

Kingdom of Saudi Arabia  
Ministry of Education  
Qassim University  
College of Engineering- Unaizah  
Department of Civil Engineering



المملكة العربية السعودية  
وزارة التعليم  
جامعة القصيم  
كلية الهندسة - عنيزة  
قسم الهندسة المدنية

# Guide to Civil Engineering Program

College of Engineering-Unaizah



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### 1. Preface:

Civil Engineering program is established to satisfy all needs with respect to creating and maintaining civil infrastructure of the country especially in Qassim

region. The rapid development of modern materials, measurement techniques, construction methods and management tools require properly trained civil engineers. In view of these factors the Civil Engineering program in Unaizah Engineering college always maintain the pace of development so as to meet the modern requirements of civil infrastructure.

The Department comprises six sub-disciplines: Structure Engineering, Construction Engineering and management, Geotechnical and Foundation

Engineering, Water resources, Transportation and Surveying Engineering, and Environmental Engineering.

**Structure Engineering:** Specializes in the design and implementation of residential and industrial metals and concrete structures.

**Engineering Management and Construction:** study the quantities and the implementation of facilities at the lowest possible cost and the fastest possible time and management of the work site.

**Geotechnical engineering and foundations:** It is specialized in studying the chemical, physical and mechanical properties of soil and rock materials and techniques, as well as studying the structural properties of soils and foundations.

**Water Resources:** It is concerned with the design of water structures, infrastructure and foundations as well as hydraulic designs.

**Transportation Systems and Surveying Engineering:** It is concerned with the design and construction of highways, traffic engineering, as well as the study of cadastral dimensions and geographical locations of engineering designs.

**Environmental Engineering:** studying the use of engineering, mathematical and scientific methods to design systems that help solve environmental problems, mitigate pollution damage, permanent monitoring and continuous control of air, land and water pollution centers, in addition to practical ways to protect health and safety in the facilities.

## 2. Location:

The Department of Civil Engineering is located in compass of the Engineering college in Unaizah Province – ElQassim Region - Saudi Arabia. The Engineering college

in Unaizah is one of the several colleges of Qassim University. The following figure shows the location of the Engineering college in Unaizah, where is located at the western border of the Unaizah city at a distance 8 km from the center of the city as shown in Fig.1



Figure 1: Location of Unaizah Engineering College

### 3. Occupations/Jobs Availability for the Graduate:

- Academic fields at universities, colleges and research centers.
- Engineer in the Ministry of municipalities.
- Engineer in the Ministry of transportation.
- Engineer in the Ministry of water and electricity.
- Engineer in the other ministries and government agencies in the operation and
- Maintenance of civil sectors.
- Constructions companies and offices in the implementation, design, surveying,
- Quantity calculations, supervision, and consulting of engineering projects.
- Engineer in companies, factories, workshops, airports, water treatment plants and
- Private construction companies.
- Environmental protection agencies.
- Rail construction, operation and maintenance.
- Road and tunnel construction and maintenance.

