief list of topics to be covered

1. Introduction: Matter
2. Chemical calculations
3. Atomic structure, Bohr theory,
4. Quantum theory, Quantum numbers
5. The electron configuration of atoms
6. The Periodic table
7. Gases
8. Solutions
9. Chemical kinetics
10. Chemical equilibrium
11. Thermochemistry

CSC 209

8. **Course Name and code:** Computer Programming – CSC 209
9. **Credit hours:** 3 hrs
   **Contact hours:** 4 hrs (2 hours lectures and 1 hour practical)
10. **Instructor/coordinator:** Dr. Hussam ALZEIN
11. **Text book and Other supplemental materials**
   **Text book:**
   **References:**
   **Other supplemental materials**
   - Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: ([http://qec.edu.sa/eng/students/lectures/lectureres.asp](http://qec.edu.sa/eng/students/lectures/lectureres.asp)).

12. **Specific course information**
   **A) Catalog Description**
   Introduction to computers and computing fundamentals in MATLAB, Data Types, Variables, Scalar and array operations, Built-In MATLAB Functions, Simple input/output statement, plotting commands, Relational and logical expressions, IF-ELSE control structure, the switch control structure, The WHILE statement, The FOR statement and looping structure, Arrays one dimensional and multidimensional Methods, Engineering Applications.
   **B) Prerequisites:** None
   **C) Co-requisites:** None
   **D) Course Condition:** ○ Required · Elective ○ Selective

13. **Specific goals for the course**
   **A) Course Specific outcomes**
By the end of this course, students are expected to be able to

1. Describe Essential elements of MATLAB programming language
2. Describe the concept of data types, variables and assignment
3. State the notions of selection and repetition structure in MATLAB
4. State the notions of array, vector and matrix in MATLAB
5. Describe 2D Plotting
6. Develop analytic skills to solve simple engineering problem
7. write, test programs in MATLAB

B) Old Relation to the student outcomes

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C) New Relation to the student outcomes

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14. Brief list of topics to be covered

1. Introduction to MATLAB, The Advantages of MATLAB, Disadvantages of MATLAB, The MATLAB Environment
2. MATLAB Basics Variables and Arrays, Creating and Initializing Variables in MATLAB, Assignment Statements, Built-in Functions, Keyboard Input
3. Multidimensional Arrays, Subarrays, Special Values, Displaying Output Data
4. Scalar and Array Operations, Scalar and Array Operations, Built-in MATLAB Functions
5. Introduction to Plotting
6. MATLAB Applications: Vector Mathematics, MATLAB Applications: Matrix Operations and Simultaneous Equations
7. Two-Dimensional Plots
8. Branching Statements and Program Design, Top-Down Design Techniques, Relational and Logic Operators, The if Construct,
9. The switch Construct, MATLAB Applications: Roots of Polynomials
10. Loops and Vectorization, The while Loop, The for Loop
11. Logical Arrays and Vectorization
12. MATLAB Applications: Statistical Functions
13. MATLAB Applications: Curve Fitting and Interpolation
14. Engineering Applications
GE 104

Course Name and code: Basics of Engineering Drawing – GE 104

Credit hours: 3 hrs

Contact hours: 5 hrs (2 hours lectures and 3 hour Lab)

Instructor/Coordinator: Prof. Elamir Samy Gadelmawla

4. Text book and Other supplemental materials

Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description
GE 104 teaches students the basics of engineering drawing including orthographic projection, sectional views, auxiliary views, and writing dimensions. In addition, the student will learn how to draw simple engineering drawings using recent computer aided design (CAD) software.

B) Prerequisites: None
C) Co-requisites: None
D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes
By the end of this course, students will be able to:
  1. Understand the basics of geometrical construction and sketching techniques.
  2. Understand the fundamentals of orthographic projection, Sectional and auxiliary views, isometric views.
1.

2.

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3. Draw and interpret engineering drawings.
4. Construct isometric views from two orthographic views.
5. Draw orthographic views from isometric views.
6. Draw sectional views.
7. Apply international standards of dimensioning on engineering drawings.
8. Apply recent computer technology (CAD software) to draw simple engineering drawings.

B) Old Relation to the student outcomes

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C) New Relation to the student outcomes

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7. Brief list of topics to be covered

1. Introduction, Graphic instruments and their use
2. Basics of lettering and line types
3. Constructional geometry
4. Orthographic projection and sectional views
5. Writing dimensions and international standards
6. Isometric views
7. Computer graphics using AutoCAD

GE 105

Course Name and code: Basics of engineering technology – GE 105

Credit hours: 2 hrs
Contact hours: 1 hour lecture, 2 hours (practice)
Instructor/coordinator: Lec. Bashar Alani

4. Text book and Other supplemental materials

Text book:
- Basic of Production Engineering (Arabic Version), Engineering College, KAU, KSA.

References:
- Introduction to manufacturing, chapman

Other supplemental materials
- Course materials (assignments, documents, sheets, ...) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description
Basic engineering technology including casting, welding, forging, plastics forming and metal cutting. Lab includes industry tours and hands-on machine shop projects focusing on fundamental theory and operation of precision measuring instruments, hand tools, metal lathes, shaper, drills and mills M/c.

B) Prerequisites: GE 104

C) Co-requisites: None

D) Course Condition: ☑ Required ☐ Elective ☐ Selective

6. Specific goals for the course

A) Course Specific outcomes
By the end of this course, students are expected to:

1. Know workshop safety, bench work and marking techniques, handling machine tools, joining, casting processes.
2. Be familiar with the major classes of engineering materials.
3. Be able to locate material property data.
4. Understanding of production of different materials (Iron and steel making aluminum, copper and their alloys).
5. Understanding of metrology including standard of length, comparators, angle measurement, limits and gauge design.
6. Undertake, under supervision, workshop practice with hands-on in turning, welding, milling and metrology
3. **B) Old Relation to the student outcomes**

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■ Highly related to Student Outcome (SO)
□ To some extent related to Student Outcome (SO)

7. **Brief list of topics to be covered**

1. Introduction to manufacturing systems and industrial safety.
2. Properties of Metals, Non-ferrous Metals, Non-ferrous Alloys
3. Production of Iron and Steel, Plain Carbon and Alloy Steels, Tool Steels and the Iron-Carbon Diagram
5. Production of copper and its alloys, aluminum and its alloys
6. Casting processes: sand casting, die casting.

**GE 201**

Course Name and code: Statics – GE 201
Credit hours: 3 hrs
Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)
Instructor/coordinator: Dr. Saad M. S. Mukras

4. Text book and Other supplemental materials

Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, etc) will be uploaded to the College WebSite: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description

B) Prerequisites: None

C) Co-requisites: None

D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes
By the end of this course, students are expected to be able to:

1. Define concepts in mechanics including; scalars, vectors, forces, moments, couples and resultants.
2. Explain what is meant by a structure being in equilibrium
3. Analyze basic structures in equilibrium.
4. Determine the internal loads in basic structures in equilibrium (including, trusses, frames & machines).
5. Determine the centroid of a line, an area and a volume and the area and mass moment of inertia.
6. Analyze the friction forces on a body.

B) Old Relation to the student outcomes
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C) New Relation to the student outcomes

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- Highly related to Student Outcome (SO)
- To some extent related to Student Outcome (SO)

7. Brief list of topics to be covered

1. Basic concepts, Scalars and Vectors, Units.
2. Force Systems: 2D - Rectangular Components, Moment
3. Force Systems: 2D - Couple, Resultants
4. Force Systems: 3D - Rectangular Components, Moment and Couple
5. Equilibrium in 2D: FBD, Equilibrium condition
6. Equilibrium in 3D: Equilibrium condition
7. Plane Trusses: Method of Joints, Method of Sections
8. Frames and Machines
9. Center of Mass, Centroid of Line, Area and Volume - Composite bodies
10. Beams: External Effects
11. Rectangular & Polar moment of Inertia, Radius of Gyration
12. Friction Phenomena

**GE 202**

Course Name and code: Dynamics – GE 202

Credit hours: 3 hrs

Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)

Instructor/coordinator: Dr. Saad M. S. Mukras
4. **Text book and Other supplemental materials**

   **Text book:**

   **References:**

   **Other supplemental materials**
   - Course materials (assignments, documents, etc) will be uploaded to the College WebSite: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. **Specific course information**

   **A) Catalog Description**
   Kinematics of particles: curvilinear motion, and relative motion; Kinetics of particles: Newton’s Law, work and energy, impulse and momentum, and impact; Kinematics of rigid body in plane motion: relative velocity and acceleration, and rotating axes, Kinetics of rigid body in plane motion: translation, fix axis rotation, general motion and work & energy. Impulse and momentum.

   **B) Prerequisites:** GE 201

   **C) Co-requisites:** None

   **D) Course Condition:** □ Required □ Elective □ Selective

6. **Specific goals for the course**

   **A) Course Specific outcomes**
   By the end of this course, students are expected to:
   1. Define particles and rigid bodies as applied to dynamics
   2. Define kinetics and kinematics
   3. Recall the solution approaches to kinetics of particles and rigid body problems
   4. Differentiate between particles and rigid bodies with reference to dynamics
   5. Analyze the position, velocity and acceleration of particles and rigid bodies
   6. Apply “kinetics solution procedures” to study motion and forces in particles and rigid bodies
   7. Transform physical problems into mathematical problem in order to extract the required quantities

   **B) Old Relation to the student outcomes**
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7. Brief list of topics to be covered

1. Introduction to dynamics, Kinematics of Particles: Rectilinear motion
2. Kinematics of Particles: Plane & Space Curvilinear Motion
3. Kinematics of Particles: Relative Motion
4. Kinematics of Particles: Constrained motion of connected particles
6. Plane Kinematics of Rigid Bodies: Rotation
7. Plane Kinematics of Rigid Bodies: Relative Velocity & Relative Acceleration

GE 401

Course Name and code: Engineering Economy – GE 401

Credit hours: 3 hrs

Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)

Instructor/coordinator: Dr. Osama Mohamed Irfan
4. **Text book and Other supplemental materials**

**Text book:**
- *References:* White, I. and John, A, Principles of engineering economic analysis, John Willy, 2009

**Other supplemental materials**
- Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. **Specific course information**

**A) Catalog Description**

(1) Introduction to Engineering Economy (2) Interest formulas and economics equivalence, cash flow estimation and diagrams (3) Nominal and effective interest rates(4) Comparison of alternatives and decision making based on economic considerations (5) Application of present worth and annual worth analysis (6) Break Even point and analysis (7) Depreciation and depletion methods (8)Economic analysis of Public sector projects (9) Cost Estimation – (10) Evaluating of Replacement and retention alternatives.

**B) Prerequisites:** None

**C) Co-requisites:** None

**D) Course Condition:** ■ Required  □ Elective  □ Selective

6. **Specific goals for the course**

**A) Course Specific outcomes**

By the completion of this course the student will be able to:

1. Understand and define the basic concepts and roles of engineering economy.
2. Identify main engineering economy symbols, select suitable compound interest factors (single payment, uniform series, gradient series and shifted series).
4. Select from different alternatives.
5. Realize the basic concepts of replacement or retention of an asset.
3. **B) Old Relation to the student outcomes**

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3. **C) New Relation to the student outcomes**

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- **■** Highly related to Student Outcome (SO)
- **☐** To some extent related to Student Outcome (SO)

7. **Brief list of topics to be covered**

1. Introduction to Engineering Economy - Interest Rate and Rate of Return.
3. Cash Flows, their estimations and diagrams, Time value of money, Single payment formulas, Uniform Series formulas, gradient formulas and cash flows that are shifted.
4. Nominal and effective interest rate.
5. Formulating alternatives and making decision, (Present worth and Annual worth analysis).
7. Depreciation economic analysis of operations.
9. Cost Estimation
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**GE 402**

**Course Name and code:** Project Management  GE 402

**Credit hours:** 3 hrs

**Contact hours:** 4 hrs (2 hours lectures and 2 hours tutorial)  **Instructor:** Dr. Tomas U. Ganiron, Jr.

4. **Text book and Other supplemental materials**

   **Text book:**

   **References:**

   **Other supplemental materials**
   - Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lecturers.asp).

5. **Specific course information**

   **A) Catalog Description**
   The course gives an introduction to project management which includes initiating process, planning process, project organization, project execution process, project control & closing process. It also covers the management functions, methods of planning and program development time CPM (materials, equipment, labor, sub-contractor), the network diagram, time scaled event network, leadership, project vision and mission, delegating, motivation, constructive & positive feedbacks, decision making, team building, engineering ethics, negotiation & contracts, risk management, conflict management, stress management & anger management, SWOT Analysis, and hands-on MS project/primavera planning.

   **B) Prerequisites: Pass 90 Credit hours**

   **C) Co-requisites: None**
1. –

2. –

3. D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes

By the end of this course, students are expected to:

1. Assess and evaluate the factors that lay behind successful project management techniques.
2. Design a risk management program, stress management program, conflict management program and anger management program suited to the specific need of construction companies.
3. Appreciate and be able to discuss the range of project management approaches.
4. Analyze the impact of resource constraints on achieving project goals.
5. Distinguish and describe the range of different techniques available in project management.
6. Evaluate the effects of organizational issues on PM.
7. Apply theoretical insights from their courses to managing effective projects.

B) Old Relation to the student outcomes

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7. Brief list of topics to be covered

1. Project Management Concepts
2. Initiating Process: Linking the project to the product, Problem scope, Product scope and Project scope.
5. The Network Diagram, Gantt chart, Manpower leveling, Crashing and Cost plan.
6. Quality plan, Communication plan and Implementation plan.
8. Motivation, Positive & constructive feedbacks, Communication, Team building and Decision making.
9. Contracts, Bidding & Awarding procedures, and Engineering code of ethics.
11. Project execution, Monitor and Control process
12. Computer hands on-Basic Primavera Planning
13. Computer hands on-Advanced Primavera Planning
14. Computer hands on-Basic and Advanced MS Project
15. Special topics in Career planning and Career management

GE 405

Course Name and code: Co-operative Training GE 405

Credit hours: 9 hrs

Contact hours: ---

Instructor/coordinator: Prof. Elamir Samy Gadelmawla

4. Text book and Other supplemental materials

Text book:
- N/A

References:
- N/A

Other supplemental materials
- Course Instructions are uploaded for the students on the College Web-Site: (http://qec.edu.sa).

5. Specific course information

A) Catalog Description
Cooperative Training Program is a joint effort between the College of Engineering and the public and the private sectors in the area of specialization to allow students to practice
3. skills and knowledge they have learned. Coop students are required to spend seven months of practical training in a relevant field in industry.

B) Prerequisites: 100 hours teaching.
C) Co-requisites: None
D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course
A) Course Specific outcomes
By the end of this course, students will be able to:

1. Apply the major discipline theoretical knowledge.
2. Practice what he gained of skills.
3. Enhance the ability of working in a team.
4. Gain the competence of adaptation (anticipating, adapting to, and promoting changes important to a profession societal purpose and the professional role).
5. Receive and practice the ethics of a profession as standards that guide professional behavior.
6. Acquire the leadership competence.
7. Have the scholarly concern for improvement.

B) Old Relation to the student outcomes

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7. Brief list of topics to be covered

☐ N/A
Math 105

Course Name and code: Differential Calculus  MATH 105 Credit

hours: 3 hrs

Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)

Instructor/coordinator: Dr. Syed Shakaib Irfan

4. Text book and Other supplemental materials

Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description

B) Prerequisites: None

C) Co-requisites: None

D) Course Condition: □ Required    □ Elective     □ Selective

6. Specific goals for the course

A) Course Specific outcomes
By the end of this course, students are expected to be able to:

1. Draw the graphs of the functions using properties of translation, symmetry etc and family of functions.
2. Find Composition of functions, new functions from old functions.
3. Evaluate limits of the functions and check the continuity of various types of functions,
4. Evaluate vertical and horizontal asymptotes.
5. Find tangent line and rate of change.
6. Find derivatives of different kinds of functions using different methods: Sum, Difference, Product, Quotient Rules and Implicit Differentiation.
7. Apply differentiation to find linear approximation, concavity and maxima or minima of functions.
8. Use Rolle’s and Mean-Value Theorems.

B) Old Relation to the student outcomes

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C) New Relation to the student outcomes

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7. Brief list of topics to be covered

1. Real Numbers, Functions, New functions from old, Family of functions.
2. Limits, Asymptotes, Limits and continuity of trigonometric functions
3. Derivative function, Techniques of differentiations, Derivatives of trigonometric and inverse trigonometric functions.
4. Tangent lines, rates of change, Chain Rule, Implicit differentiation and Related rates.
5. Derivative in Graphing and Applications: Increase, Decrease, Concavity, Relative Extrema, First and Second Derivative Test.
6. Applications of Extrema, Rolle's and Mean Value Theorems.
Math 106
Course Name and code: Integral Calculus – MATH 106
Credit hours: 3 hrs
Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)
Instructor/coordinator: Dr. Syed Shakaib Irfan

4. Text book and Other supplemental materials

Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description
Fundamental theorem of calculus, the definite and indefinite integral. Area, volume of revolution, work, arc length. Integration of inverse trigonometric, logarithmic, exponential functions, hyperbolic and inverse hyperbolic functions. Techniques of integration: substitution, by parts, trigonometric substitution, partial fractions, miscellaneous substitutions, numerical integration, improper integral. Parametric and polar curves.

B) Prerequisites: None

C) Co-requisites: None

D) Course Condition: ■ Require □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes
By the end of this course, students are expected to be able to:

1. Understand definite and indefinite integrals.
2. Calculate the limit of functions by L’Hospital’s rule.
3. Apply integration to find the area between to curves, volumes, arc length and surface area of the solid of revolution.
4. Integrate various types of functions: logarithmic, exponential trigonometric, inverse trigonometric, hyperbolic functions and inverse hyperbolic functions.
5. Use various integration methods such as integration by parts, by trigonometric substitution, partial fractions to integrate various types of function.
6. Evaluate numerical integration and improper integrals.
7. Evaluate tangent lines and arc lengths for parametric and polar curves.

B) Old Relation to the student outcomes

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7. Brief list of topics to be covered
   1. Indefinite integral, integral by substitution and definite integral.
   2. Fundamental theorem of calculus and average value of a function & its applications
   3. Derivatives and integration of logarithmic and exponential functions. L’Hospital rule.
   4. Evaluating definite integrals by substitution, logarithmic and other functions defined by integrals
   5. Area, volume, length of a plane curve and area of surface of revolution
   6. Hyperbolic functions, integration by parts, integrating trigonometric functions, trigonometric substitution and integrating rational functions by partial fractions
1. **Course Name and code:** Differential & Integral Calculus - Math 203

2. **Credit hours:** 3 hrs
   
   **Contact hours:** 4 hrs (3 hours lectures and 1 hour tutorial)

3. **Instructor/coordinator:** Dr. Mohammad Sajid

4. **Text book and Other supplemental materials**
   
   **Text book:**
   
   **References:**
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   **Other supplemental materials**
   - Course materials (assignments, documents, sheets, etc.) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. **Specific course information**

   **A) Catalog Description**
   Infinite series, convergence and divergence of infinite series, integral test, ratio test, root test and comparison test. Conditional convergence and absolute convergence, alternating series test. Power series. Taylor and Maclaurin series. Functions in two or three variables, their limits, continuity and differentiability, The chain rule, Directional derivatives; gradient, Tangent planes, Maxima and Minima for function in two or three variables, Lagrange multipliers, Double integral and its applications to area, volume, moments and center of mass. Double integrals in polar coordinates. Triple integral in rectangular, cylindrical and spherical coordinates and applications to volume, moment and center of mass. Vector fields, line integrals, surface integrals, Green’s theorem, the divergence theorem. Stokes theorem.