## 4. Program Mission and Goals:

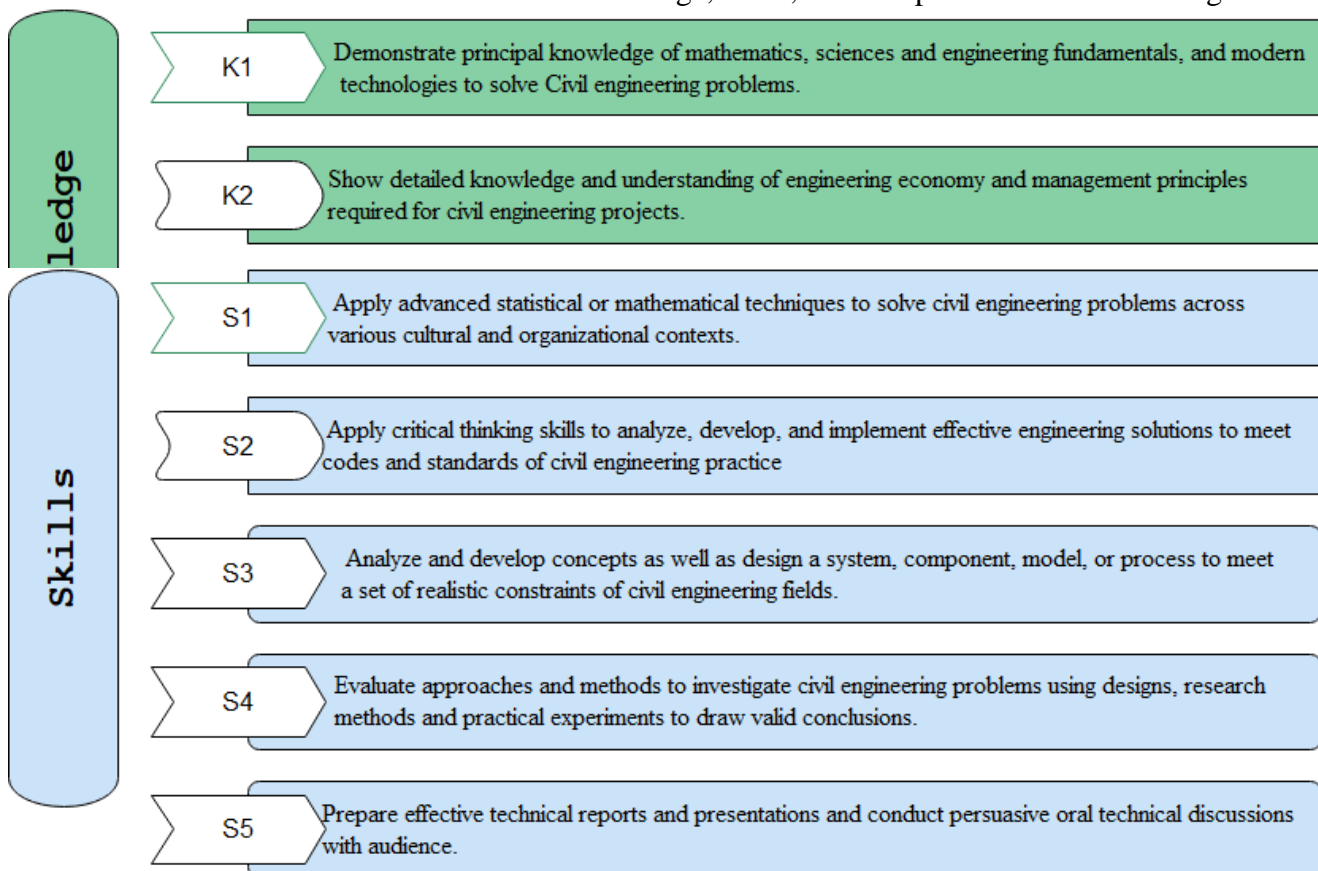
Providing a high quality program in education and scientific research to prepare civil engineers committed to professional, ethical and community responsibility.

## 5. Program Goals:

- 1- Providing an educational program in civil engineering in accordance with the standards of quality and academic accreditation.
- 2- Preparing competent engineers to meet the requirements of the labor market in various fields of civil engineering.
- 3- Preparing engineers capable of innovating engineering solutions, continuing self-learning and keeping abreast of developments in the fields of civil engineering.
- 4- Developing the spirit of teamwork and leadership, and Inculcate the values of professional, ethical and community responsibility.

## 6. Program Learning Outcomes

The learning outcomes of CE program are aligned with Saudi qualification frame work and classified in three main domains knowledge, skills, and competence as shown in Fig.2