   **B) Prerequisites:** Math 105, Math 106

   **C) Co-requisites:** None

   **D) Course Condition:** ■ Required  □ Elective  □ Selective

6. **Specific goals for the course**

   **A) Course Specific outcomes**
   
   By the end of this course, students are expected to:

   1. Understand the meaning of convergence of sequences.
2. Able to determine sum of infinite series.
3. Identify and use convergence tests of series
4. Understand basic concepts of functions of two or more variables.
5. Recognize maxima and minima of functions of several variables.
6. Compute the multiple Integrals and its applications
7. Understand the basic concepts of vector fields, gradient, divergence curl & their properties.
8. Understand Green’s, divergence and Stock’s theorems.

B) **Old Relation to the student outcomes**

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7. **Brief list of topics to be covered**

1. Sequences and Monotone Sequences
2. Infinite Series
3. Divergence Test, Integral Test, p-series; Comparison, Ratio and Root Tests
4. Alternating Series Test, Conditional and Absolute Convergence
5. Maclaurin and Taylor Series; Power Series
6. Functions in two or three variables, their limits, continuity and differentiability, partial derivatives, the chain rule
7. Directional derivatives; Gradient, Tangent planes
8. Maxima and Minima for functions of two or three variables, Lagrange multipliers
9. Double Integrals and its Applications
10. Triple Integrals and its Applications
11. Vector fields and their divergence and curl
12. Line Integrals, Green’s Theorem and Surface Integrals
13. Divergence Theorem and Stoke’s Theorem
Math 208

Course Name and code: Differential Equations – Math 208

Credit hours: 3 hrs
Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)

Instructor/coordinator: Prof. Gamal Attia

4. Text book and Other supplemental materials

Text book:


References:


Other supplemental materials

- Course materials (assignments, documents, sheets,) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description

Different types of first order differential equations and its applications. Linear differential equations of higher order. Linear differential equations with constant coefficients. Reduction of the order. Series solution of ordinary differential equations. Frobenius’s method. Fourier series of odd and even functions. Integration of Fourier series

B) Prerequisites: Math 203

C) Co-requisites: None

D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes

By the end of this course, students are expected to have:
1. An ability to understand the meaning of differential equations, its types, order and degree.
2. An ability to classify and solve ordinary differential equations of first order.
3. An ability to solve ordinary differential equations of higher order.
4. An ability to find the series solution of differential equations.
5. An ability to know the applications of differential equation in engineering problems.
6. An ability to find the Fourier expansions of the functions.

B) Old Relation to the student outcomes

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7. Brief list of topics to be covered

1. Introduction to Ordinary Differential Equations (ODE).
2. Separable ODE. and Equations reduced to separable.
3. Homogeneous DE. and DE reduced to Homogeneous.
4. Exact ODE and Integrating Factors.
5. Linear and Bernoulli’s DE.
6. Introduction; linear Independence.
7. Linear DEs with Constant Coefficients, Auxiliary Equation.
9. Variation of Parameters, Applications.
10. System of ODE.
11. Fourier series, Fourier Expansion for Odd and Even Functions.,
Math 244

Course Name and code: Advanced Linear Algebra – Math 244

Credit hours: 3 hrs
Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)
Instructor/coordinator: Prof. Ahmed Elsonbaty

4. Text book and Other supplemental materials
   Text book:
   References:
   Other supplemental materials
   - Course materials (assignments, documents, sheets,) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information
   A) Catalog Description
   Introduction, Euclidean n-Space, Linear Transformations , Properties of Linear, Transformations , Linear Transformations and polynomials, Real Vector Spaces, Subspaces, Linear Independence , Basis and dimension, Row spaces, column space and Nullspace, Rank and Nullity, Introduction to Inner Products space, Angle and Orthogonally in inner product space, Orthogonal Bases, Best Approximation, least squares, Change of Basis, Orthogonal Matrices

   B) Prerequisites: Math 107

   C) Co-requisites: None

   D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course
   A) Course Specific outcomes
   By the end of this course, students are expected to:
1. Be familiar with several important concepts in linear algebra, including vector spaces, linear independence of vectors, subspaces, bases, and dimension of vector spaces.
2. Be familiar with fundamentals of linear transformations and its applications.
3. Learn how to use linear algebra to solve problems from engineering and other fields.
4. Learn how to calculate the eigenvalues and eigenvectors.
5. Acquire the ability to prove mathematical theorems.
6. To able to apply several important concepts in linear algebra to such real world phenomena.
7. To prepare the student for courses that has Linear Algebra as a prerequisite.
8. To improve the students’ ability to think logically, analytically, and abstractly.
9. To improve the students’ ability to communicate mathematics, both orally and in writing.

**B) Old Relation to the student outcomes**

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**7. Brief list of topics to be covered**

1. Euclidean n-space and linear transformations from $\mathbb{R}^n$ to $\mathbb{R}^m$.
2. Characterization of linear transformations from $\mathbb{R}^n$ to $\mathbb{R}^m$.
3. Generalized vectors from 2- and 3-space of vectors to vectors in n-space.
4. Inner product spaces.
5. Angle and orthogonality in inner product space.
Math 254

Course Name and code: Numerical Methods – Math 254

Credit hours: 3 hrs

Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)

Instructor/coordinator: Dr. Syed Shakaib Irfan

4. Text book and Other supplemental materials

Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description
An introductory course in numerical methods where the following subjects will be taught to the students: Numerical Solution of non-linear equations and associated errors, convergence rate, solution of system of equations by direct and repeated methods and associated errors, Interpolation and polynomial approximation and associated errors, Numerical differentiation and integration and associated errors, Least Square Method, Introduction to numerical solutions for ordinary differential equations.

B) Prerequisites: Math 106, Math 107

C) Co-requisites: None
D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course
   A) Course Specific outcomes
   By the end of this course, students are expected to be able to

   1. Compute root of nonlinear equations by using Newton’s Method, Secant Method, Fixed Point Iteration Method etc.
   2. Describe the errors arising in numerical computation.
   3. Familiar with different kinds of techniques for interpolating data.
   4. Define numerically definite integrals and numerical differentiation of functions.
   5. Familiar with concepts of different matrices methods to solve the system of linear equations and Ability to use iterative methods to determine the solution of system of linear equations.

   B) Old Relation to the student outcomes

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7. Brief list of topics to be covered
   1. Introduction of interpolation, polynomial interpolation.
3.
2. Divided differences, Newton’s divided difference interpolation, error in polynomial interpolation.
3. Bisection, Newton’s, secant and fixed point iteration methods for finding the roots of equations.
4. Solution of systems of linear equations, LU factorization, error in solving linear systems
5. Iteration methods (Jacobi and Gauss-Seidel Methods), the Eigen value problem
6. Gaussian numerical integration, numerical differentiation
7. Numerical solutions for ordinary differential equations: Euler's, Heun’s, Taylor and Rung-Kutta method & associated error

Math 322
Course Name and code: Partial Differential Equations – Math 322
Credit hours: 3 hrs
Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)
Instructor/coordinator: Prof. Gamal Attia

4. Text book and Other supplemental materials
Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, sheets,) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information
A) Catalog Description
Gamma and Beta Functions, The Boundary Value Problem and Orthogonal System,

B) Prerequisites: Math 208
C) Co-requisites: None

D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes

On successful completion of this course, student will be able to:

1. Understand basic concepts of Beta and Gamma functions.
2. Acquainted with concept of boundary value problem and orthogonal system.
3. Expand functions in Bessel and Legendre functions.
4. Acquainted the concepts of Partial differential equation (PDE) and its classifications.
5. Solve PDE with the help of separation of variable method.
7. Solve Wave Equation by D’Almbert Method.

B) Old Relation to the student outcomes

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7. **Brief list of topics to be covered**
   1. Gamma and Beta Functions.
   2. The Boundary Value Problem and Orthogonal System.
   3. Expansion the Functions in Bessel functions.
   4. Legendre Functions.
   5. Classification of the Partial Differential Equations according the Order and Linearity.
   7. Solution of Wave Equation by Separation of the Variable Method.
   8. Solution of Wave Equation by D’almbert method.
  10. Solution of Laplace Equation in Different Regions.
Math 328


Credit hours: 3 hrs

Contact hours: 4 hrs (3 hours lectures and 1 hour tutorial)

3. Instructor/coordinator: Prof. Gamal Attia

4. Text book and Other supplemental materials

Text book:

References:

Other supplemental materials
- Course materials (assignments, documents, sheets,) are uploaded for the students use on the College Web-Site: [http://qec.edu.sa/eng/students/lectures/lectureres.asp](http://qec.edu.sa/eng/students/lectures/lectureres.asp).

5. Specific course information

A) Catalog Description
Definition of operations Research, modeling with linear programming, the simplex method, sensitivity analysis, duality and Post-Optimal analysis, transportation & assignment problems, network problem, integer linear programming.

B) Prerequisites: Math 107

C) Co-requisites: None

D) Course Condition: ☐ Required ☐ Elective ☐ Selective

6. Specific goals for the course

A) Course Specific outcomes
On successful completion of this course, student will be able to:

1. Describe the origins and basic methodology of operations research.
2. Give examples of applications of operations research in especially in engineering field.
3. Develop linear programming formulations to represent a variety of applied problems including transportation, assignment, and network models.
4. Solve two-variable linear programming problems using the graphical method.
5. Apply the simplex algorithm to solve linear programming problems.
6. Use software to solve linear programming and integer programming problems.
7. Interpret reports generated by software outputs.
8. Explain the role of sensitivity analysis in linear programming.
9. Explain the role of duality in linear programming.
10. Construct and interpret the dual of linear programming problems.
11. Apply specialized algorithms to solve the transportation, assignment & network problems.
12. Develop integer programming formulations to represent a variety of scenarios.
13. Solve integer programming problems "by hand".

B) Old Relation to the student outcomes

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7. Brief list of topics to be covered

1. Definition of operations Research.
2. Modeling with linear programming.
3. The simplex method.
5. Sensitivity analysis.
7. Dual simplex method.
8. Transportation & assignment problems, Hungarian method, u,v multiplier, Northwest corner method, least cost method.
10. Integer linear programming.

**Phys 104**

1. **Course Name and code:** General Physics – Phys 104 2.

   **Credit hours:** 4 hrs
   
   **Contact hours:** 5 hrs (3 hours lectures and 2 hour lab.)

2. **Instructor/coordinator:** Prof. Gamaleldin Ata

3. **Text book and Other supplemental materials**

   **Text book:**
   - *Physics for Scientists and Engineers*, Fourth edition, Raymond A. Serway, Saunders
   College Publishing ISBN 0-03-015654-8 With Modern Physics

   **Other supplemental materials**
   - Course materials (assignments, documents, sheets, …..) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

4. **Specific course information**
   
   **A) Catalog Description**

   **B) Prerequisites:** None

   **C) Co-requisites:** None

   **D) Course Condition:** ■ Required □ Elective □ Selective

5. **Specific goals for the course**

   **A) Course Specific outcomes**

   By the end of this course, students are expected to:

   1. Demonstrate acquired analytical problem solving skills and apply them to problems from different topic areas.

   2. Propose and refine physical models based on observation, discussion with other observers, and physical reasoning.
3. Demonstrate the ability to apply general science principles from the three topic areas
4. Demonstrate the ability to apply proportional reasoning to numerical problems.
5. Demonstrate an understanding of the concept of the charge as a physical model and draw diagrams for the description of laws of field phenomena and hence the Gauss, Faraday and Kirchhoff laws
6. Demonstrate an understanding of fundamental elements of current electricity. In particular the student will demonstrate the ability to
7. Understand the concepts of the atom and appreciate the importance of models in describing the properties and behavior of atoms and nuclei.
8. Understand the nuclear models and nuclear structures.

B) Old Relation to the student outcomes

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7. Brief list of topics to be covered

1. The charge as a physical model and draw diagrams for the description of laws of field phenomena and
2. The Gauss, Faraday and Kirchhoff laws
3. Fundamental elements of current electricity.
4. The concepts of the atom and appreciate the importance of models in describing the properties and behavior of atoms and nuclei.
5. the nuclear models and nuclear structures.
Chem 111

8. **Course Name and code:** General Chemistry – Chem 111

9. **Credit hours : 4 hrs**
   
   **Contact hours: 4 hrs (3 hours lectures and 1 hour practical)**

10. **Instructor/coordinator:** Dr. Karim M ElSawy

11. **Text book and Other supplemental materials**

   **Text book:**

   **References:**

   **Other supplemental materials**
   - Course materials (assignments, documents, sheets, etc.) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

12. **Specific course information**

   **A) Catalog Description**
   Matter, Chemical calculations, Atomic structure, Bohr theory, Quantum theory, Quantum numbers, The Electron configuration of atoms, The periodic table, Gases, Solutions, Chemical kinetics, Chemical equilibrium, Thermochemistry.

   **B) Prerequisites:** None

   **C) Co-requisites:** None

   **D) Course Condition:** ■ Required □ Elective □ Selective

13. **Specific goals for the course**

   **A) Course Specific outcomes**
   By the end of this course, students are expected to:
   
   6. Distinguish different forms of matter
   7. Perform basic chemical calculations
   8. Know the different aspects of atomic structure and relevant theories
   9. Be able to correctly assign the electron configuration of arbitrary atoms and deduce related chemical properties
10. Appreciate the significance of the periodic table and be able to use it to compare the physical and chemical properties of different elements.

11. Apply the gas laws to simple problems of general and chemical interest.

12. Recognize the importance of the time domain of chemical reaction through chemical kinetics and to understand factors that control progression of chemical reaction.

13. Grasp the importance of chemical equilibrium, its relation to chemical kinetics and its impact on performing chemical calculations.

14. Understand the basics of thermochemistry as a subtopic of the broader field of thermodynamics.

B) Old Relation to the student outcomes

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Student Outcomes (SO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 111</td>
<td>a  b  c  d  e  f  g  h  i  j  k  L</td>
</tr>
<tr>
<td></td>
<td>■  □  □  □  f  ■  □  □  □  □  □</td>
</tr>
</tbody>
</table>

■ Highly related to Student Outcome (SO)
□ To some extent related to Student Outcome (SO)

C) New Relation to the student outcomes

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Student Outcomes (SO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 111</td>
<td>1  2  3  4  5  6  7</td>
</tr>
<tr>
<td></td>
<td>■  □  □  ■  □  □  □</td>
</tr>
</tbody>
</table>

■ Highly related to Student Outcome (SO)
□ To some extent related to Student Outcome (SO)

14. Brief list of topics to be covered

15. Introduction: Matter
16. Chemical calculations
17. Atomic structure, Bohr theory,
18. Quantum theory, Quantum numbers
19. The electron configuration of atoms
20. The Periodic table
21. Gases
22. Solutions
23. Chemical kinetics
24. Chemical equilibrium
25. Thermochemistry

CSC 209

15. Course Name and code: Computer Programming – CSC 209

16. Credit hours: 3 hrs
   Contact hours: 4 hrs (2 hours lectures and 1 hour practical)

17. Instructor/coordinator: Dr. Hussam ALZEIN

18. Text book and Other supplemental materials
   
   **Text book:**

   **References:**

   **Other supplemental materials**
   - Course materials (assignments, documents, sheets, …) are uploaded for the students use on the College Web-Site: (http://qec.edu.sa/eng/students/lectures/lectureres.asp).

19. Specific course information

   **A) Catalog Description**
   Introduction to computers and computing fundamentals in MATLAB, Data Types, Variables, Scalar and array operations, Built-In MATLAB Functions, Simple input/output statement, plotting commands, Relational and logical expressions, IF-ELSE control structure, the switch control structure, The WHILE statement, The FOR statement and looping structure, Arrays one dimensional and multidimensional Methods, Engineering Applications.

   **B) Prerequisites: None**

   **C) Co-requisites: None**

   **D) Course Condition: □ Required · Elective · Selective**

20. Specific goals for the course

   **A) Course Specific outcomes**
   By the end of this course, students are expected to be able to
26. Describe Essential elements of MATLAB programming language
27. Describe the concept of data types, variables and assignment
28. State the notions of selection and repetition structure in MATLAB
29. State the notions of array, vector and matrix in MATLAB
30. Describe 2D Plotting
31. Develop analytic skills to solve simple engineering problem
32. Write, test programs in MATLAB

B) Old Relation to the student outcomes

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Student Outcomes (SO)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a b c d e f g h i j k l</td>
</tr>
<tr>
<td>CSC 209</td>
<td>■</td>
</tr>
</tbody>
</table>

■ Highly related to Student Outcome (SO)
□ To some extent related to Student Outcome (SO)

C) New Relation to the student outcomes

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Student Outcomes (SO)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>CSC 209</td>
<td>■</td>
</tr>
</tbody>
</table>

■ Highly related to Student Outcome (SO)
□ To some extent related to Student Outcome (SO)

21. Brief list of topics to be covered

15. Introduction to MATLAB, The Advantages of MATLAB, Disadvantages of MATLAB, The MATLAB Environment
16. MATLAB Basics Variables and Arrays, Creating and Initializing Variables in MATLAB, Assignment Statements, Built-in Functions, Keyboard Input
17. Multidimensional Arrays, Subarrays, Special Values, Displaying Output Data
18. Scalar and Array Operations, Scalar and Array Operations, Built-in MATLAB Functions
19. Introduction to Plotting
20. MATLAB Applications: Vector Mathematics, MATLAB Applications: Matrix Operations and Simultaneous Equations
21. Two-Dimensional Plots
23. The switch Construct, MATLAB Applications: Roots of Polynomials
24. Loops and Vectorization, The while Loop, The for Loop
25. Logical Arrays and Vectorization
26. MATLAB Applications: Statistical Functions
27. MATLAB Applications: Curve Fitting and Interpolation
28. Engineering Applications
Appendix A2
Engineering Courses

CE 282: Introduction to Geotechnical Engineering
2 Credit

Catalogua Description:

The student is presented with an introductory course of engineering geology as a solid base for studying geotechnical engineering. An extensive in-class presentation of different rock types, its origin and the engineering structure of rock particles. Types and classification of rocks based on origin and strength. Weathering process. Classification of soil based on formation. Index and engineering classification of soil. Clay minerals and soil structure.

Course Web Address: http://www.qec.edu.sa/

Prerequisites: None

Co-requisites: None

Course Category: Core Course

Textbook:


References:

Other
Supplemental
Materials: Site Uploaded; Notes, Assignments, Quizzes and Exams Model Answers, etc.

Credit and Contact Hours:

Credits: 2 hours, Contact: 3 hours (2 hours of lecture and 1 hour of tutorial per week)

Course Coordinator’s Name: Associate Prof. Sherif M. Elkholy

Computer Usage: In completing the homework assignments and preparing reports.

Specific Outcomes of Instructions:

Students who successfully complete the course will be able to demonstrate that he acquired:
1. A knowledge of geological structure of earth and earth crust.
2. A knowledge of minerals and their types and physical properties.
3. A knowledge of different rock groups and understanding of the rock cycle.
4. An understanding the formation process and properties of igneous, sedimentary, and metamorphic rock.
5. An understanding of the structural features of rock masses and their effect on rock mass quality.
6. An understanding of the origin, formation, and properties of residual and transported soil.
7. An understanding of the first principles of soil/water phase relationships.

Old Related Student Outcomes:

b) An ability to apply knowledge of mathematics, science and engineering.

j) A recognition of the need for, and an ability to engage in life-long learning.

New Related Student Outcomes:

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Topics to be covered:
<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1st</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Minerals</td>
<td>2nd &amp; 3rd</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Rocks</td>
<td>4th &amp; 5th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Igneous Rocks</td>
<td>6th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Weathering Process</td>
<td>7th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Sedimentary Rocks</td>
<td>8th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Metamorphic Rocks</td>
<td>9th &amp; 10th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Structural Features of Rock</td>
<td>11th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Masses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Origin and Composition of Soil</td>
<td>12th &amp; 13th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Soil-Water Phase Relationships</td>
<td>14th &amp; 15th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

Prepared by: Associate Prof. Sherif M. ElKholy

Date: 01/03/2015

**CE 202: Mechanics of Materials**

3 Credit Catalogue

**Description:**


**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Statics (GE 201)

**Co-requisites:** Differential and Integral Calculus (Math 203) Course

**Category:** Core Course

**Textbook:**


Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Dr. Gamal A. M. Al-Saadi

Computer Usage: Writing home works and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
14. An understanding of how to calculate the internal forces.
15. Knowledge of fundamental concepts such as stresses and strains.
16. An ability to compute normal stresses due to normal forces and bending moments.
17. An ability to compute shear stresses due to shear forces and torsion for some shapes of sections.
18. Knowledge of principal stresses and strains and ability to compute them.
19. An ability to compute stresses induced in spherical and cylindrical vessels.
20. Knowledge of the elastic buckling phenomenon of columns.

Old Related Student Outcomes:

b) An ability to apply knowledge of mathematics, science and engineering
d) An ability to apply knowledge of mathematics, science and engineering
f) An ability to identify, formulate, and solve engineering problems

New Related Student Outcomes:
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial Forces, Shear and Bending Moments of Bars and Beams, and Load-</td>
<td>1st, 2nd</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Shear-Moment Relationships</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properties of Sections, and Rotation of Section Axes</td>
<td>3rd, 4th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>The Normal Stresses, Applications on Bending Moment-Curvature</td>
<td>5th, 6th, 7th, 8th</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>-</td>
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<tr>
<td>Relationships, The General Case of Normal Stresses, Applications on</td>
<td></td>
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<td></td>
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<tr>
<td>the general case</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>The Shear Stresses, Applications on the Shear Flow, Shear Stresses</td>
<td>9th, 10th, 11th</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
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<tr>
<td>in Torsion</td>
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<tr>
<td>Analysis of Stresses in Two Dimensions, and Analysis of Strains in</td>
<td>12th, 13th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Two Dimensions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spherical and cylindrical pressure vessels</td>
<td>14th</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Elastic Buckling of Columns</td>
<td>15th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
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</tbody>
</table>

**Prepared by:** Dr. Gamal Al-Saadi  
**Date:** 9/3/2015

**CE 112: Survey Basics**  
**2 Credits Catalogue**

**Description:**
Definitions and concepts in land surveying, divisions and importance of surveying, units of measurements, introduction to theory of measurements and errors, linear measurements, angular measurements, directions, levelling and contouring, computer applications.

Course Web Address: http://www.qec.edu.sa/

Prerequisites by Topic: Mathematics, Math 107

Co-requisites: ..........................................................

Course Category: Core Course

Textbook:

References:
..........................................................

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, etc.

Credit and Contact Hours:

Credits: 2 hours, Contact: 3 hours (1 hour lecture and 2 hours Lab activities per week)

Course Coordinator’s Name: Associate Prof. Ramadan Hassan

Computer Usage:
Adjusting levelling loops, lines, open and closed traverses and contouring.

Course Objectives:
The student will:
7. Be taught the principles and practice of engineering surveying.
8. Be able to widen his experience and skills in measuring equipment and techniques used in engineering surveying to a competent level.
9. Be acquainted the measurement errors.
10. Be able to know the topographic map characteristics.
11. Develop a team work skills.
12. Be able to develop competence and confidence in the use of modern surveying field instruments to observe, collect and process surveying data.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will be able to:

1. Identify the main surveying branches, instrumentation and units of measurement.
2. Illustrate the location ties-ins methods.
3. Perform linear measurements and calculate their corrections kinds.
4. Evaluate measurements errors and analyze the standard error
5. Perform the height difference measurements and levels computations 6. Compute horizontal and vertical angles from measurements
7. Compute the azimuths and bearings for the traverse sides.
8. Explain the topographic map characteristics

**Old Related Student Outcomes**

a) An ability to apply knowledge of mathematics, science and engineering 
b) An ability to design and conduct experiments, as well as to analyze and interpret data 
d) An ability to function on multidisciplinary teams 
e) An ability to identify, formulate, and solve engineering problems 
g) An ability to communicate effectively 
j) A knowledge of contemporary issues 
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. 

**New Related Student Outcomes**

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. 
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
3. An ability to communicate effectively with a range of audiences. 
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. 
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
### Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basics of Surveying</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Introduction to Theory of Measurement and Errors</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Leveling measurements</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;, 4&lt;sup&gt;th&lt;/sup&gt;, 5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9</td>
<td>3</td>
<td>-</td>
<td>6</td>
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<tr>
<td>Distance Measurements</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; - 8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9</td>
<td>3</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Angles &amp; Directions</td>
<td>9&lt;sup&gt;th&lt;/sup&gt; - 10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Computer Applications ( Traverse Surveys Computations and Adjustment)</td>
<td>11&lt;sup&gt;th&lt;/sup&gt; – 12&lt;sup&gt;th&lt;/sup&gt;, 13&lt;sup&gt;th&lt;/sup&gt;</td>
<td>9</td>
<td>3</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Topographic Survey</td>
<td>14&lt;sup&gt;th&lt;/sup&gt; – 15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

**Prepared by:** Associate Prof. Ramadan Hassan  
**Date:** March, 12, 2015
Catalogue Description

**CE 203: Structural Materials**  
*3 Credit*


**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Mechanics of Materials (CE202)  
**Co-requisites:** None  
**Course Category:** Core Course

**Textbook:**  
ASTM Standards, -Cement and concrete research, -Cement and concrete composite

**Other**  
**Supplemental Materials:** Site Uploaded; Notes, Solved Examples, Model Answers, etc.

**Credit and Contact Hours:**  
Credits: 3 hours, Contact: 4 hours (2 hours lecture and 2 hours practical; per week)

**Course Coordinator’s Name:** Dr. Gamal A. M. Al-Saadi

**Computer Usage:** Writing home works and required reports and drawing some engineering sketches.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will demonstrate to have the following outcomes:

22. An understanding of knowledge of the mechanical properties of different structural materials.
23. An understanding of properties, specification, and utilization of ferrous metals.
25. A knowledge of properties, specification, and utilization of Bricks, Glass, Ceramics and plastics.
26. A knowledge of testing machines, measuring devices and the statistical evaluation of testing results

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
d) An ability to function on multidisciplinary teams
g) An ability to communicate effectively
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
3. an ability to communicate effectively with a range of audiences.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Fundamentals of Engineering Materials</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Testing of Materials, and Standards and specifications</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4</td>
<td>2</td>
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### Catalogue Description

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<tr>
<th>Topic</th>
<th>Weeks</th>
<th>Hours</th>
<th>Credits</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Bricks and Blocks Manufacturing, Properties and utilization (clay, Calcium silicate and concrete), Ceramics, Lime, and Glasses</td>
<td>3rd, 4th, 5th</td>
<td>12</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Plastics, Bending and shear tests</td>
<td>6th, 7th</td>
<td>8</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Timber (selection, properties and utilization), Bending and shear tests</td>
<td>8th, 9th</td>
<td>8</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Testing Machines, measurement devices, Metals</td>
<td>10th, 11th</td>
<td>8</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Metals, Manufacturing, Types and Properties of ferrous metals, tension, compression, bending, shear, hardness, impact tests, and nondestructive tests</td>
<td>12th, 13th, 14th, 15th</td>
<td>16</td>
<td>8</td>
<td>-</td>
</tr>
</tbody>
</table>

### Prepared by: Dr. Gamal Al-Saadi  
Date: 9/3/2015

### CE 230: Fluid Mechanics  
3 Credit


**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Dynamics GE 202, Integral Calculus Math 106

**Co-requisites:** None

**Course Category:** Core Course

**Textbook:**  

**References:**

Other
Supplemental
Materials: Site Uploaded; Notes, Model Answers, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour of tutorial; per week)

Course Coordinator’s Name: Associate Prof. Yousry Ghazaw

Computer Usage: Word Processor (student's choice), Spreadsheet (student's choice)

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
8. An understanding of fluid mechanics fundamentals, including concepts of mass conservation
10. An ability to apply the Bernoulli equation to solve problems in fluid mechanics.
11. An ability to use energy equations to understand pressure and velocity variations.
12. An ability to perform dimensional analysis for problems in fluid mechanics.
13. An ability to estimate "losses" in flow systems.
14. Understand of viscosity and its important in real flows.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
e) An ability to identify, formulate, and solve engineering problems
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
Catalogue Description

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture s</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid properties : Dimensions and units, Viscosity.</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Mass, Weight, Temperature, Atmospheric pressure, Vapour pressure and surface tension.</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Fluid Statics: Force, Stress, and Pressure at a point, Basic equation of fluid statics.</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Units and scales of pressure Measurement Manometers</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Forces on Plane Areas</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Forces on curved Surfaces and Buoyant force</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Kinematics: Continuity equation</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Energy equation and its application Mechanical energy of a flowing fluid, steady flow energy equation.</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;, 9&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Pitot tube, orifice plate, etc</td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Small and large orifices</td>
<td>11&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Weirs</td>
<td>12&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Pipe lines</td>
<td>13&lt;sup&gt;th&lt;/sup&gt;, 14&lt;sup&gt;th&lt;/sup&gt;, 15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

Prepared by: Dr: Yousry Ghazaw   Date:
CE 231: Fluid Mechanics Laboratory
1 Credit

Measuring of temperature and atmospheric pressure. Fluid properties such as viscosity, density, surface tension for liquids. Hydrostatic pressure on fully and partially submerged plane. Flow from a hole in the side of a tank, coefficient of velocity, coefficient of contraction and coefficient of discharge. Flow over weirs, Reynolds Number, Bernoulli's theorem, Pizometric tubes, venturi meter and Pitot tube. Fluid flow and coefficient of friction in pipes.

Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

Prerequisites: None
Co-requisites: Fluid mechanics CE230
Course Category: Core Course
Textbook:
4. Armfield Manuals U.K.
References:

Other Supplemental Materials: Site Uploaded; Notes, Model Answers, etc.

Credit and Contact Hours:
Credits: 1 hours, Contact: 2 hours (2 hour lab per week)

Course Coordinator’s Name: Associate Prof. Yousry Ghazaw

Computer Usage: Word Processor (student's choice), Spreadsheet (student's choice)

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:
8. Ability to conduct laboratory experiments using a hydraulic bench and many other accessories such Bernoulli's apparatus, weirs, orifice in side tank, Reynolds experiment etc.
9. Ability to conduct experiments to determine friction coefficients in pipes.
10. An understanding of the relation between fluid mechanics theory and practice
Catalogue Description

11. Ability to prepare a written report.
12. Ability to present an oral report.
13. Ability to work as part of a group.
14. An understanding of laboratory ethics

Program Old Related Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
h) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program New Related Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
3. an ability to communicate effectively with a range of audiences.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
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<th>Tutorial</th>
<th>Lab</th>
</tr>
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<tbody>
<tr>
<td>Introductory Lecture,</td>
<td>1st</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
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<tr>
<td>Temperature and atmospheric pressure</td>
<td>2nd</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
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<tr>
<td>Specific gravity, surface tension and viscosity</td>
<td>3rd</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Hydrostatic pressure on plane surface</td>
<td>4th,5th</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Side orifice flow</td>
<td>6th</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Coefficient of velocity</td>
<td>7th</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>
CE 304: Properties and Testing of Concrete
3 Credit

Cement: Manufacture, properties, types of cement, tests. Aggregate: Types, properties, grading, tests. Mixing water, concrete: proportions, mixing, handling, placing, fresh and hardened properties, tests, curing.

Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

Prerequisites: Structural Materials (CE203)
Co-requisites: None
Course Category: Core Course

Textbook:
3- H.Kosmatka et al., USA, “Design and Control of Concrete Mixtures” by” 15th edition, Portland Cement Association

References: ASTM Standards.
Catalogue Description

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (2 hours lecture and 2 hours Lab; per week)

Course Coordinator’s Name: Dr. Gamal A. M. Al-Saadi

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate to have the following outcomes:

9. The Knowledge of the manufacturing, properties, types of cements.
10. The knowledge of the specifications and required tests for cement.
11. The knowledge of the properties, specification, types, grading and required tests for aggregates.
12. The knowledge of the grading and required tests for aggregates.
13. The knowledge of mixing, handling, placing and curing of concrete.
14. The knowledge of the properties, specification, and required tests for fresh concrete.
15. The ability to design and calculate the proportioning of the different constituents of a concrete mix.
16. The knowledge of the Properties and Tests of hardened concrete.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) An ability to function on multidisciplinary teams
g) An ability to communicate effectively
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. an ability to communicate effectively with a range of audiences.

4. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
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<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to concrete</td>
<td>1st</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Manufacture of Cement, Types and properties of cement, and Cement Tests</td>
<td>2nd, 3rd, 4th</td>
<td>12</td>
<td>6</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Types and properties of Aggregates, Grading and Tests of Aggregates, and Mixing water</td>
<td>5th, 6th, 7th</td>
<td>12</td>
<td>6</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Designing and Proportioning Concrete Mixtures, Mixing, Handling, placing, and Curing</td>
<td>8th, 9th, 10th, 11th</td>
<td>16</td>
<td>8</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Properties and Tests of Fresh Concrete and hardened concrete</td>
<td>12th, 13th</td>
<td>8</td>
<td>4</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Control Tests for Concrete</td>
<td>14th</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Non-destructive tests</td>
<td>15th</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

**Prepared by:** Dr. Gamal Al-Saadi  
**Date:** 9/3/2015
CE 305: Structural Analysis
3 Credit

Catalogue Description:


Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

Prerequisites: Mechanics of Materials CE 202
Co-requisites: None

Course Category: Core Course

Textbook:

References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Prof. Hesham Ali Zieneldin

Computer Usage: Writing home works and required reports and drawing some engineering sketches.
Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. A knowledge of stability and equilibrium of different types of structures and an ability to apply them.
2. An ability to calculate the reactions of different structures.
3. An ability to use method of joints and method of sections to solve truss problems.
4. An ability to analyze and draw shear force and bending moment diagrams of determinate beams.
5. An ability to draw normal force, shear force and bending moment diagrams of frames and analyze arches.
6. An ability to use different methods to calculate deflections for determinate structures. 7. An ability to draw influence lines for internal forces in different structures.

Old Related Student Outcomes:
a) An ability to apply knowledge of mathematics, science and engineering
e) An ability to identify, formulate, and solve engineering problems
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

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</thead>
<tbody>
<tr>
<td>Types of structures and loads: introduction, classification of structures, loads and supports</td>
<td>1st, 2nd</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Analysis of statically determinate structures: superposition, equilibrium, determinacy and stability, reactions computation</td>
<td>3rd, 4th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Analysis of statically determinate Trusses: types, method of joints, method of sections</td>
<td>5th, 6th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Analysis of statically determinate beams: shear force and bending moment diagrams, load-shear-moment relationships</td>
<td>7th, 8th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Analysis of statically determinate frames: shear force and bending moment diagrams</td>
<td>9th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Analysis of statically determinate arches: internal forces in a three-hinged arch</td>
<td>10th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Deflections of statically determinate beams: double integration, conjugate beam, and virtual work methods</td>
<td>11rd, 12th &amp; 13th</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Influence lines for statically determinate beams</td>
<td>14th, 15th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

**Prepared by:** Prof. Hesham Ali Zieneldin  
**March 2015**

**CE 320: Construction Engineering**  
3 Credits **Catalog**

**Description:**
Overview of the construction industry, earthmoving machinery and properties, excavation and lifting, loading and hauling, compaction and finishing, concrete construction, concrete form design, concrete economics, construction economics, contract construction.

**Course Web Address:**

http://www.qec.edu.sa/

**Prerequisites by Topic:** (None)

**Co-requisites:** .................................................................

**Course Category:** Core Course

**Textbook:**

**References:**
.................................................................
Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc. Credit and Contact Hours: Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour of tutorial per week)

Computer Usage: Writing home works and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:
Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. An ability to outline the construction engineering field.
2. An ability to recognize different types of earthmoving machinery and properties.
3. An ability to develop the skill of calculating the production of different types of earthmoving equipment.
4. An ability to calculate the production of different types of earthmoving equipment.
5. An ability to employ the principal requirements for concrete formwork.
6. An ability to analyze and design concrete form.
7. An ability to categorize and calculate the different items affecting the concrete and construction economics.

Old Related Student Outcomes:
a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

Topics to be covered: 
<table>
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<tr>
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<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of the Construction Industry</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;, 2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Earthmoving Machinery and Properties</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;, 4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Excavation and Lifting</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Loading and Hauling</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;, 7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Compaction and Finishing</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Concrete Construction</td>
<td>9&lt;sup&gt;th&lt;/sup&gt;, 10&lt;sup&gt;th&lt;/sup&gt;, 11&lt;sup&gt;th&lt;/sup&gt;</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Concrete Form Design</td>
<td>12&lt;sup&gt;th&lt;/sup&gt;, 13&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Concrete Economics</td>
<td>14&lt;sup&gt;th&lt;/sup&gt;, 15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
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</tr>
</tbody>
</table>

**Prepared by:** Associate Prof. Ramadan Hassan  
**Date:** March 2015

**CE 353: Geotechnical Engineering**  
3 Credit

**Catalogue Description:**

The student is presented with a wide range of in-class experience in the field of geotechnical engineering in order to become comfortable with its basic theoretical and practical principles. The scope of the course is directed towards making the student aware of the influence of geotechnical engineering principles in all fields of civil engineering. The course covers the following topics; flow of water in soil, soil compaction, soil compressibility, calculation of structures settlement, shear strength of soils, lateral earth pressure, and introduction to the stability of soil side slopes.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)  
**Prerequisites:** CE 285  
**Corequisites:** None  
**Course Category:** Core Course  
**Textbook:**


-72-
References:

Other Supplemental Materials: Site Uploaded; Notes, Assignments, Quizzes and Exams Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hours of lecture and 1 hour of tutorial per week)

Course Coordinator’s Name: Associate Prof. Sherif M. ElKholy

Computer Usage: In completing the homework assignments and preparing reports. Specific Outcomes of Instructions:

Students who successfully complete the course will be able to demonstrate that he acquired:
1. A knowledge and understanding of soil indices and their effect on soil behavior.
2. An understanding of the principles of soil compaction and flow of water through soil.
3. The ability to analyze and investigate problems of seepage through soil and under structures.
   4. An understanding of the principle of soil effective stress and stresses in soil mass due to external loading.
5. An understanding of principles of soil compressibility and the ability to analyze soil settlements.
6. An understanding of principles of soil shear strength and its effect on soil behavior under loads.
7. An understanding of the principles of soil lateral earth pressure and how to determine it.