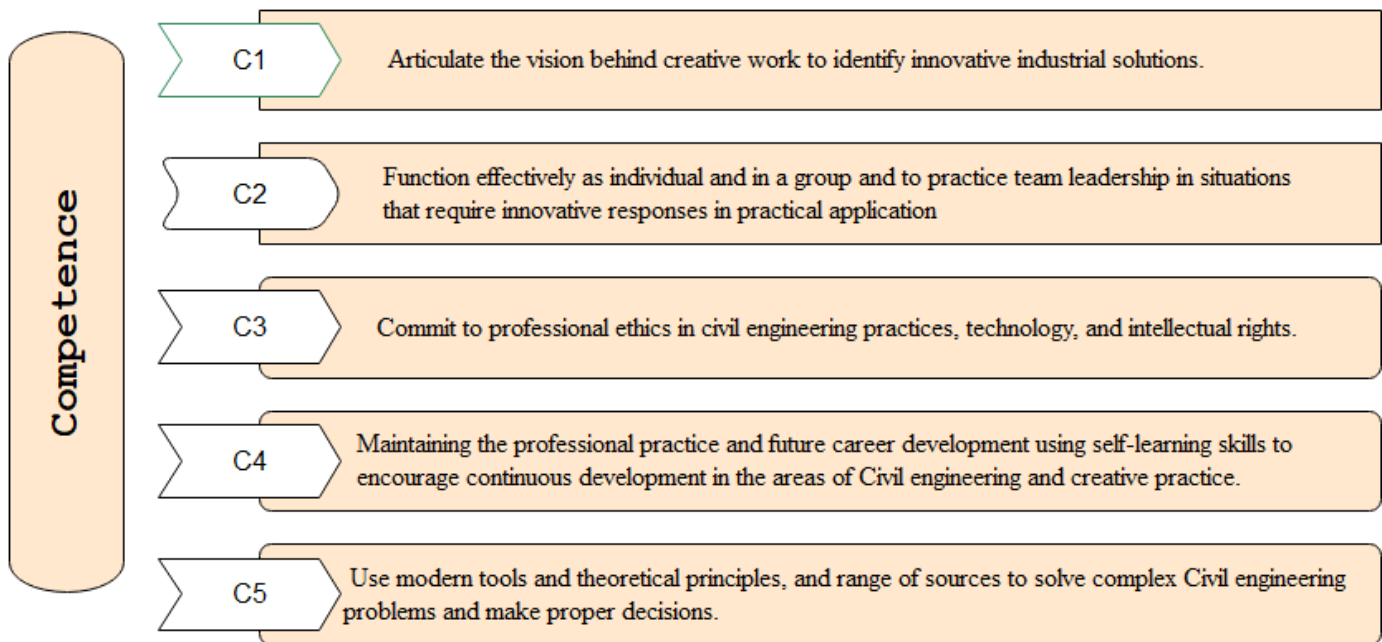


Figure 2: Program Learning Outcomes

## 7. Graduated Attributes

The graduate attributes of CE program are compatible with Qassim University' graduate attributes and listed below:

- ❖ GA1: Well-informed (engineering knowledge base)
- ❖ GA2: Critically think
- ❖ GA3: Innovative, and creative
- ❖ GA4: Design-oriented
- ❖ GA5: Effective communicator
- ❖ GA6: Investigative
- ❖ GA7: Decision maker and leadership entrepreneur
- ❖ GA8: Effectively work as an individual/team member
- ❖ GA9: Professionally act
- ❖ GA10: Ethically act, socially and environmentally responsible
- ❖ GA11: Fluently use modern tools and technologies

## 8. Program Management Structure

The organization structure of CE program is shown in Fig.3.