Old Related Student Outcomes:

   a) An ability to apply knowledge of mathematics, science and engineering
   b) An ability to design and conduct experiments, as well as to analyze and interpret data
   e) An ability to identify, formulate, and solve engineering problems
   f) An understanding of professional and ethical responsibility
   h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
   k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**Topics to be covered:**

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</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1(^{st})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Soil/Water Indices</td>
<td>2(^{nd})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Soil Characterization and Classification</td>
<td>3(^{rd})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Soil Compaction</td>
<td>4(^{th})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Permeability of Soil</td>
<td>5(^{th})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Water Seepage and Flow Nets</td>
<td>6(^{th})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Principle of Effective Stresses</td>
<td>7(^{th})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Stresses in Soil Masses</td>
<td>8(^{th})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Soil Compressibility</td>
<td>9(^{th})</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Primary and Secondary Settlement Analysis</td>
<td>10(^{th}) &amp; 11(^{th})</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Shear Strength of Soils</td>
<td>12(^{th}) &amp; 13(^{th})</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Soil Lateral Earth Pressure</td>
<td>14(^{th}) &amp; 15(^{th})</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

**CE 354: Geotechnical Engineering Lab**

1 Credit

**Catalogue Description:**

The student is presented with a wide range of laboratory experiments that cover the physical and engineering properties of different soil types in order to become comfortable with the basic engineering soil properties that are used in soil classification and problems investigations. These
properties include moisture density relationships, soil indices, classifications and identification of soils, soil coefficient of permeability, soil compaction, soil consolidation, direct shear and unconfined strength of soil.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** CE 285

**Co-requisites:** CE 353 Course

**Category:** Core Course

**Textbook:**

**References:**

…………………………………………………………………………………………………………………………

**Other Supplemental Materials:** Site Uploaded; Notes, Assignments, and Exams Model Answers, etc….

**Credit and Contact Hours:**

Credits: 1 hour, Contact: 2 hours (2 hours of laboratory session per week)

**Course Coordinator’s Name:** Associate Prof. Sherif M. ElKholy

**Computer Usage:** In completing the homework assignments and preparing lab reports.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will be able to demonstrate that:

1. He acquired an understanding of soil water phase relationships.
2. He acquired a knowledge of the procedures of collecting soil samples.
3. He will be able to perform soil lab tests and write lab reports.
4. He will be able to estimate soil properties such as natural water contents, Atterberg Limits, and consolidation.
5. He will be able to apply principles of AASHTO and USCS soil classification systems.
6. He will be able to analyze results of laboratory and field compaction tests.
7. He will be able to evaluate soil shear strength parameters using unconfined and direct shear tests.

**Old Related Student Outcomes:**
a) An ability to apply knowledge of mathematics, science and engineering  
b) An ability to design and conduct experiments, as well as to analyze and interpret data  
d) An ability to function on multidisciplinary teams  
g) An ability to communicate effectively (3g1 orally, 3g2 written)  
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.  

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.  
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.  
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.  
3. an ability to communicate effectively with a range of audiences.  
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and Lab Safety Regulation</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Soil Phase Relationships</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Natural Water Content</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Soil Solids Specific Gravity</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Particle Size Analysis of Cohesionless Soil (Sieve Analysis)</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Atterberg Limits</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Classification of Soils</td>
<td>7&lt;sup&gt;th&lt;/sup&gt; &amp; 8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Compaction Test (Lab and Field)</td>
<td>9&lt;sup&gt;th&lt;/sup&gt; &amp; 10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Coefficient of Permeability</td>
<td>11&lt;sup&gt;th&lt;/sup&gt;</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>
CE 370: Water and Wastewater Engineering
4 Credits

Catalogue Description:

Analysis of water distribution and wastewater collection systems, computer modeling of network systems; water treatment including coagulation, flocculation, softening, sedimentation, filtration, desalination and disinfection; wastewater treatment, principles of biological treatment systems including activated sludge, extended aeration, biological filtration, and stabilization ponds.

Course Web Address: http://www.qec.edu.sa/
Prerequisites: Fluid mechanics, CE 230
Co-requisites: ......
Course Category: Core Course

References:
Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credit: 4 hours, Contact: 5 hours (4 hours lectures and 1 hour tutorial) per week
Course Coordinator’s Name: Associate Prof. Tarek Elmitwalli
Computer Usage: Computer applications in design of water and wastewater systems, spreadsheet

Specific Outcomes of Instructions:
Students who successfully complete the course will be able to
11. Recognize the different types of water and wastewater pipeline material.
12. Recognize the basic information about chemistry and biology as it applies to water and wastewater technologies.
13. Recognize the different components of the water and wastewater treatment processes.
14. Determine the required water and wastewater quantity for a certain community.
15. Analyze and solve design problems in water and wastewater systems.
17. Design of water distribution system.
18. Design of sewage collection system.
19. Use the internet-searching engine to find material for the case study report
20. Apply Excel spreadsheet in the design and calculation skills.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and quantity of water, chemistry, biology</td>
<td>1st &amp; 2nd</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Water processing: mixing and flocculation, sedimentation, flocculator- clarifiers,</td>
<td>3rd, 4th &amp; 5th</td>
<td>15</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Water processing: filtration, turbidity removal, iron and manganese removal, precipitation softening</td>
<td>6th &amp; 7th</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Water processing: disinfection, removal of dissolved salts</td>
<td>8th</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Water pipes, collection, distribution, design</td>
<td>9th</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Sewer arrangement, materials and design</td>
<td>10th &amp; 11th</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Wastewater processing: considerations in plant design, preliminary treatment</td>
<td>12th</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Wastewater processing: primary treatment</td>
<td>13th</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Wastewater processing: secondary treatment, biological aeration, biological filtration</td>
<td>14th</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Wastewater processing: tertiary treatment</td>
<td>15th</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Prepared by: Associate Prof. Tarek Elmitwalli  Date: March 2015

CE 315: Reinforced Concrete

3 Credit Catalogue

Description:


Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

Prerequisites: CE 305: Structural Analysis.

CE 304: Properties and Testing of Concrete Co-requisites:

Course Category: Core Course Textbook:
References:
- M. Nadim Hassoun, and Akthem Al Manaseer, Structural Concrete Theory and design, John Wiley & Sons Inc, Latest Edition
- Saudi Building Code Latest Edition,
- ACI Latest Edition

Other
Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hours recitation; per week)

Course Coordinator’s Name: Assistant Prof. Dr. Ahmed Elragi

Computer Usage: Writing home works and required reports. Drawing plans and elevations of some designed applications.
Using the software package Office, and SAP2000 for analysis of some problems.

Specific Outcomes of Instructions:
Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. An ability to conduct the knowledge of the reinforced concrete as a structural material.
2. An ability to conduct the knowledge of the mechanics of reinforced concrete members.
3. An ability to use building codes in the design of reinforced concrete structures.
4. An ability to use ultimate strength design method and elastic concept in reinforced concrete design.
5. An ability to design reinforced concrete beams and slabs subjected to flexure and shear forces.
6. An ability to compute development length, splices and deflections in reinforced concrete structures.
7. An ability to design reinforced concrete columns and staircases.

Old Related Student Outcomes:
a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
4. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture(s)</th>
<th>Tutorial Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Material properties, Mechanics of reinforced concrete members</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Ultimate strength design &amp; elastic concept, Load factors and load combination (ACI Code)</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Flexural design of beams with rectangular and T cross sections, ACI code requirements</td>
<td>3rd, 4th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Analysis and design of beams with compression reinforcement, Reinforcement details</td>
<td>4th &amp; 5th</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Analysis and design of beams for shear and diagonal tension, ACI Code requirements</td>
<td>6th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Design of one-way &amp; two-way slabs, Analysis and design of continuous beams and slabs</td>
<td>7th, 8th, 9th &amp; 10th</td>
<td>16</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Development length, anchorage and splice of reinforcement. Deflections and crack control</td>
<td>11th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Design of non-sway short and long concrete columns</td>
<td>12th &amp; 13th</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Design of different types of staircases.</td>
<td>14th &amp; 15th</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

**Prepared by:** Assistant Prof. Dr. Ahmed Elragi

**Date:** 1/3/2015

**CE 317: Computer Applications in CE**

3 Credit
Catalogua Description:

This course develops the problem solving skills essential for analysis and design of several applications in civil engineering and provides graduates with ability for continual development through lifelong learning. This includes the following; problem formulation, problem modeling, and constitutive modeling of different engineering materials. The course utilizes FEM-based software packages in analyzing and solving engineering problems, results verification and interpretation. The used software packages will vary depending on job market demands. Examples of packages include, but not limited to, SAP 2000, PLAXIS, Geo-Slope Suit, ANSAS, STAD Pro, Mod Flow, Pipe Net,…etc

Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

Prerequisites: CE315, CE 353

Co-requisites: None

Category: optional

Textbook:

The user's manual of the specified software package. There is no specific textbook for the course; however the students are encouraged to acquire any of the references mentioned below.

References:

Other Supplemental Materials: Site Uploaded; Notes, Assignments, Quizzes and Exams Model Answers, etc….

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (2 hours of lecture and 1 hour of tutorial and 1 hour Lab per week)

Course Coordinator’s Name: Dr. Ahmad AlSonbaty and Dr. Sherif M. ElKholy

Computer Usage: In completing the homework assignments and preparing reports.

Specific Outcomes of Instructions:
Students who successfully complete the course will be able to demonstrate that he acquired:
1 Knowledge of several software packages used in civil engineering applications.
2. Ability to formulate and model problems using the computer capabilities.
3. Ability to model different engineering materials.
4. Ability to use several software packages according to the studied problem.
5. Ability to verify and interpret the results.

**Old Related Student Outcomes:**
- a) An ability to apply knowledge of mathematics, science and engineering
- e) An ability to identify, formulate, and solve engineering problems
  - i) A recognition of the need for, and an ability to engage in life-long learning
  - j) A knowledge of contemporary issues
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction About FEM</td>
<td>1st, 2nd</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Modeling Attributes</td>
<td>3rd</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Problem Formulation</td>
<td>4th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Constitutive modeling of materials</td>
<td>5th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Applications on Structures Problems</td>
<td>6th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Using Software Package SAP2000</td>
<td>7th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Applications using SAP2000 (Beams, Plane Frames and Trusses)</td>
<td>8th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Applications using SAP2000 (Trussed Frames and Space Frames)</td>
<td>9th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Applications using SAP2000 (Variety of Foundation Types)</td>
<td>10th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
CE 331: Hydrology

3 Credit

Catalogue Description:

Course Web Address: http://www.qec.edu.sa/

Prerequisites: Fluid mechanics CE230

Co-requisites: None

Course Category: Core Course

Textbook:

References:

Other

Supplemental

Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc. Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour of tutorial; per week)

**Course Coordinator’s Name:** Associate Prof. Yousry Ghazaw

**Computer Usage:** Ready-made Finite elements program. Spreadsheets, writing homework's and reports.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

8. Knowledge of basic hydrologic cycle.
10. An ability to use differential equations to understand groundwater flow.
11. Knowledge of water resource management in arid and semiarid areas.
12. An ability to estimate "losses from precipitation".
14. An ability to select solution methods appropriate for a hydrological modeling.

**Relationship of course to program objectives:**

This course develops the fundamentals of water resources and problem solving skills essential for the water shed management, reservoir operations, flood management and water supply.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
j) A knowledge of contemporary issues

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory Lecture, The hydrologic cycle</td>
<td>1\textsuperscript{st}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Fundamentals of meteorology: temperature, humidity, wind, precipitation, and evaporation.</td>
<td>2\textsuperscript{nd}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Stream-flow and run-off.</td>
<td>3\textsuperscript{rd}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Groundwater flow and aquifers</td>
<td>4\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>wells</td>
<td>5\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>salt water intrusion in coastal aquifers</td>
<td>6\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Stream-flow hydrographs.</td>
<td>7\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Unit hydrographs</td>
<td>8\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Unit hydrographs for various durations and its applications</td>
<td>9\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Introduction to Water Resources management and its demand</td>
<td>10\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Water Resources management in arid and semi-arid regions.</td>
<td>11\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Application of water resources planning in Saudi Arabia</td>
<td>12\textsuperscript{th}</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Application of water resources planning in Saudi Arabia</td>
<td>13\textsuperscript{th}, 14\textsuperscript{th}</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

Prepared by: Dr: Yousry Ghazaw

Date: March 1\textsuperscript{st}, 2015

CE 341: Transportation and Traffic Engineering
4 Credit

Catalogue Description:


Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)
Prerequisites: None

Co-requisites: None

Course Category: Core Course

Textbooks:


References: None

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 4 hours, Contact: 5 hours (4 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Prof. Sayed A. Habib

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
9. Recognize the transportation systems and its characteristics.
10. Recognize the transportation and society.
11. Differentiate between the components of transportation systems.
12. Recognize vehicle motion, flow, performance, continues flow, terminals, transportation demand and traffic system.
13. Recognize the traffic stream characteristics and traffic engineering studies.
14. Explain the traffic safety.
15. Determine the capacity of urban streets and intersections.
16. Explain the congestion management.

Old Related Student Outcomes
a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes**
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>The transportation Systems and its Characteristics</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Transportation and society</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Components of Transportation Systems</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Vehicle motion, Flow, and Performance</td>
<td>4th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Continues Flow</td>
<td>5th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Terminals &amp; Introduction to Transportation Demand</td>
<td>6th, 7th</td>
<td>4 4</td>
<td>3 3</td>
<td>1 1</td>
<td>-</td>
</tr>
<tr>
<td>Components of Traffic System</td>
<td>8th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Traffic Stream Characteristics</td>
<td>9th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Traffic Engineering Studies &amp; Traffic Safety</td>
<td>10th, 11th</td>
<td>4 4</td>
<td>3 3</td>
<td>1 1</td>
<td>-</td>
</tr>
</tbody>
</table>
This course is an advanced course in geotechnical engineering that emphasized on analysis and design of different types of foundation, retaining and sheet pile walls. The topics that are included; types of foundation, bearing capacity of shallow foundation, bearing capacity of deep foundations, pile foundations, retaining walls, and sheet pile walls.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** CE 353

**Co-requisites:** None

**Course Category:** Core Course

**Textbook:**


**References:**

………………………………………………………………………………………………………………………………………………

**Other Supplemental Materials:** Site Uploaded; Notes, Assignments, Quizzes and Exams Model Answers, etc….

**Credit and Contact Hours:**
Credits: 3 hours, Contact: 4 hours (3 hours of lecture and 1 hour of tutorial per week)

**Course Coordinator’s Name:** Associate Prof. Sherif M. ElKholy

**Computer Usage:** In completing the homework assignments and preparing reports.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will be able to demonstrate that:

1. He acquired an understanding of failure criteria for soil failure under foundations.
2. He will be able to calculate the soil bearing capacity for different types of foundations.
3. He will be able to analyze problems of both shallow and deep foundations.
4. He will be able to design the spread footings as well as the mat foundations.
5. He will be able to investigate and analyze the stability of simple gravity and cantilever types of retaining walls.
6. He will be able to analyze the simple sheet pile walls using cantilever method.
7. He will be able to analyze and design the pile foundations and investigate the pile group action.

**Old Related Student Outcomes:**

- a) An ability to apply knowledge of mathematics, science and engineering
- c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- e) An ability to identify, formulate, and solve engineering problems
- f) An understanding of professional and ethical responsibility
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) A recognition of the need for, and an ability to engage in life-long learning
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and Subsurface Soil Exploration (Site Investigation)</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Types of Foundations</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Bearing Capacity of Shallow Foundations</td>
<td>3rd &amp; 4th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Analysis of Spread Foundation</td>
<td>5th &amp; 6th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Design of Isolated Footings</td>
<td>7th &amp; 8th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Analysis of Combined and Mat Foundations</td>
<td>9th &amp; 10th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Retaining Walls</td>
<td>11th &amp; 12th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Sheet Pile Walls</td>
<td>13th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Pile Foundation</td>
<td>14th &amp; 15th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

CE 375: Steel Structures Design

3 Credit Catalogue

Description:

Analysis and design of roof trusses. Design of tension and compression members, columns under eccentric loadings, column bases and footings. Design of beams. Welded and bolted connections. Design of building frames. Introduction to plastic analysis. Steel building project. All according to AISC specifications.

Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)
Prerequisites: CE 305: Structural Analysis.

Co-requisites:

Course Category: Core Course

Textbook:


References:
Saudi Building Code, latest edition
LRFD Latest Edition Other

Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hours recitation; per week)

Course Coordinator’s Name: Assistant Prof. Dr. Ahmed Elragi

Computer Usage: Writing home works and required reports.
Drawing plans and elevations of some designed applications and details of connections.
Using the software package SAP2000 for analysis of some problems.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
8. An ability to conduct the knowledge of different applications of steel structures.
9. An ability to conduct the knowledge of the behavior and stability of steel structures.
10. An ability to design tension members and compression members.
11. An ability to design steel beams and steel beam-columns.
12. An ability to design column base plates and beam bearing plates.
13. An ability to analyze and design bolted connections.
14. An ability to analyze and design welded connections.

Old Related Student Outcomes:
a) An ability to apply knowledge of mathematics, science and engineering  
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability  
e) An ability to identify, formulate, and solve engineering problems  
f) An understanding of professional and ethical responsibility  
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context  
i) A recognition of the need for, and an ability to engage in life-long learning  

New Related Student Outcomes:  
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.  
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.  
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.  
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Steel Structures</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Roof Trusses and Bracing Systems</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of Tension Members</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of Compression Members</td>
<td>4th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of Columns and Column Bases</td>
<td>5th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of Beams with adequate Lateral Support</td>
<td>6th &amp; 7th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Beams with Inadequate Lateral Support</td>
<td>8th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shear, Web Yielding and Beam Bearing Plates</td>
<td>9th &amp; 10th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Design of Beam-Columns</td>
<td>11th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of Bolted Connections</td>
<td>12th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Several Types of Bolted Connections</td>
<td>13th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Welded Connections</td>
<td>14th</td>
<td>4</td>
<td>3</td>
<td>1</td>
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</tr>
</tbody>
</table>
CE 401: Concrete Technology
3 Credit Catalogue

Description:
In-depth study of composition, characteristics and hydration of cements; structure and properties of hardened cement paste; local aggregates; workability, strength, volume changes and permeability of concrete; failure mechanisms of plain concrete; production, handling and quality control of concrete; mix design; special concretes such as fiber reinforced concrete, ferro-cement and polymer impregnated; durability problems of concrete in the Gulf environment; preventive measures, specifications and construction techniques for local conditions. Course Web Address: http://www.qec.edu.sa/

Prerequisites: Structural Materials (CE 203)
Co-requisites: None
Course Category: Elective Course Textbook:

References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hours Lecture and 1 hour Tutorial; per week)

Course Coordinator’s Name: Dr. Gamal A. Al-Saadi Computer Usage:
• Computer will be used in controlling testing machines and measuring devices, and in data analysis and in statistical evaluation of testing results.
• Using IT in searching for information in the development of concrete technology and presenting technical reports.

Specific Outcomes of Instructions:
Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
9. Getting knowledge about the behavior of materials used in advanced concrete technology
10. Studying types, properties and tests of advanced concrete mixes
11. Studying volume change, permeability and failure mechanisms of concrete
12. Ability to apply quality control techniques in producing concrete
13. Understanding mixture design of special concretes for Gulf environment
14. Getting knowledge of using fibers, polymers and Ferro-cement in producing special concrete
15. Realize the behavior and properties of advanced materials used in producing concrete
16. Ability to produce special concretes to be used in the Gulf environment

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
g) An ability to communicate effectively
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Fundamentals of concrete technology</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>
Hydration of cements; hardened cement paste; local aggregates

Workability, volume change and permeability of concrete

Strength and failure mechanisms of plane concrete

Production, handling and quality control of concrete

Effect of admixtures on the quality of concrete

Design of special concrete mixtures using fibers, polymers and ferro-cements

Durability problems of concrete in the Gulf environment

Specifications and construction techniques for Gulf environment

Prepared by: Dr. Gamal Al-Saadi  Date: 1/3/2015

CE 403: Advanced Reinforced Concrete

3 Credit Catalogue

Description:

Design of floor systems: ribbed and flat slabs. Design of beams for torsion, combined shear and torsion by the strength method. Design of short and long columns under eccentric loadings. Study of different structural systems for covering large dimensions halls. Analysis and design of reinforced concrete water tanks. Introduction to the design of prestressed concrete members.

Course Web Address: http://www.qec.edu.sa/

Prerequisites: CE 315: Reinforced Concrete.

Co-requisites:

Course Category: Optional Course Textbook:

References:
- M. Nadim Hassoun, and Akthem Al Manaseer, Structural Concrete Theory and design, John Wiley & Sons Inc, Latest Edition
- Saudi Building Code Latest Edition,

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hours recitation; per week)

Course Coordinator’s Name: Assistant Prof. Dr. Ahmed Elragi

Computer Usage: Writing home works and required reports. Drawing plans and elevations of some designed applications.

Using the software package Office, and SAP2000 for analysis of some problems.

Specific Outcomes of Instructions:
Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. Be able to conduct the knowledge of design methods of advanced reinforced concrete structures.
2. An ability to design reinforced concrete ribbed and flat slabs.
3. An ability to design reinforced concrete beams for torsion, and combined shear and torsion.
4. An ability to design reinforced concrete short and long columns subjected to eccentric loadings.
5. A knowledge of structural systems used for covering large dimensions halls.
6. An ability to design reinforced concrete water tanks.
7. Be able to conduct the knowledge of design procedure of prestressed concrete members.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

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<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Review of ultimate strength design &amp; elastic concept, ACI Code requirements</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Analysis and design of ribbed slabs, Load distribution, Design of hidden beams,</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Analysis of flat slabs: construction loads, bending moments in strips. Direct design method.</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of flat slabs: Equivalent frame method, slab deflections, details of reinforcements.</td>
<td>4th &amp; 5th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Design of concrete beams for torsion, and combined shear and torsion.</td>
<td>6th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of short and long columns subjected to eccentric loads, Interaction diagrams.</td>
<td>7th, 8th &amp; 9th</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Study of different structural systems for covering large dimensions halls.</td>
<td>10th &amp; 11th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Analysis and design of reinforced concrete water tanks.</td>
<td>12th &amp; 13th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Introduction to the design of prestressed concrete members.</td>
<td>14th &amp; 15th</td>
<td>8</td>
<td>6</td>
<td>2</td>
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</tr>
</tbody>
</table>

Prepared by: Assistant Prof. Dr. Ahmed Elragi                  Date: 1/3/2015

**CE 406: Advanced Structural Analysis**

3 Credit
Catalogue Description:

Analysis of indeterminate structures; trusses, beams, plane frames and arches. Method of consistent deformation; flexibility matrix formulation; pre-strain, temperature change and support movement effects. Slope deflection method. Matrix analysis of beams and plane frame using the stiffness method. Moment distribution; sway consideration.

Course Web Address: http://www.qec.edu.sa/

Prerequisites: Structural Analysis CE 305 Co-requisites: None

Course Category: Elective Course

Textbook:

References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Prof. Hesham Ali Zieneldin

Computer Usage: Writing home works and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

8. A knowledge of different types of indeterminate structural systems.
10. An ability to use the force method to analyze indeterminate structures.
11. An ability to use the moment distribution method to analyze indeterminate structures.
12. An ability to use the slope-deflection equations to analyze indeterminate structures.
13. An ability to use a numerical computerized method (stiffness method) for structural analysis.
14. An ability to select a solution method appropriate for a given problem.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

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<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Statically Indeterminate Structural Systems, Deteminacy and Stability</td>
<td>1st, 2nd</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>
"The Force Method", Analysis of Indeterminate Beams, Frames, Arches and Trusses  
| 3rd, 4th, 5th | 12 | 9 | 3 | - |

Effect of Support Movements  
| 6th | 4 | 3 | 1 | - |

Effect of Temperature Change  
| 7th | 4 | 3 | 1 | - |

"The Moment Distribution Method", Analysis of Beams and Frames considering the Sidesway effect  
| 8th, 9th, 10th | 12 | 9 | 3 | - |

"The Slope Deflection Equations", Analysis of Beams and Frames  
| 11th, 12th | 8 | 6 | 2 | - |

"The Stiffness Method", Analysis of Beams and Frames  
| 13th, 14th, 15th | 12 | 9 | 3 | - |

**Prepared by:** Prof. Hesham Ali Zieneldin  
**March 1st, 2015**

**CE 412: Advanced Steel Design**

**3 Credit**

**Catalogue Description:**

Introduction to elastic-plastic material behavior, plastic analysis and design of continuous beams and simple frames using load resistance factor design (LRFD); design of built-up beams and plate girders, optimum proportioning of I-beam, design of composite section analysis and design for torsion, design of semi-rigid and rigid connections, computer application and usage in design of rigid frames and steel buildings.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** CE 375: Steel Structures Design  
**Co-requisites:**

**Course Category:** Optional Course  
**Textbook:**

**References:**
Saudi Building Code, latest edition
LRFD Latest Edition

**Other Supplemental Materials:** Site Uploaded; Notes, Solved Examples, Model Answers, etc.

**Credit and Contact Hours:**
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hours recitation; per week)

Course Coordinator’s Name: Assistant Prof. Dr. Ahmed Elragi

Computer Usage: Writing home works and required reports.
Drawing plans and elevations of some designed applications and details of connections.
Using the software package SAP2000 for analysis of some problems. Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

7. Be able to conduct the knowledge of Load and Resistance Factor Design method.
8. Be able to conduct the knowledge of the plastic analysis and design of beams.
9. An ability to design built-up beams and plate girders.
10. An ability to analyze and design composite sections.
11. An ability to design semi-rigid and rigid steel connections.
12. An ability to design rigid frames and steel building.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering

b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c) An ability to identify, formulate, and solve engineering problems

d) An understanding of professional and ethical responsibility

e) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
f) A recognition of the need for, and an ability to engage in life-long learning

g) A knowledge of contemporary issues

New Related Student Outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

4. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture s</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to elastic-plastic behavior of steel</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
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<tr>
<td>Plastic analysis of beams</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Plastic design of several types of beams</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;,</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Load Resistance Factor Design method</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tension members</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Axially loaded columns</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;&amp; 7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bending members</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of built-up beams</td>
<td>9&lt;sup&gt;th&lt;/sup&gt; &amp; 10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td></td>
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<tr>
<td>Plate girders</td>
<td>11&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
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<tr>
<td>Analysis of composite sections</td>
<td>12&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of composite beams</td>
<td>13&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Design of Semi-rigid connections</td>
<td>14&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td></td>
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<tr>
<td>Design of rigid connections</td>
<td>15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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</tr>
</tbody>
</table>

Prepared by: Assistant Prof. Dr. Ahmed Elragi  
Date: 1/3/2015

CE 443: Design of Pavement  
3 Credit

Catalogue Description:

Pavement types and loading, behavior of pavements under dynamic loads, stresses in flexible and rigid pavements, pavement components, pavement design factors, flexible highway and airport pavement design, rigid highway and airport pavement design; overlay design and computer applications; practical pavement design project of a road and airport.

Course Web Address: http://www.qec.edu.sa/
Prerequisites: CE 205
Co-requisites: None
**Course Category:** Elective Course  

**Textbooks:**


**References:**


**Other Supplemental Materials:** Site Uploaded; Notes, Solved Examples, Model Answers, etc.

**Credit and Contact Hours:**

Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

**Course Coordinator’s Name:** Prof. Sayed A. Habib

**Computer Usage:** Writing homeworks and required reports and drawing some engineering sketches.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will:

1. Tell the principles of pavement types and loading  
2. Recognize the behavior of pavements under dynamic loads.  
3. Analyze the stresses in flexible and rigid pavements.  
4. Outline pavement components and pavement design factors.  
5. Design flexible and rigid pavements in highway and airport.  
6. Design overlay.  
7. Use computer applications.  
8. Perform practical pavement design project of a road and airport.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science, and engineering principles to solve civil engineering problems in practice.
b) An ability to design and conduct experiments, and to analyze and interpret data in major recognized civil engineering areas.
c) An ability to analyze and design a system, civil engineering structure or component to meet desired goals in civil engineering applications economically viable, sustainable and acceptable socially, politically and ethically.
e) An ability to identify, formulate, and solve civil engineering problems.
h) An understanding of the impact of engineering solutions in a global, economical, environmental and societal context.
i) A recognition of the need for, and an ability to engage in, life-long learning.
k) An ability to use modern tools, techniques and skills necessary for civil engineering practice.

**New Related Student Outcomes:**
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture(s)</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement types and loading</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Behavior of pavements under dynamic loads</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; 3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Stresses in flexible and rigid pavements</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Pavement components</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
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<tr>
<td>Pavement design factors</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; 7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
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<tr>
<td>Flexible highway and airport pavement design</td>
<td>8&lt;sup&gt;th&lt;/sup&gt; 9&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
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</tr>
<tr>
<td>Rigid highway and airport pavement design</td>
<td>10&lt;sup&gt;th&lt;/sup&gt; 11&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Overlay design</td>
<td>12&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Computer applications</td>
<td>13&lt;sup&gt;th&lt;/sup&gt; 14&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Practical pavement design project of a road and airport</td>
<td>15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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<td>-</td>
</tr>
</tbody>
</table>

**Prepared by:** Prof. Sayed A. Habib

**Date:**
CE 453: Advanced Geotechnical Engineering

3 Credit

Catalogua Description:

The student is presented with a wide range of in-class experience in the field of advanced geotechnical engineering in order to enhance his in-depth knowledge about selected topics. These geotechnical topics are considered to be essential for a civil engineer who would emphasize his carrier in the geotechnical engineering field. The scope of the course is directed towards making the student aware of the influence of selected advanced geotechnical engineering topics in several fields of civil engineering. The course covers the following topics; the stability of ground slopes; braced cuts and excavations, advanced seepage analysis in porous media; fundamentals of rock mechanics; principles of soil dynamics and liquefaction; seismic earth pressures, and seismic slope stability. The selected topics may be changed frequently according to the recent advances in geotechnical engineering and the job market demands for geotechnical engineers.

Course Web Address: http://www.qec.edu.sa/

Prerequisites: None

Co-requisites: None

Course Category: Core Course

Textbook:


Other Supplemental Materials: Site Uploaded; Notes, Assignments, Quizzes and Exams Model Answers, etc….

Credit and Contact Hours:
Credits: 2 hours, Contact: 3 hours (2 hours of lecture and 1 hour of tutorial per week)

**Course Coordinator’s Name:** Associate Prof. Sherif M. ElKholy

**Computer Usage:** In completing the homework assignments and preparing reports.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will demonstrate the following outcomes through tests and homework assignments:
1. A knowledge and understanding of stability of ground slopes.
2. An understanding of the principles of soil braced cuts and excavations.
3. Ability to analyze and investigate advanced problems of seepage through porous media.
4. An understanding of the fundamentals of rock mechanics.
5. An understanding of principles of soil dynamics and liquefaction.
6. An understanding of principles of seismic earth pressures, and seismic slope stability.

**Old Related Student Outcomes:**

This course provides the following outcomes:
- a) An ability to apply knowledge of mathematics, science and engineering
- e) An ability to identify, formulate, and solve engineering problems
- f) An understanding of professional and ethical responsibility
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) A recognition of the need for, and an ability to engage in life-long learning
- j) A knowledge of contemporary issues

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1st</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Minerals</td>
<td>2nd &amp; 3rd</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Rocks</td>
<td>4th &amp; 5th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>
Igneous Rocks | 6th | 3 | 2 | 1 | -
Weathering Process | 7th | 3 | 2 | 1 | -
Sedimentary Rocks | 8th | 3 | 2 | 1 | -
Metamorphic Rocks | 9th & 10th | 6 | 4 | 2 | -
Structural Features of Rock Masses | 11th | 3 | 2 | 1 | -
Origin and Composition of Soil | 12th & 13th | 6 | 4 | 2 | -
Soil-Water Phase Relationships | 14th & 15th | 6 | 4 | 2 | -

| Prepared by: | Associate Prof. Sherif M. ElKholy | Date: 01/03/2015 |

**CE 454: Soil Improvement and Earth Structure Design**

3 Credit

**Catalogua**

**Description:**

The student is presented with a wide range of in-class experience in the field of advanced foundation engineering in order to become comfortable with selected topics in foundation engineering and earth supporting structures. The scope of the course is directed towards making the student aware of advanced topics in foundation design and earth structures analysis. The course covers the following topics; subsurface site exploration; analysis of large piles and drilled shafts; analysis of laterally loaded piles; structural design of piles and pile caps; analysis and design of machine foundation; analysis and design of anchored sheet pile walls and retaining walls; beams on elastic foundation; and analysis and design of mechanically stabilized earth structures. The selected topics may be changed frequently according to the recent advances in geotechnical engineering and the job market demands for geotechnical engineers.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Geotechnical Engineering, CE 353.

**Co-requisites:** None

**Course Category:** Core Course

**Textbook:**

Other Supplemental Materials: Site Uploaded; Notes, Assignments, Quizzes and Exams Model Answers, etc.

Credit and Contact Hours:

3 hours of lectures per week, 1 hour of recitation per week

Course Coordinator’s Name: Associate Prof. Sherif M. ElKholy

Computer Usage: In completing the homework assignments and preparing reports.

Specific Outcomes of Instructions:
Students who successfully complete the course will be able to demonstrate that he acquired:
1. A knowledge of planning and execution subsurface site exploration.
2. An understanding of the behaviour and analysis of large piles and drilled shafts.
3. Ability to understand and analyze the behavior of laterally loaded piles.
4. Knowledge of the techniques of structural design of different types of pile caps.
5. An understanding of analysis of beams on elastic foundation.
6. An understanding of the principles of analysis and design of machine foundation.
7. An understanding of the behaviour of mechanically stabilized earth structures.

Old Related Student Outcomes:
This course provides the following outcomes:
   a) An ability to apply knowledge of mathematics, science and engineering
   c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
   e) An ability to identify, formulate, and solve engineering problems
   h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
   i) A recognition of the need for, and an ability to engage in life-long learning
   j) A knowledge of contemporary issues

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, subsurface site exploration</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Large piles and pile shafts</td>
<td></td>
<td>4</td>
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<tr>
<td>Laterally loaded piles</td>
<td></td>
<td>6</td>
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<tr>
<td>Structural design of pile caps</td>
<td></td>
<td>4</td>
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<tr>
<td>Theory of beams on elastic foundation</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
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<tr>
<td>Machine foundation</td>
<td></td>
<td>6</td>
<td></td>
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<td>-</td>
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<tr>
<td>Design of anchored sheet pile and retaining walls</td>
<td></td>
<td>6</td>
<td></td>
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<td>-</td>
</tr>
<tr>
<td>Mechanically stabilized earth structures</td>
<td></td>
<td>6</td>
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</tr>
</tbody>
</table>

**Prepared by:** Associate Prof. Sherif M. ElKholy  
**Date:** 01/03/2015

**CE 455: Highway Planning and Design**

3 Credit

**Catalogue Description:**


**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Transportation and Traffic Engineering CE 341
Co-requisites: None


References: None

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 4 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Prof. Sayed A. Habib

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:
Students who successfully complete the course will:
1. Recognize highway planning in rural and urban areas.
2. Tell highway location studies.
3. Differentiate between the geometric and structural design.
4. Recognize highway materials and drainage.
5. Design of highway mixtures.
6. Design of highway flexible pavement.
7. Outline highway safety engineering.
8. Recognize the highway construction.
9. Outline the pavement evaluation and maintenance.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway Planning in Rural and Urban Area</td>
<td>1st 2nd</td>
<td>4 4</td>
<td>3 3</td>
<td>1 1</td>
<td>-</td>
</tr>
<tr>
<td>Highway Location Studies</td>
<td>3rd</td>
<td>4 3</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Engineering and Aesthetic Considerations</td>
<td>4th</td>
<td>4 3</td>
<td>1</td>
<td>-</td>
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</tr>
<tr>
<td>Geometric Design</td>
<td>5th 6th</td>
<td>4 4</td>
<td>3 3</td>
<td>1 1</td>
<td>-</td>
</tr>
<tr>
<td>Structural Design</td>
<td>7th 8th</td>
<td>4 3</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Highway Materials and Drainage</td>
<td>9th 10th</td>
<td>4 4</td>
<td>3 3</td>
<td>1 1</td>
<td>-</td>
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<tr>
<td>Highway Construction</td>
<td>11th</td>
<td>4 3</td>
<td>1</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Discussion of AASHTO and Saudi Highway Design Manuals</td>
<td>12th</td>
<td>4 3</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Complete Geometric Design of a two-lane highway</td>
<td>13th 14th</td>
<td>4 4</td>
<td>3 3</td>
<td>1 1</td>
<td>-</td>
</tr>
<tr>
<td>Introduction to Computer Software for Geometric Design</td>
<td>15th</td>
<td>4 3</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
CE 456: Hydraulic Engineering

3 Credit

Catalogue Description:
Steady flow in closed conduits and open channels. Pumps. Networks of pipes. Dimensional analysis and similitude. Laboratory experiments covering fluid measurements, flow through pipes, open channel, centrifugal pump.

Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

Prerequisites: Fluid Mechanics CE 230

Co-requisites: None

Course Category: Core Course


Other Supplemental Materials: Site Uploaded; Notes, Model Answers, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour of lab; per week)

Course Coordinator’s Name: Associate Prof. Yousry Ghazaw

Computer Usage: Word Processor (student's choice), Spreadsheet (student's choice)

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

1. A knowledge of different hydraulic phenomena and an ability to apply it to solve open channel flow problems.
2. An understanding of how to calculate specific energy and critical depth in open channel flow.
3. An ability to use EXCEL spreadsheet to analyze various flow profiles in open channel.
4. An ability to use continuity and energy equations to calculate various flow parameters.
5. An ability to analyze hydraulic jump and water hammer.
6. An ability to compute time of emptying or filling reservoirs and vessels under unsteady flow.
7. An ability to select solution methods appropriate for a given hydraulic problem.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c) An ability to identify, formulate, and solve engineering problems
d) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
f) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
g) A recognition of the need for, and an ability to engage in life-long learning
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
4. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
5. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lect</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction: types of flow: open channel flow, pipe flow, steady, unsteady flow, uniform, non-uniform flow.</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Open channel flow: specific energy, critical flow, normal flow depth, critical flow depth, critical velocity, sub-critical flow, super-critical flow.</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Humps and constrictions, Application to real life problems (Numerical examples)</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>
Hydraulic jump (definition and analysis), alternate depths, relationship between alternate depths, Energy dissipation, Application to real life problems (Numerical examples).  

Pipe flow, friction formula, pipe networks, Hardy Cross method, Application to real life problems (Numerical examples)  

Unsteady flow, flow from one reservoir to another, water hammer (definition and analysis), and relationship for pressure wave velocity and pressure change for various types of valve closure, Application to real life problems (Numerical examples).  

Energy and momentum equations, gradually varied flow, various water surface profiles (analysis and drawings), Application to real life problems (Numerical examples)  

Pumps, types of pumps, cavitation's, suction, delivery and total head, shut-off head, characteristic curves of pumps, specific speed, power, efficiency.  