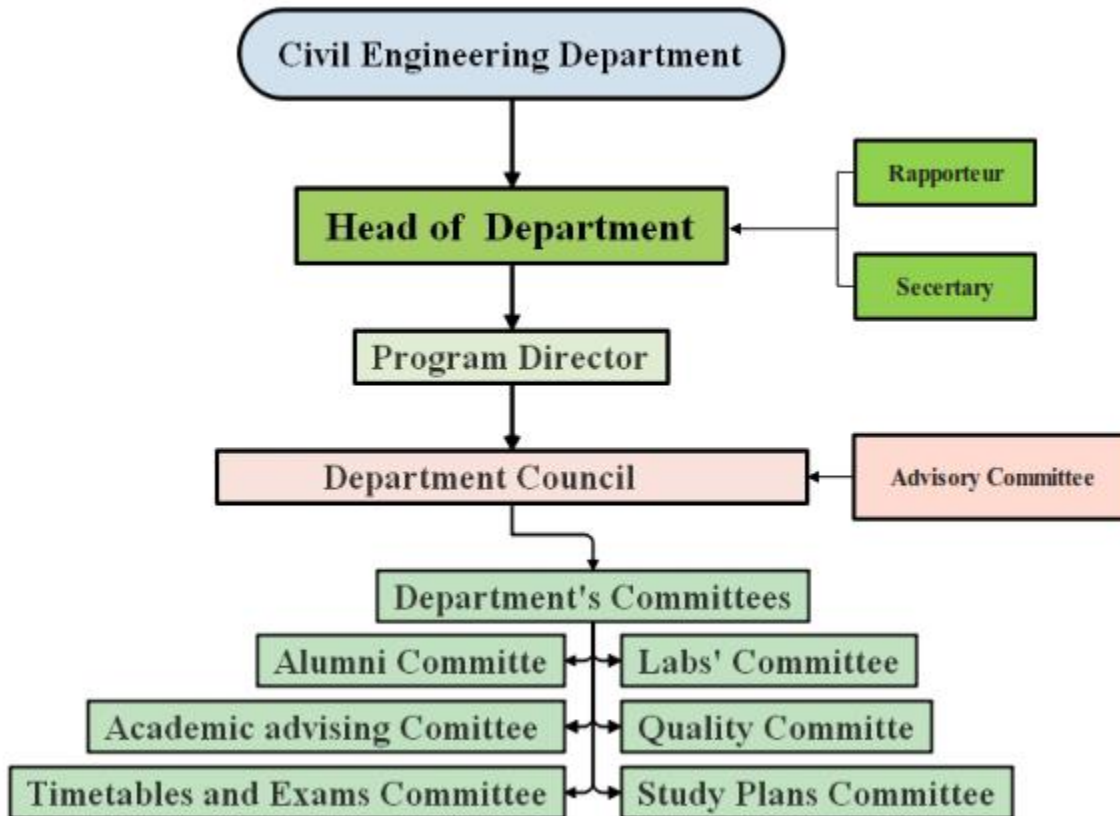


Figure 3: CE Program Organizational Chart

## 9. CE program Faculty Staff

The CE department has distinguished faculty members with different specific specialty. Table 1 summarized the faculty members in CE department.

Table 1: Faculty members in CE department

No.	No.	Rank	Specific Specialty	Nationality
1	Dr. Saud Gazai Almutairi	Assist. Prof.	Construction Management	Saudi
2	Dr. Mohamamed Saleh Al-Fawzan	Assist. Prof.	Traffic and Transportation Engineering	Saudi
3	Dr. Ibrahim Saleh Al-falag	Assist. Prof.	Traffic and Transportation Engineering	Saudi
4	Dr.Abdulaziz Murshad Almursad	Assist. Prof.	Structural Engineering	Saudi
5	Dr. AbdulAtif A.Almunaifi	Associate Prof.	Structural Engineering	Yemeni
6	Dr. Hani Ahmed Dahish	Assist. Prof.	Structural Engineering	Egyptian
7	Dr.Muneer Qaid Saeed	Assist. Prof.	Structural Engineering	Yemeni



8	Dr. Ahmed Hussain Birima	Assist. Prof.	Environmental Engineering	Sudanese
9	Dr.Ragab Elsayed Rabeiy	Assist. Prof.	Water sources Engineering	Egyptian
10	Dr.Mudathir Hassan Bakri	Assist. Prof.	Geotechnical Engineering	Sudanese
11	Eng. Abdulmalik H. Al-Hasson	Lecturer	Water sources Engineering	Saudi

## 10. Student Admission Requirements

Admission of students to the College of Engineering –Unizah, Qassim University is centrally administered by the Deanship of Admission and Registration. Students are admitted to the Preparatory Year (PY) in Engineering/Science branch.

The selection of students for PY is based on their high school GPA and their performance in Subject Achievement Test and General Aptitude Test. After completing the PY, students are accepted to the college in level 3 after which they distributed to the various departments according to three criteria: their preference, PA from the PY, and the capacity of each department.

The percentage limit of admitted students in each of the three departments (Civil-Electrical-Mechanical) in Unaizah Engineering college doesn't exceed 35% of the total number of students and less than 20%. The applicant students are distributed to the different departments on condition that passing all the courses of level 3 so that the trade-off between the students according to the following priorities:

- (1) Students choice (Civil / Electrical / Mechanical).
- (2) GPA.

## 11. Study plain of the CE Program

The student has to complete 160 credit hours, 21credit hours in preparatory year and 139 credit hours in civil engineering program: 12 credit hours university requirement, 48 credit hours' college requirement, 73 credit CE department requirement and 6 credit hours as free courses. The details of credit hours are summarized in Table 2 and Figure 4:

Table 2: Details of credit hours of CE study plan

Requirements		Number of Credits	% Percentage
Preparatory Year		21	13.1%
University		12	7.5%
College 48 CR	Required	42	30%
	Elective	6	



Specialty 73 CR	Required outside the department		6	45.62%
	Required in the department	Required	61	
		Elective	6	
Free courses 6 CR			6	3.75%
			160	100%