Dimensional analysis, Dimensionless Numbers, Buckingham Pi Theorem, Application to real life problems (Numerical examples),  

Similitude and physical modeling, geometric, kinematic and dynamic similarities, Application to real life problems (Numerical examples)  

-Laboratory Work

---

Prepared by: Dr: Yousry Ghazaw  
Date: March 1st, 2015

---

**CE 458: Design of Water Structures**  
3 Credit Catalogue

**Description:**


**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)  
**Prerequisites:** Fluid mechanics CE230  
**Co-requisites:** None  
**Course Category:** Elective Course  
**Textbook:**

ISBN 1577660307 References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc. Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour of tutorial; per week)

Course Coordinator’s Name: Associate Prof. Yousry Ghazaw

Computer Usage: Ready-made Finite elements program. Spreadsheets, writing homework's and reports.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
8. Be able to select the appropriate dimension of hydraulic structures.
9. Understand the case of loading for hydraulic structures.
10. Ability to analyze and solve design problems incorporated hydraulic structures.
11. Design of weirs, culvert, siphons, intake structures, dams and so on.
12. Be able to design (hydraulically and structurally) different type of hydraulic structures.
13. An ability to select solution methods appropriate for a given problem.
14. An ability to use a numerical computerized method for water structural analysis

Old Related Student Outcomes

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c) An ability to identify, formulate, and solve engineering problems
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
New Related Student Outcomes
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
5. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory Lecture, Cross structures: Hydraulic design of Culverts (pipe, box )</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Structure design of Culverts</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hydraulic design of Siphons</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Structure design of Siphons</td>
<td>4th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hydraulic design of Aqueducts</td>
<td>5th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Structure design of Aqueducts</td>
<td>6th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Seepage underneath hydraulic structures</td>
<td>7th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Energy Dissipation</td>
<td>8th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Design of inlet and Outlet structures for irrigation canals.</td>
<td>9th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hydraulic Design of weirs</td>
<td>10th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hydraulic Design of Spillways</td>
<td>11th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hydraulic Design of Siphon Spillways</td>
<td>12th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Dams</td>
<td>13th, 14th, 15th</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

Prepared by: Dr: Yousry Ghazaw  
Date: March 1st, 2015
CE 464: Project Surveying
3 Credits Catalogue

Description:

Laser systems and alignment, electronic distance measurement with high precision, total station, land subdivision and legal aspects; route surveying, hydrographical surveying, mine surveying, construction surveying, ruin surveying, industrial surveying, structure deformation measurement and monitoring, earth crustal deformation measurement.

Course Web Address:

http://www.qec.edu.sa/

Pre-requisites

by Topic:
Survey Basics CE 112

Co-requisites: …………………………………………………………………...

Course Category: Elective Course Textbook:


References:

……………………………………………………………………………………

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour tutorial per week)

Course Coordinator’s Name: Associate Prof. Ramadan Hassan

Computer Usage:

Total Station Software, and Computer Applications for solving different surveying problems.

Specific Outcomes of Instructions:

Students who successfully complete the course will be able to:

11. Outline the principles of EDM and the geometry of total station measurements.
12. Compute and analyze station coordinates that is collected by total station instrument.
13. Define the alignment of pipe line using laser system
14. Identify the land subdivision planning, its legal aspects and the used LIS layers.
15. Analyze the setting out data for many projects in the construction field.
16. Recognize the setting out technique of horizontal curves using deflection angles and total station techniques.
17. Apply surveying skills relevant to many surveying projects such as construction field and hydrographical surveying.
18. Recognize the fundamental of structure deformation monitoring techniques using precise leveling and GPS
19. Compute the grade lines, slope stakes, elevation differences, areas and volumes quantities.
20. Suggest the surveying location techniques for the hydrographical surveying and draw water depths contours.

Old Related Student Outcomes:
  a) An ability to apply knowledge of mathematics, science and engineering
  b) An ability to design and conduct experiments, as well as to analyze and interpret data
  e) An ability to identify, formulate, and solve engineering problems
  g) An ability to communicate effectively
  i) A recognition of the need for, and an ability to engage in life-long learning
  j) A knowledge of contemporary issues
  k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
  1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
  6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
  3. an ability to communicate effectively with a range of audiences.
  7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
  4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
  2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture s</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Modern EDM Instruments:</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Total Station</td>
<td>3rd – 4th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Construction surveying</td>
<td>5th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>-------------------------------------</td>
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<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Laser System, Alignment and related projects</td>
<td>6th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Route Surveys</td>
<td>7th - 8th - 9th</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Land subdivision and Legal aspects</td>
<td>10th, 11th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Hydrographic surveying:</td>
<td>12th, 13th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>GPS &amp; Structure deformation monitoring: Basics, methods and applications</td>
<td>14th - 15th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

**Prepared by:** Associate Prof. Ramadan Hassan  
**Date:** March 1st, 2015

### CE 475: Environmental Engineering

3 Credits

**Catalogue Description:**


**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Water and wastewater engineering, CE 370

**Co-requisites:** .......

**Course Category:** Elective Course

**Textbook:**

References: None

Other Supplemental Materials:

Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credit: 3 hours, Contact: 4 hours (3 hours lectures and 1 hour tutorial) per week

Course Coordinator’s Name: Associate Prof. Tarek Elmitwalli

Computer Usage: Computer applications in environmental engineering, spreadsheet

Specific Outcomes of Instructions:

Students who successfully complete the course will be able to

11. Recognize the material and energy balances for solving any environmental engineering problem.
12. Define water pollutants and their sources.
14. Recognize basic information on air and noise pollution.
15. Recognize the methods of liquid waste disposal: overland, in streams, lake and sea.
16. Recognize the different components of solid waste management.
17. Recognize the different components of hazardous waste management.
18. Analyze and solve problems in the environmental engineering systems.
19. Design of different components in the environmental engineering.
20. Use the internet searching to find the material for the course.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c) An ability to identify, formulate, and solve engineering problems
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to environmental engineering</td>
<td>1st &amp; 2nd</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Type of reactors</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Mass balance and water quality</td>
<td>4th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Water quality</td>
<td>5th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Wastewater treatment for reuse</td>
<td>6th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Sludge: treatment, reuse and disposal</td>
<td>7th &amp; 8th</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Solid waste: management, sources, minimization, collection and treatment</td>
<td>9th, 10th &amp; 11th</td>
<td>12</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Hazardous wastes: definition, sources and treatment</td>
<td>12th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Air pollution: definition, sources and minimization</td>
<td>13th &amp; 14th</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Noise pollution: definition, sources and minimization</td>
<td>15th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Prepared by: Associate Prof. Tarek Elmitwalli  Date: March 1st, 2015

CE 490: Selected Topics in Civil Engineering

3 Credit
Catalogue Description:

State of the art subjects in the field of civil engineering. Topics tailored to cover the recent issues in this field. Topics to cover deeply some specific problems in the compulsory courses.

Course Web Address: http://www.qec.edu.sa/

Prerequisites: None
Co-requisites: CE491 Senior Design Project-1

Course Category: Elective Course

Textbook: To be determined by the instructor.

References: *To be determined by the instructor.*

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Assoc.Prof. Sherif Alkholy

Computer Usage: Internet search, writing homeworks and required reports, drawing some engineering sketches and using some softwares for analysis and design.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

8. Engineering aspects of practical civil engineering.
9. Advanced concepts and special Topics in civil engineering.
11. The ability to define the engineering problems, and formulate them.
12. Performing data analysis and critical thinking.
13. The ability of working in a team.
14. The ability to have the skills of ideas development and sharing with others.

**Old Related Student Outcomes:**
Depending on the topics, they could be any combination of a-k

a) An ability to apply knowledge of mathematics, science and engineering  
b) An ability to design and conduct experiments, as well as to analyze and interpret data  
c) An ability to design a system, component, or process to meet desired needs within realistic  
   constraints such as economic, environmental, social, political, ethical, health and safety,  
   manufacturability, and sustainability  
d) An ability to function on multidisciplinary teams  
e) An ability to identify, formulate, and solve engineering problems  
f) An understanding of professional and ethical responsibility  
g) An ability to communicate effectively  
h) The broad education necessary to understand the impact of engineering solutions in a  
   global, economic, environmental, and societal context  
i) A recognition of the need for, and an ability to engage in life-long learning  
j) A knowledge of contemporary issues  
k) An ability to use the techniques, skills, and modern engineering tools necessary for  
   engineering practice.

**New Related Student Outcomes:**
1. an ability to identify, formulate, and solve complex engineering problems by applying  
   principles of engineering, science, and mathematics.  
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and  
   use engineering judgment to draw conclusions.  
2. an ability to apply engineering design to produce solutions that meet specified needs with  
   consideration of public health, safety, and welfare, as well as global, cultural, social,  
   environmental, and economic factors.  
5. an ability to function effectively on a team whose members together provide leadership,  
   create a collaborative and inclusive environment, establish goals, plan tasks, and meet  
   objectives.  
4. an ability to recognize ethical and professional responsibilities in engineering situations and  
   make informed judgments, which must consider the impact of engineering solutions in global,  
   economic, environmental, and societal contexts.  
3. an ability to communicate effectively with a range of audiences.  
7. an ability to acquire and apply new knowledge as needed, using appropriate learning  
   strategies.

**Topics to be covered:**
CE 400: Senior Design Project (SDP)

22. **Course Name and code**: Senior Design Project – CE 400

23. **Credit hours**: 3 hrs.

   **Contact hours**: 4 hrs.

24. **Coordinator/Instructor**: Dr. Sherif M. ElKholy

25. **Text book and Other supplemental materials**

   **Text book**:  
   - No specific textbook (to be determined by the project supervisor based on the scope and application of the project)

   **References**:  
   - No specific textbook (to be determined by the project supervisor based on the scope and application of the project)

   **Other supplemental materials**:  
   - Senior Design Project Guidelines.  

26. **Specific course information**

   **A) Catalog Description**

   The student is assigned, among a team of students and one or more faculty professors, the design of an applied project, which simulates the real working condition to which the student will be
exposed after graduation. The project should be comprehensive and includes all the necessary preliminary field studies, final design drawings, bill of materials, and the total cost of the project, if any, depending on the natures of project. The SDP project shall continue for one semester. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion

B) **Prerequisites**
   - Cooperative training GE 405

C) **Co-requisites**
   - None

D) **Course Condition**
   - ■ Required  □ Elective  □ Selective

27. **Specific goals for the course**

A) **Course Specific outcomes**

By the end of this course, students are expected to be able to:

1. Apply knowledge of mathematics, science and engineering in solving an engineering problem.
2. Design an experiment, when applicable, collect, analyse and interpret data.
3. Design a civil engineering, component, to meet desired needs within realistic constraints including: identify design inputs and recognize constraints, apply or develop design approaches and, when relevant, realize successful system, component or process.
4. Demonstrate teamwork and project management attributes
5. Develop models and/or apply problem solving approaches for technical problems. This may include problem definition, identifying objectives, use of heuristics, generating alternative models/solutions, deciding the course of solution, explain problem solving strategies, applying models/solution and evaluating results
6. Demonstrate professional and ethical responsibilities and academic integrity
7. Organize and present technical work in written reports and in oral presentations
8. Demonstrate understanding for the broader impact of engineering solutions in a global, economic, environmental, and societal context as applicable
9. Seek information from different sources and enhance further learning independently
10. Realize current issues related to engineering problems
11. Apply techniques and capabilities of the modern engineering tools in the field of civil engineering

B) **Old Relation to the student outcomes**

(a) an ability to apply knowledge of mathematics, science, and engineering
(e) an ability to identify, formulate, and solve engineering problems
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(f) an understanding of professional and ethical responsibility  
(h) the broad education necessary to understand the impact of engineering solutions in a  
global, economic, environmental, and societal context  
(j) a knowledge of contemporary issues  
(g) an ability to communicate effectively  
(i) a recognition of the need for, and an ability to engage in life-long learning  
(k) an ability to use the techniques, skills, and modern engineering tools necessary for  
engineering practice.

C) New Relation to the student outcomes
1. an ability to identify, formulate, and solve complex engineering problems by applying  
principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret  
data, and use engineering judgment to draw conclusions.
2. an ability to apply engineering design to produce solutions that meet specified needs with  
consideration of public health, safety, and welfare, as well as global, cultural, social,  
environmental, and economic factors.
5. an ability to function effectively on a team whose members together provide leadership,  
create a collaborative and inclusive environment, establish goals, plan tasks, and meet  
objectives.
4. an ability to recognize ethical and professional responsibilities in engineering situations  
and make informed judgments, which must consider the impact of engineering solutions in  
global, economic, environmental, and societal contexts.
3. an ability to communicate effectively with a range of audiences.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning  
strategies.

7. Brief list of topics to be covered
   • Review previous works and collection of data related to the design.
   • Defining and formulation of the problem, determination of the project objectives.
   • Applying design concepts to achieve the target objective of the project.
   • Where appropriate o Building mathematical models, o Conducting simulations, o  
Carrying out the planned experiments.
   • Analyzing the results and evaluating the end product.
   • Formulation of the suggestions, recommendations and conclusions.
   • Writing the final report and preparing for the final presentation.

| Prepared by: | Dr. Sherif ElKholy | Date: March 2015 |
Appendix A – 2

Syllabi for Modified/Developed Courses
Developed Curriculum

CE 205: Properties of Structural Materials
2 Credit

Catalogue Description:

Course Web Address: http://www.qec.edu.sa/

Prerequisites: Mechanics of Materials (CE202)

Co-requisites: None

Course Category: Core Course


References: Mitchell’s Building Series, Alan Everett, Mitchell Publishing Company Ltd.

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 2 hours, Contact: 3 hours (1 hour lecture and 2 hours practical; per week)

Course Coordinator’s Name: Dr. Gamal A. M. Al-Saadi

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate to have the following outcomes:
27. Getting the Knowledge of the properties of materials such as ductile and brittle materials.
28. Studying of the properties, specification, types, and required tests for metals.
29. Studying of the properties of bricks, lime, gypsum, and wood.
30. Studying of the properties, specification, and required tests for single and double shear.
31. Studying of the properties, specification, and required tests for non-destructive test.

Old ABET Program Outcomes:
   a) An ability to apply knowledge of mathematics, science and engineering
   b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

e) An ability to identify, formulate, and solve engineering problems

f) An understanding of professional and ethical responsibility

h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i) A recognition of the need for, and an ability to engage in life-long learning

k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New ABET Program Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Classification of Engineering Materials</td>
<td>1st</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Properties of Bricks, Lime, and Gypsum</td>
<td>7th, 8th, 9th</td>
<td>9</td>
<td>3</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Properties of Glasses</td>
<td>10th</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Properties of Metals</td>
<td>11th</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Properties of Timber</td>
<td>12th, 13th</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Non Destructive Tests</td>
<td>14th, 15th</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>
CE 206: Structural Analysis-1
3 Credit Catalogue

Description:


Course Web Address: http://www.qec.edu.sa/

Prerequisites: Mechanics of Materials CE 202

Co-requisites: None

Course Category: Core Course


Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Prof. Hesham Ali Zieneldin

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:
Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. A knowledge of stability and equilibrium of different types of structures and an ability to apply them.
2. An ability to calculate the reactions of different structures.
3. An ability to use method of joints and method of sections to solve truss problems.
4. An ability to analyze and draw shear force and bending moment diagrams of determinate beams.
5. An ability to draw normal force, shear force and bending moment diagrams of frames and analyze arches.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyse and interpret data
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate, and solve engineering problems
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**Topics to be covered:**

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<thead>
<tr>
<th>Topics</th>
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<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
</table>
Types of structures and loads: introduction, classification of structures, loads and supports

Analysis of statically determinate structures: superposition, equilibrium, determinacy and stability, reactions computation

Analysis of statically determinate Trusses: types, method of joints, method of sections

Analysis of statically determinate beams: shear force and bending moment diagrams, load-shear-moment relationships

Analysis of statically determinate frames: shear force and bending moment diagrams

Analysis of statically determinate arches: internal forces in a three-hinged arch

Deflections of statically determinate beams: double integration, conjugate beam, and virtual work methods

Influence lines for statically determinate beams

| Prepared by: | Prof. Hesham Ali Zieneldin |

**CE 212: Plane Surveying**

3 Credits

**Catalogue Description:**

Definitions and concepts in land surveying, divisions and importance of surveying, units of measurements, introduction to theory of measurements and errors, linear measurements, angular measurements, directions, leveling and contouring, area and volume computations, computer applications.

**Course Web Adresse:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)
Prerequisites by Topic:

Mathematics, Math 107

Co-requisites: ...........................................................................................................

Course Category: Core Course

Textbook:

References:
.............................................................................................................................

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 5 hours (2 hours lecture, 1 hour tutorial and 2 hours Lab activities per week)

Computer Usage:

Adjusting levelling loops, lines, open and closed traverses and contouring.

Specific Outcomes of Instructions:
Students who successfully complete the course will be able to:
1. Identify the main surveying branches, instrumentation and units of measurement.
2. Illustrate the location ties-ins methods.
3. Perform linear measurements and calculate their corrections kinds.
4. Evaluate measurements errors and analyze the standard error
5. Perform the height difference measurements and levels computations
6. Compute horizontal and vertical angles from measurements
7. Compute the azimuths and bearings for the traverse sides.
8. Explain the topographic map characteristics
11. Compute areas and volumes.

Old Related Student Outcomes:
a) An ability to apply knowledge of mathematics, science and engineering  
b) An ability to design and conduct experiments, as well as to analyze and interpret data  
d) An ability to function on multidisciplinary teams  
e) An ability to identify, formulate, and solve engineering problems  
g) An ability to communicate effectively  
i) A recognition of the need for, and an ability to engage in life-long learning  
j) A knowledge of contemporary issues  
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**  
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.  
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.  
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.  
3. an ability to communicate effectively with a range of audiences.  
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.  
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.  
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basics of Surveying:</td>
<td>1st</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Theory of Measurement</td>
<td>2nd , 3rd</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Leveling measurements</td>
<td>4th , 5th , 6th</td>
<td>15</td>
<td>6</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Distance Measurement</td>
<td>7th , 8th</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Angles &amp; Directions</td>
<td>9th , 10th</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Topographic Survey</td>
<td>11th</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
GE 582: Introduction to Geotechnical Engineering  
2 Credit

Cataloga Description:

The student is presented with an introductory course of engineering geology as a solid base for studying geotechnical engineering. An extensive in-class presentation of different rock types, its origin and the engineering structure of rock particles. Types and classification of rocks based on origin and strength. Weathering process. Classification of soil based on formation. Index and engineering classification of soil. Clay minerals and soil structure.

Course Web Address: http://www.qec.edu.sa/

Prerequisites: None

Co-requisites: None

Course Category: Core Course

Textbook:


References:

.................................................................
Other Supplemental Materials: Site Uploaded; Notes, Assignments, Quizzes and Exams Model Answers, etc.

Credit and Contact Hours:

Credits: 2 hours, Contact: 3 hours (2 hours of lecture and 1 hour of tutorial per week)

Course Coordinator’s Name: Associate Prof. Sherif M. ElKholy

Computer Usage: In completing the homework assignments and preparing reports.

Specific Outcomes of Instructions:
Students who successfully complete the course will be able to demonstrate that he acquired:
1. A knowledge of geological structure of earth and earth crust.
2. A knowledge of minerals and their types and physical properties.
3. A knowledge of different rock groups and understanding of the rock cycle.
4. An understanding the formation process and properties of igneous, sedimentary, and metamorphic rock.
5. An understanding of the structural features of rock masses and their effect on rock mass quality.
6. An understanding of the origin, formation, and properties of residual and transported soil.
7. An understanding of the first principles of soil/water phase relationships.

Old Related Student Outcomes:
a) An ability to apply knowledge of mathematics, science, and engineering principles to solve civil engineering problems in practice.
i) A recognition of the need for, and an ability to engage in, life-long learning.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics to be covered:
<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1st</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Minerals</td>
<td>2nd &amp; 3rd</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Rocks</td>
<td>4th&amp; 5th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Igneous Rocks</td>
<td>6th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Weathering Process</td>
<td>7th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Sedimentary Rocks</td>
<td>8th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Metamorphic Rocks</td>
<td>9th &amp;10th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Structural Features of Rock Masses</td>
<td>11th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Origin and Composition of Soil</td>
<td>12th &amp; 13th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Soil-Water Phase Relationships</td>
<td>14th &amp; 15th</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

 Prepared by: Associate Prof. Sherif M. ElKholy  
 Date: 10/10/2015

**CE 306: Structural Analysis-2**  
2 Credit

**Catalogue Description:**

Analysis of indeterminate structures; trusses, beams, plane frames and arches. Method of consistent deformation; flexibility matrix formulation; pre-strain, temperature change and support movement effects. Moment distribution; sway consideration. Matrix analysis of beams and plane frame using the stiffness method.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Structural Analysis-1 CE 206  
**Co-requisites:** None

**Course Category:** Core Course


Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 2 hours, Contact: 3 hours (2 hours lecture and 1 hour tutorial; per week)

Course Coordinator’s Name: Prof. Hesham Ali Zieneldin

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

1. A knowledge of different types of indeterminate structural systems.
2. A knowledge of the advantageous performance of indeterminate structures.
3. An ability to use the force method to analyze indeterminate structures.
4. An ability to use the moment distribution method to analyze indeterminate structures.
5. An ability to use a numerical computerized method (stiffness method) for structural analysis.
6. An ability to select a solution method appropriate for a given problem.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c) An ability to function on multidisciplinary teams
d) An ability to identify, formulate, and solve engineering problems
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Statically Indeterminate Structural Systems, Determinacy and Stability</td>
<td>1st, 2nd</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>&quot;The Force Method&quot;, Analysis of Indeterminate Beams, Frames, Arches and Trusses</td>
<td>3rd, 4th, 5th</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Effect of Support Movements</td>
<td>6th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Effect of Temperature Change</td>
<td>7th</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
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<tr>
<td>&quot;The Moment Distribution Method&quot;, Analysis of Beams and Frames considering the Sidesway effect</td>
<td>8th, 9th, 10th, 11th</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>-</td>
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<tr>
<td>&quot;The Stiffness Method&quot;, Analysis of Beams and Frames</td>
<td>12th, 13th, 14th, 15th</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>-</td>
</tr>
</tbody>
</table>

**Prepared by:** Prof. Hesham Ali Zieneldin

**CE 307: Properties and Testing of Concrete**

2 Credit
Catalogue Description:

Cement: Manufacture, properties, types of cement, tests. Aggregate: Types, properties, grading, tests. Mixing water, concrete: proportions, mixing, handling, placing, fresh and hardened properties, tests, curing.

Course Web Address: http://www.qec.edu.sa/

Prerequisites: Properties of Structural Materials (CE205)
Co-requisites: None
Course Category: Core Course


References: ASTM Standards.

Other Supplemental Materials: Site Uploaded Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 2 hours, Contact: 3 hours (1 hours lecture and 2 hours Lab; per week)

Course Coordinator’s Name: Dr. Gamal A. M. Al-Saadi

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate to have the following outcomes:

17. Getting knowledge about the different materials composing concrete.
18. Studying the types, properties, tests of cement and aggregates.
19. Studying the aggregates for concrete (shape, size, and grading).
22. Studying of the properties and tests of fresh and hardened concrete.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
h) The broad education necessary to understand the impact of engineering solutions in a
global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying
   principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and
   use engineering judgment to draw conclusions.
4. an ability to recognize ethical and professional responsibilities in engineering situations and
   make informed judgments, which must consider the impact of engineering solutions in global,
   economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning
   strategies.
2. an ability to apply engineering design to produce solutions that meet specified needs with
   consideration of public health, safety, and welfare, as well as global, cultural, social,
   environmental, and economic factors.

**Topics to be covered:**

<table>
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<tr>
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<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Fundamental of Concrete</td>
<td>1st</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>cement</td>
<td>2nd, 3rd, 4th, 5th, 6th</td>
<td>15</td>
<td>5</td>
<td>-</td>
<td>10</td>
</tr>
</tbody>
</table>
Introduction, manufacture of cement, types and properties of cement, and cement tests

Aggregates: Types and properties of aggregates, and Grading and tests of aggregates

Mixing water, admixtures for concrete

Mixing, Handling, placing, and curing

Properties and Tests of Fresh and hardened Concrete

<table>
<thead>
<tr>
<th>Prepared by:</th>
<th>Dr. Gamal Al-Saadi</th>
<th>Date: 9/3/2015</th>
</tr>
</thead>
</table>

CE 318: Design of Reinforced Concrete Structures
4 Credit

Catalogue Description:


Prerequisites: CE 306: Structural Analysis - 2
CE 307: Properties and Testing of Concrete

Co-requisites:

Course Category: Core Course

Textbook:

References:
- M. Nadim Hassoun, and Akthem Al Manaseer, Structural Concrete Theory and design, John Wiley & Sons Inc, Latest Edition
Saudi Building Code Latest Edition,
- ACI Latest Edition

Other Supplemental Materials: Site Uploaded; Notes Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 4 hours, Contact: 4 hours (4 hour lecture and 1 hour recitation; per week)

Course Coordinator’s Name: Assistant Prof. Dr. Ahmed Elragi

Computer Usage: Writing home works and required reports.
Drawing plans and elevations of some designed applications.
Using the software package Office, and SAP2000 for analysis of some problems. Specific Outcomes of Instructions:
Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. An ability to conduct the knowledge of the reinforced concrete as a structural material.
2. An ability to conduct the knowledge of the mechanics of reinforced concrete members.
3. An ability to use building codes in the design of reinforced concrete structures.
4. An ability to use ultimate strength design method and elastic concept in reinforced concrete design.
5. An ability to design reinforced concrete beams and slabs subjected to flexure and shear forces.
6. An ability to compute development length, splices and deflections in reinforced concrete structures.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c) An ability to identify, formulate, and solve engineering problems
d) An understanding of professional and ethical responsibility
e) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
f) A recognition of the need for, and an ability to engage in life-long learning
g) A knowledge of contemporary issues
h) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

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<tr>
<th>Topics</th>
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<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Material properties, Mechanics of reinforced concrete members</td>
<td>1st</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ultimate strength design &amp; elastic concept, Load factors and load combination</td>
<td>2nd</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Flexural design of beams with rectangular and T cross sections</td>
<td>3rd &amp; 4th</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Analysis and design of beams with compression reinforcement, Reinforcement details</td>
<td>5th</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Analysis and design of beams for shear and diagonal tension,</td>
<td>6th &amp; 7th</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Design of one-way slabs, Analysis and design of continuous beams and slabs</td>
<td>8th &amp; 9th</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Development length, anchorage and splice of reinforcement. Deflections and crack control</td>
<td>10th &amp; 11th</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Design of non-sway short concrete columns</td>
<td>12th &amp; 13th</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Design of different types of staircases, Detailing</td>
<td>14th &amp; 15th</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Prepared by: Assistant Prof. Dr. Ahmed Elragi Date: 1/1/2015

CE 330: Hydraulics
3 Credit

Catalogue Description:

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Fluid Mechanics CE 230

**Co-requisites:** None

**Course Category:** Core Course  
**Textbook:**

**References:**

**Other Supplemental Materials:** Site Uploaded; Notes, Model Answers, etc.

**Credit and Contact Hours:**
Credits: 2 hours, Contact: 3 hours (2 hour lecture and 1 hour of tutorial; per week)

**Course Coordinator’s Name:** Associate Prof. Yousry Ghazaw

**Computer Usage:** Word Processor (student's choice), Spreadsheet (student's choice)

**Specific Outcomes of Instructions:**

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. Recognize the essential parameters describing a steady flow in open channels and pipes.
2. Understand the properties of hydraulic jump.
3. Be able to calculate flow in network of pipes.
4. Be able to solve a range of problems in steady open channel flow.
5. Be able to estimate the length of backwater curves.
6. Be able to deal with different types of pump.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering  
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability  
e) An ability to identify, formulate, and solve engineering problems  
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context  
i) A recognition of the need for, and an ability to engage in life-long learning
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
5. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contac t Hours</th>
<th>Lectur es</th>
<th>Tutori al</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction:</strong></td>
<td>1st</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
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<tr>
<td>Course outlines, Review properties of water, and hydrostatic forces.</td>
<td></td>
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<tr>
<td><strong>Open channel flow:</strong></td>
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<tr>
<td><em>Uniform flow through open channel</em></td>
<td>2nd</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Introduction, Manning's formula for discharge through an open channel. Chezy's formula for discharge through an open channel. Discharge through rectangular, trapezoidal, and circular cross sections. Best Hydraulic section</td>
<td>3rd 4th 5th</td>
<td></td>
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</tr>
<tr>
<td><strong>Non-Uniform flow through open channel</strong></td>
<td>6th 7th 8th 9th</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Specific energy of a flowing liquid, Specific energy diagram. Flow analysis, normal depth, critical depth and critical velocity. Froude number, hydraulic jump Alternate depths, and energy dissipation.</td>
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<tr>
<td><strong>Gradually varied flow</strong></td>
<td>10th 11th</td>
<td>6</td>
<td>4</td>
<td>2</td>
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<tr>
<td>Gradually varied flow analysis Types of water surface profiles.</td>
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</tbody>
</table>
Pumps:
Introduction, Types of pumps
Suction-delivery and total head.
Characteristic curves of pumps, system curves.
Pump selection.

CE 403: Advanced Reinforced Concrete
3 Credit Catalogue

Description:
Design of floor systems: ribbed and flat slabs. Design of beams for torsion, combined shear and torsion by the strength method. Design of short and long columns under eccentric loadings. Study of different structural systems for covering large dimensions halls. Analysis and design of reinforced concrete water tanks. Introduction to the design of prestressed concrete members.

Course Web Address: http://www.qec.edu.sa/
Prerequisites: CE 318: Design of Reinforced Concrete Structures. Co-requisites:
Course Category: Optional Course
Textbook:

References:
- M. Nadim Hassoun, and Akthem Al Manaseer, Structural Concrete Theory and design, John Wiley & Sons Inc, Latest Edition
- Saudi Building Code Latest Edition,

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hours recitation; per week)

Course Coordinator’s Name: Assistant Prof. Dr. Ahmed Elragi

Computer Usage: Writing home works and required reports.
Drawing plans and elevations of some designed applications.
Using the software package Office, and SAP2000 for analysis of some problems.
Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
1. Be able to conduct the knowledge of design methods of advanced reinforced concrete structures.
2. An ability to design reinforced concrete ribbed and flat slabs.
3. An ability to design reinforced concrete beams for torsion, and combined shear and torsion. 4. An ability to design reinforced concrete short and long columns subjected to eccentric loadings.
5. A knowledge of structural systems used for covering large dimensions halls.
6. An ability to design reinforced concrete water tanks.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science, and engineering principles to solve civil engineering problems in practice.

c) An ability to analyze and design a system, civil engineering structure or component to meet desired goals in civil engineering applications economically viable, sustainable and acceptable socially, politically and ethically.

e) An ability to identify, formulate, and solve civil engineering problems.

f) An ability to understand professional, social and ethical practices and responsibilities.

h) An understanding of the impact of engineering solutions in a global, economical, environmental and societal context.

i) A recognition of the need for, and an ability to engage in, life-long learning.

New Related Student Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture s</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
</table>
Introduction, Review of ultimate strength design & elastic concept, ACI Code requirements

Analysis and design of ribbed slabs, Load distribution, Design of hidden beams,

Analysis of flat slabs: construction loads, bending moments in strips. Direct design method.

Design of flat slabs: Equivalent frame method, slab deflections, details of reinforcements.

Design of concrete beams for torsion, and combined shear and torsion.

Design of short and long columns subjected to eccentric loads, Interaction diagrams.

Study of different structural systems for covering large dimensions halls.

Analysis and design of reinforced concrete water tanks.

Introduction to the design of prestressed concrete members.

Prepared by: Assistant Prof. Dr. Ahmed Elragi     Date: 1/1/2014

**CE 418: Structural Analysis-3**

3 Credit

**Catalogue Description:**

Analysis of 3-D frames and trusses, shells, soil structure interaction problems, structures under dynamic loading and other indeterminate structures.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Structural Analysis-2 CE 306 **Co-requisites:**

None
**Course Category:** Elective Course


**References:** Billington D. P., Thin Shell Concrete Structures, McGraw-Hill, Latest Edition

**Other Supplemental Materials:** Site Uploaded; Notes, Solved Examples, Model Answers, etc.

**Credit and Contact Hours:**

Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

**Course Coordinator’s Name:** Prof. Hesham Ali Zieneldin

**Computer Usage:** Writing homeworks and required reports and drawing some engineering sketches.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:
15. A knowledge of different types of advanced indeterminate structural systems.
16. An ability to analyze 3-D frames and trusses.
17. An ability to analyze shells.
18. An ability to model and analyze soil-structure interaction problems.
19. An ability to analyze structures under dynamic loading.
Old Related Student Outcomes:
  a) An ability to apply knowledge of mathematics, science and engineering
  c) An ability to design a system, component, or process to meet desired needs within realistic
     constraints such as economic, environmental, social, political, ethical, health and safety, 
     manufacturability, and sustainability
  d) An ability to function on multidisciplinary teams
  e) An ability to identify, formulate, and solve engineering problems
  h) The broad education necessary to understand the impact of engineering solutions in a
     global, economic, environmental, and societal context
  i) A recognition of the need for, and an ability to engage in life-long learning
  j) A knowledge of contemporary issues
  k) An ability to use the techniques, skills, and modern engineering tools necessary for 
     engineering practice.

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying
   principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with
   consideration of public health, safety, and welfare, as well as global, cultural, social, 
   environmental, and economic factors.
5. an ability to function effectively on a team whose members together provide leadership, 
   create a collaborative and inclusive environment, establish goals, plan tasks, and meet 
   objectives.
4. an ability to recognize ethical and professional responsibilities in engineering situations and 
   make informed judgments, which must consider the impact of engineering solutions in global, 
   economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning 
   strategies.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, 
   and use engineering judgment to draw conclusions.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to special</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>structure analysis problems</td>
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<tr>
<td>Analysis of 3D Trusses</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;,3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Analysis of 3D Frames</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;,5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Shell Structures.</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;,7&lt;sup&gt;th&lt;/sup&gt;,8&lt;sup&gt;th&lt;/sup&gt;,9&lt;sup&gt;th&lt;/sup&gt;</td>
<td>16</td>
<td>12</td>
<td>4</td>
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<tr>
<td>Soil Structure Interaction</td>
<td>10&lt;sup&gt;th&lt;/sup&gt;,11&lt;sup&gt;th&lt;/sup&gt;,12&lt;sup&gt;th&lt;/sup&gt;</td>
<td>12</td>
<td>9</td>
<td>3</td>
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</tbody>
</table>
CE 443: Design of Pavement
3 Credit

Catalogue Description:

Pavement types and loading, behavior of pavements under dynamic loads, stresses in flexible and rigid pavements, pavement components, pavement design factors, flexible highway and airport pavement design, rigid highway and airport pavement design; overlay design and computer applications; practical pavement design project of a road and airport.

Course Web Address: http://www.qec.edu.sa/
Prerequisites: CE 205
Co-requisites: None
Course Category: Elective Course
Textbooks:


References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model
Answers, etc.

**Credit and Contact Hours:**
Credits: 3 hours, Contact: 4 hours (3 hours lecture and 1 hour tutorial; per week)

**Course Coordinator’s Name:** Prof. Sayed A. Habib

**Computer Usage:** Writing homeworks and required reports and drawing some engineering sketches.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will:
1. Tell the principles of pavement types and loading
2. Recognize the behavior of pavements under dynamic loads.
3. Analyze the stresses in flexible and rigid pavements.
4. Outline pavement components and pavement design factors.
5. Design flexible and rigid pavements in highway and airport.
6. Design overlay.
7. Use computer applications.
8. Perform practical pavement design project of a road and airport.

**Old Related Student Outcomes:**
- c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- e) An ability to identify, formulate, and solve engineering problems
- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) A recognition of the need for, and an ability to engage in life-long learning
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

**New Related Student Outcomes:**
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture(s)</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement types and loading</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Behavior of pavements under dynamic loads</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
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</tr>
<tr>
<td>Stresses in flexible and rigid pavements</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Pavement components</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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</tr>
<tr>
<td>Pavement design factors</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; 7&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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<td>8&lt;sup&gt;th&lt;/sup&gt; 9&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
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<tr>
<td>Flexible highway and airport pavement design</td>
<td>10&lt;sup&gt;th&lt;/sup&gt; 11&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Rigid highway and airport pavement design</td>
<td>12&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Overlay design</td>
<td>13&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Computer applications</td>
<td>14&lt;sup&gt;th&lt;/sup&gt;</td>
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<td>3</td>
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<tr>
<td>Practical pavement design project of a road and airport</td>
<td>15&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4</td>
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</tbody>
</table>

**Prepared by:** Prof. Sayed A. Habib  
**Date:** March 2015

**CE 447: Highway Engineering**  
2 Credit

**Catalogue Description:**

Course Web Address: [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

Prerequisites: CE 343

Co-requisites: None

Course Category: Core Course

Textbooks:

References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:

Credits: 2 hours, Contact: 4 hours (2 hours lecture, 1 hour tutorial and 1 hour laboratory; per week)

Course Coordinator’s Name: Prof. Sayed A. Habib

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will:
1. Recognize highway planning and capacity.
2. Differentiate between the geometric and structural design.
3. Recognize highway materials and drainage.
4. Design of highway mixtures.
5. Design of highway flexible pavement.
6. Recognize the highway construction.
7. Outline the pavement evaluation and maintenance.

Old Related Student Outcomes:

b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

New Related Student Outcomes:
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lecture</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
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<tbody>
<tr>
<td>Highway Planning and Capacity</td>
<td>1st 2nd</td>
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<td>2</td>
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<td>1</td>
<td>1</td>
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<tr>
<td>Intersections</td>
<td>5th 6th</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Highway Materials and Drainage</td>
<td>7th 8th</td>
<td>4</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Bituminous Mixtures Design</td>
<td>9th 10th</td>
<td>4</td>
<td>2</td>
<td>1</td>
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</tr>
</tbody>
</table>
CE 448: Construction and maintenance of Highways

3 Credit

Catalogue Description:

Highways construction materials; asphalt concrete mix design; asphalt plants operation; material placement and compaction methods; quality control; earthwork, roadside requirements; construction standards; pavement performance and evaluation; pavement distress identification; surface treatments; overlay design; pavement recycling techniques. Course Web Address: http://www.qec.edu.sa/

Prerequisites: None

Co-requisites: CE 447

Course Category: Core

Course Textbooks:


References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.
Credit and Contact Hours:
Credits: 2 hours, Contact: 4 hours (2 hours lecture, 1 hour tutorial and 1 hour laboratory; per week)

Course Coordinator’s Name: Prof. Sayed A. Habib

Computer Usage: Writing homeworks and required reports and drawing some engineering sketches.

Specific Outcomes of Instructions:

Students who successfully complete the course will:
1. Recognize highways construction materials.
2. Design of asphalt concrete mix.
3. Recognize asphalt plants operation, material placement and compaction methods.
4. Recognize the quality control; earthwork, roadside requirements, construction standards.
5. Recognize pavement performance and evaluation.
6. Be able to analyze the pavement distress.
7. Outline surface treatments.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
c) An ability to identify, formulate, and solve engineering problems
d) An ability to communicate effectively
e) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
f) A recognition of the need for, and an ability to engage in life-long learning

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highways construction materials</td>
<td>1st</td>
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<td>Asphalt concrete mix design</td>
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<td></td>
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<td>4</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Asphalt plants operation</td>
<td>4th</td>
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<td>3</td>
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<td>-</td>
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<tr>
<td>Material placement and compaction methods</td>
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<td>4</td>
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<tr>
<td>Quality control</td>
<td>6th</td>
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<tr>
<td>Highway Materials</td>
<td>7th</td>
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<tr>
<td>Earthwork</td>
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<td>Construction standards</td>
<td>10th</td>
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</tbody>
</table>
CE 457: Open Channel Hydraulics
3 Credit

Catalogue Description:

Course Web Address: http://www.qec.edu.sa/

Prerequisites: Fluid Mechanics CE330

Co-requisites: None Course

Category: Core Course

Textbook:

References:


Other Supplemental Materials: Site Uploaded; Notes, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour of tutorial; per week)

Course Coordinator’s Name: Associate Prof. Yousry Ghazaw

Computer Usage: Word Processor (student's choice), Spreadsheet (student's choice)

Specific Outcomes of Instructions:
Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

1. Recognize the essential parameters describing steady flow, unsteady flow, uniform flow and nonuniform flow in open channels.
2. Be able to calculate back water curves.
3. Be able to deal with erodible channel.
4. Be able to design alluvial channels.
5. To understand the concepts of dynamic similarity and be able to use dimensional analysis to design and interpret laboratory experiments.
6. Be able to deal with sediment transport and erosion in open channel.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
g) An ability to communicate effectively
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

**Topics to be covered:**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Week / Date</th>
<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
</table>
**Introduction:**
Course outlines,
Review of basic principle of hydraulics.

<table>
<thead>
<tr>
<th>Flow in open channels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of open flow. Empirical open channel formulas.</td>
</tr>
<tr>
<td>Friction factors in open channel flow, hydraulic efficiency of section.</td>
</tr>
<tr>
<td>Energy regimes in open channel Flow transitions, hydraulic jump.</td>
</tr>
<tr>
<td>Non uniform flow</td>
</tr>
<tr>
<td>Computation of water surface profile in an irregular channel, Flow profile in flood plains.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanics of sedimentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic properties of sediments</td>
</tr>
<tr>
<td>Movement of sediment in the bed.</td>
</tr>
<tr>
<td>Suspended sediment load</td>
</tr>
<tr>
<td>Total sediment load</td>
</tr>
<tr>
<td>Bed geometry and flow resistance in alluvial channels,</td>
</tr>
<tr>
<td>Reservoir sedimentation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hydraulic structures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weirs and Siphon Spillways.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensional analysis and Similitude (hydraulic model studies):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric, kinematics and dynamic similitude (examples)</td>
</tr>
<tr>
<td>Dimensionless numbers, Buckingham pi theorem (examples)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prepared by:</th>
<th>Dr: Yousry Ghazaw</th>
<th>Date: March 2015</th>
</tr>
</thead>
</table>

**CE 459: Groundwater Hydrology**
3 Credit

**Catalogue Description:**
Course Web Address: http://www.qec.edu.sa/

Prerequisites: Hydrology CE331

Co-requisites: None Course

Category: Core Course

Textbook:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour of tutorial; per week)

Course Coordinator’s Name: Associate Prof. Yousry Ghazaw

Computer Usage: Ready-made Finite difference program. Spreadsheets, writing homework's and reports.

Specific Outcomes of Instructions:

Students who successfully complete the course will demonstrate the following outcomes by tests and homework:

- Realize the need of hydrology as an engineering science essential for the planning, design and operation of water resource systems
- Recognize the essential parameters describing a groundwater flow.
- Develop an understanding of the flow in confined and unconfined aquifers.
- Develop an understanding of steady and unsteady flow problems.
- Understand the mechanism of wells. □ Develop an understanding of groundwater recharge and saline water intrusion and environmental aspects of groundwater. □ Realize groundwater aspects in Saudi Arabia.

Old Related Student Outcomes:

a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

j) A knowledge of contemporary issues

New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

Topics to be covered:

<table>
<thead>
<tr>
<th>Topics</th>
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<th>Lectures</th>
<th>Tutorial</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to groundwater hydrology:</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Hydrological process related to groundwater hydrology:</td>
<td>2nd 3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Occurrence, storage and supply of groundwater:</td>
<td>4th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Basic differential equations for flow in confined and unconfined aquifers:</td>
<td>5th 6th 7th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Steady and unsteady groundwater flow problems:</td>
<td>8th 9th 10th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Groundwater recharge, saline water intrusion, and environmental aspects of groundwater:</td>
<td>11th 12th 13th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Case studies related to groundwater in Saudi Arabia:</td>
<td>14th 15th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Prepared by: Dr: Yousry Ghazaw

Date: March 2015
CE 462: Engineering Surveying
3 Credits Catalogue

Description:

Electronic distance measurement with high precision, total station, topographic mapping and earthworks computations, Laser systems and alignment, Precise leveling, construction surveying, route surveying, Underground surveying, Global Positioning System (GPS) and its Applications.

Course Web Address:

http://www.qec.edu.sa/

Prerequisites by Topic: Plane Surveying CE 212

Co-requisites: .................................................................

Course Category: Elective Course

Textbook:


References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, etc.

Credit and Contact Hours:

Credits: 3 hours, Contact: 4 hours (3 hour lecture and 1 hour tutorial per week)

Computer Usage:
Total Station Software, and Computer Applications for solving different surveying problems.

**Specific Outcomes of Instructions:**

Students who successfully complete the course will be able to:

21. Outline the principles of EDM and the geometry of total station measurements.
22. Compute and analyze station coordinates that is collected by total station instrument.
23. Define the alignment of pipe line using laser system
24. Analyze the setting out data for many projects in the construction field.
25. Recognize the setting out technique of horizontal curves using deflection angles and total station techniques.
26. Apply surveying skills relevant to many surveying projects such as construction field and underground surveying.
27. Recognize the fundamental of GPS and its applications
28. An ability to perform earth work calculations.

**Old Related Student Outcomes:**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**New Related Student Outcomes:**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
3. an ability to communicate effectively with a range of audiences.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

**Topics to be covered:**
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<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background</td>
<td>1st</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Laser System, Alignment and related projects</td>
<td>2nd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Precise leveling:</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Modern EDM Instruments and Total Station:</td>
<td>4th - 5th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Topographic mapping and Earthworks:</td>
<td>6th-7th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Construction surveying:</td>
<td>8th - 9th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Route Surveys:</td>
<td>10th - 11th - 12th</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Underground surveying:</td>
<td>13th</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>GPS</td>
<td>14th - 15th</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

**CE 474: Design and Operation of Water and Wastewater Treatment Plants**

3 Credits

**Catalogue Description:**

Theory and practice in sanitary engineering including the concepts of processing, design, economic evaluation and computer analysis; using practical considerations in the design and operation of treatment units and the combining of unit processing in water and wastewater treatment plants; field trips will be organized to visit various types of treatment plants in operation.

**Course Web Address:** [http://www.qec.edu.sa/](http://www.qec.edu.sa/)

**Prerequisites:** Water and wastewater engineering, CE 370

**Co-requisites:** ……

Prepared by: Associate Prof. Ramadan Hassan
Course Category: Elective Course

Textbook:


References:

Other Supplemental Materials: Site Uploaded; Notes, Solved Examples, Model Answers, etc.

Credit and Contact Hours:
Credit: 3 hours, Contact: 4 hours (3 hours lectures and 1 hour tutorial) per week

Course Coordinator’s Name:
Associate Prof. Tarek Elmitwalli

Computer Usage: Computer applications in environmental engineering, spreadsheet

Specific Outcomes of Instructions:
Students who successfully complete the course will be able to

23. State and describe sustainable treatment of water and wastewater.
24. Design of the main units in conventional and sustainable treatment of the water and wastewater.
25. Develop the main units in sludge treatment.
26. Explain the methods of controlling the design and operation and treatment of water and wastewater.
27. Calculate, evaluate and interpret the results.

Old Related Student Outcomes:
a) An ability to apply knowledge of mathematics, science and engineering
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
K) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
New Related Student Outcomes:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Topics to be covered:

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<thead>
<tr>
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<th>Contact Hours</th>
<th>Lectures</th>
<th>Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, mass balances and flow models and reactors</td>
<td>1st &amp; 2nd</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Type of reactors</td>
<td>3rd</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Preliminary unit operations and processes</td>
<td>4th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Design and operation of coagulation and flocculation units</td>
<td>5th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Design and operation of sedimentation tanks</td>
<td>6th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Design and operation of filters</td>
<td>7th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Design and operation of Ammonia removal, adsorption units, ion exchange and membrane units</td>
<td>8th &amp; 9th</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Design, operation, modelling of activated sludge systems and trickling filters systems</td>
<td>10th, 11th &amp; 12th</td>
<td>12</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Design and operation of stabilization ponds and aerated lagoons units</td>
<td>13th</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Design and operation of anaerobic and aerobic digestions, and solids removal units</td>
<td>14th &amp; 15th</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Prepared by: Associate Prof. Tarek Elmitwalli
Date: March 2015
Capstone Courses (Training and SDP)

CE 400: Senior Design Project (SDP)

1. **Course Name and code**: Senior Design Project – CE 400
2. **Credit hours**: 3 hrs.
Contact hours : 4 hrs.

3. Coordinator/Instructor : Dr. Sherif M. ElKholy

4. Text book and Other supplemental materials
   
   Text book:
   - No specific textbook (to be determined by the project supervisor based on the scope and application of the project)

   References:
   - No specific textbook (to be determined by the project supervisor based on the scope and application of the project)

   Other supplemental materials
   - Senior Design Project Guidelines.

5. Specific course information
   
   A) Catalog Description
   The student is assigned, among a team of students and one or more faculty professors, the design of an applied project, which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary field studies, visibility studies, final design drawings, bill of materials, and the total cost of the project, if any, depending on the natures of project. The SDP project shall continue for one semester. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion

   B) Prerequisites : Cooperative training GE 405

   C) Co-requisites : None

   D) Course Condition : ■ Required □ Elective □ Selective

6. Specific goals for the course
   
   A) Course Specific outcomes
   By the end of this course, students are expected to be able to:

   1. Apply knowledge of mathematics, science and engineering in solving an engineering problem.

   2. Design an experiment, when applicable, collect, analyse and interpret data.

   3. Design a civil engineering, component, to meet desired needs within realistic constraints including: identify design inputs and recognize constraints, apply or develop design approaches and, when relevant, realize successful system, component or process.

   4. Demonstrate teamwork and project management attributes

   5. Develop models and/or apply problem solving approaches for technical problems. This may include problem definition, identifying objectives, use of heuristics, generating alternative models/solutions, deciding the course of solution, explain problem solving strategies, applying models/solution and evaluating results
6. Demonstrate professional and ethical responsibilities and academic integrity
7. Organize and present technical work in written reports and in oral presentations
8. Demonstrate understanding for the broader impact of engineering solutions in a global, economic, environmental, and societal context as applicable
9. Seek information from different sources and enhance further learning independently
10. Realize current issues related to engineering problems
11. Apply techniques and capabilities of the modern engineering tools in the field of civil engineering

**B) Old Relation to the student outcomes**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**C) New Relation to the student outcomes**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

7. **Brief list of topics to be covered**
   - Review previous works and collection of data related to the design.
   - Defining and formulation of the problem, determination of the project objectives.
   - Applying design concepts to achieve the target objective of the project.
   - Where appropriate ○ Building mathematical models, ○ Conducting simulations, carrying out the planned experiments.
   - Analyzing the results and evaluating the end product.
   - Formulation of the suggestions, recommendations and conclusions. □ Writing the final report and preparing for the final presentation.

Prepared by: Dr. Sherif ElKholy    Date: March 2015

**CE 491: Senior Design Project 1**

1. **Course Name and code** : Senior Design Project 1 CE 491

2. **Credit hours** : 3 hrs  **Contact hours** : 4 hrs

3. **Coordinator** : Dr. Sherif M. ElKholy

4. **Text book and Other supplemental materials**
   
   **Text book:**
   - No specific textbook (to be determined in consultation with the supervisor based on the scope and application of the project)

   **References:**
   - No specific textbook (to be determined in consultation with the supervisor based on the scope and application of the project)

   **Other supplemental materials**
   - Senior Design Project Guidelines.

5. **Specific course information**
   
   **A) Catalog Description**
   The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary
preliminary studies, final design drawings, bill of quantities, and the total cost of the project. The graduation project shall continue for one semester. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

**B) Prerequisites**
- Complete 100 Credit hours

**C) Co-requisites**
- None

**D) Course Condition**
- Required
- Elective
- Selective

6. **Specific goals for the course**

**A) Course Specific outcomes**

By the end of this course, students are expected to be able to:

- Define and formulate engineering problems.
- Gather and extract relevant information through internet and library searches.
- Operate effectively within a team.
- Generate alternative solutions to engineering problems and consequently identify the appropriate and realistic solution among the various alternatives.
- Make a design for a component, or a system that meets the desired needs
- Prepare and deliver effective presentations.

**B) Old Relation to the student outcomes**

a) An ability to apply knowledge of mathematics, science and engineering
b) An ability to design and conduct experiments, as well as to analyze and interpret data
c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) An ability to function on multidisciplinary teams
e) An ability to identify, formulate, and solve engineering problems
f) An understanding of professional and ethical responsibility
g) An ability to communicate effectively
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**C) Relation to the student outcomes**

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

3. an ability to communicate effectively with a range of audiences.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

7. Brief list of topics to be covered
   - Survey, internet search, data collection
   - Defining and formulation of the problem, determination of the project objectives
   - Building the mathematical model, applying the design concepts to the target object or the experimental set
   - Comparing the alternative solutions to end with the best design considering the realistic constraints
   - Writing the Final Report, preparation of the Final presentation

Prepared by: Dr. Sherif ElKholy Date: March 2015

CE 492: Senior Design Project 2

Course Name and code: Senior Design Project 2 – CE 492

1. Credit hours: 2 hrs
   Contact hours: 3 hrs

2. Coordinator: Dr. Sherif ElKholy

3. Text book and Other supplemental materials
   Text book:
   - No specific textbook (to be determined in consultation with the supervisor based on the scope and application of the project)

   References:
   - No specific textbook (to be determined in consultation with the supervisor based on the scope and application of the project)
5. Specific course information

A) Catalog Description
The student is assigned, among a team of students and one or more faculty professors, the design of an applied project which simulates the real working condition to which the student will be exposed after graduation. The project should be comprehensive and includes all the necessary preliminary studies, final design drawings, bill of quantities, and the total cost of the project. At the end of the semester, there will be a seminar held for the working team of students to present the details of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

B) Prerequisites: Senior Design Project 1 CE 491

C) Co-requisites: None

D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course

A) Course Specific outcomes
By the end of this course, students are expected to be able to:

• Design a system, a component, a system or a process that meets the desired needs and which reflects considerations to environment, economy, society and safety where appropriate.

• Operate effectively within a team.

• Verify and validate a design product against specified requirements.

• Apply accurately, knowledge of mathematics, science and engineering to analyses a system, component or process. □ Prepare and deliver effective presentations.

B) Relation to the student outcomes

a) An ability to apply knowledge of mathematics, science and engineering

b) An ability to design and conduct experiments, as well as to analyze and interpret data

c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d) An ability to function on multidisciplinary teams

e) An ability to identify, formulate, and solve engineering problems

f) An understanding of professional and ethical responsibility

g) An ability to communicate effectively

h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

Other supplemental materials -
Senior Design Project Guidelines.
i) A recognition of the need for, and an ability to engage in life-long learning
j) A knowledge of contemporary issues
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

C) Relation to the student outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
3. an ability to communicate effectively with a range of audiences.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

7. Brief list of topics to be covered

- Where appropriate (Conducting simulations,
  o Prepare and develop the final output of the project and/or carrying out the planned experiments
- Analyzing the results and evaluating the end product against project objectives.
- Formulation of the suggestions, recommendations and conclusions. □ Writing the final report and preparing for the final presentation

Prepared by: Dr. Sherif Elkholy             Date: March 2015
GE 406

1. Course Name and code: Summer Training – GE 406

2. Credit hours: 2 hrs. Contact hours: ---

3. Instructor/coordinator: Prof. Elamir Samy Gadelmawla

4. Text book and Other supplemental materials
   Text book:
   - N/A
   References:
   - N/A
   Other supplemental materials
   - Course Instructions are uploaded for the students on the College Web-Site: (http://qec.edu.sa).

5. Specific course information
   A) Catalog Description
   Cooperative Training Program is a joint effort between the College of Engineering and the public and the private sectors in the area of specialization to allow students to practice the skills and knowledge they have learned. Coop students are required to spend seven months of practical training in a relevant field in industry.
   B) Prerequisites: 100 hours teaching.
   C) Co-requisites: None
   D) Course Condition: ■ Required □ Elective □ Selective

6. Specific goals for the course
   A) Course Specific outcomes
   By the end of this course, students will be able to:
   8. Apply the major discipline theoretical knowledge.
   9. Practice what he gained of skills.
   10. Enhance the ability of working in a team.
   11. Gain the competence of adaptation (anticipating, adapting to, and promoting changes important to a profession societal purpose and the professional role).
12. Receive and practice the ethics of a profession as standards that guide professional behavior.
13. Acquire the leadership competence.
14. Have the scholarly concern for improvement.

**B) Old Relation to the student outcomes**

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■ Highly related to Student Outcome (SO)
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**C) New Relation to the student outcomes**

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■ Highly related to Student Outcome (SO)
□ To some extent related to Student Outcome (SO)

**7. Brief list of topics to be covered**

□ N/A
GE 407: Cooperative Training

1. **Course Name and code:** Cooperative Training – GE 407

2. **Credit hours:** 7 hrs.
   
   **Contact hours:** ---

3. **Instructor/coordinator:** Prof. Elamir Samy Gadelmawla

4. **Text book and Other supplemental materials**
   
   **Text book:**
   - N/A
   
   **References:**
   - N/A
   
   **Other supplemental materials**
   - Course Instructions are uploaded for the students on the College Web-Site: (http://qec.edu.sa).

5. **Specific course information**

   **A) Catalog Description**
   Cooperative Training Program is a joint effort between the College of Engineering and the public and the private sectors in the area of specialization to allow students to practice the skills and knowledge they have learned. Coop students are required to spend seven months of practical training in a relevant field in industry.
B) Prerequisites: 100 hours teaching.

C) Co-requisites: None

D) Course Condition: ■ Required   □ Elective   □ Selective

6. Specific goals for the course

A) Course Specific outcomes

By the end of this course, students will be able to:

15. Apply the major discipline theoretical knowledge.
16. Practice what he gained of skills.
17. Enhance the ability of working in a team.
18. Gain the competence of adaptation (anticipating, adapting to, and promoting changes important to a profession societal purpose and the professional role).
19. Receive and practice the ethics of a profession as standards that guide professional behavior.
20. Acquire the leadership competence.
21. Have the scholarly concern for improvement.

B) Old Relation to the student outcomes

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■ Highly related to Student Outcome (SO)
□ To some extent related to Student Outcome (SO)

7. Brief list of topics to be covered

□ N/A