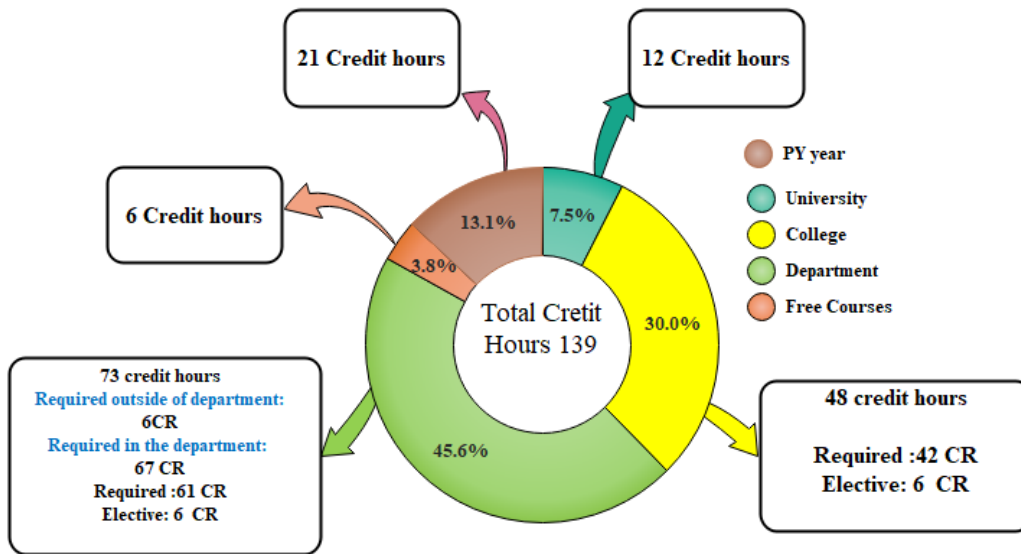


Figure 4: Details of credit hours of CE study plan

The no of required credit hours and course in each level are summarized in Table 3.

Table 3: Study plan of CE program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
Level 1	ENG0011	Preparatory English 1	Required	-	8	-
	STAT100	Statistics	Required	-	2	-
	PHYS110	Physics 1	Required	-	2	-
	CSC105	Computer skills	Required	-	4	-
	PSYCH101	Thinking skills and learning styles	Required	-	2	-

# Guide to Civil Engineering Program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
Level 2	ENG 0012	Preparatory English 2	Required	ENG001	5	-
	ESP 102	English for Engineering and Computer Science	Required	-	2	-
	MATH 105	Calculus	Required	-	3	-
	PHYS 115	Physics 2	Required	PHYS110	3	-
	CSC111	Computer Programming	Required	CSC105	3	-
Level 3	IC 101	Introduction to Islamic Lecture	Required		2	Institution
	ARAB 101	Linguistic Skills	Required		2	Institution
	PHYS 131	General Physics	Required		4	College
	GE 104	Basics of Engineering Drawing	Required		3	College
	MATH 106	Integral Calculus	Required		3	College
	CHEM 111	General Chemistry	Required		4	College
Level 4	IC 102	Islam and Community Building	Required	IC 101	2	Institution
	GE 105	Basics of Engineering Technology	Required	GE 104	2	College
	MATH 107	Linear Algebra & Analytic Geometry	Required		3	College
	MATH 203	Differential and Integral Calculus	Required	MATH 106	3	College
	GE 201	Statics	Required	MATH 106	3	College
	Geo 285	Engineering Geology	Required		2	College
	Free Course-1		Required		3	College
Level 5	IC 103	Economic System in Islam	Required	IC 101	2	Institution
	MATH 208	Differential Equations	Required	MATH 203	3	College
	GE 211	Introduction to Engineering Design I	Required		3	College
	CSC 209	Computer Programming	Required	MATH 203&107	3	College
	GE 202	Dynamics	Required	GE 201	3	College
	CE 202	Mechanics of Materials	Required	GE201&MATH203	3	Department
Level	STAT 328	Probabilities and Statistics	Required	MATH 203	3	College
	GE 213	Introduction to Engineering Design II	Required	GE 211	2	College
	CE 205	Properties of Structural Materials	Required	CE 202	2	Department

# Guide to Civil Engineering Program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
6	CE 230	Fluid Mechanics	Required	MATH106&GE 201	3	Department
	CE 231	Fluid Mechanics Laboratory	Required		1	Department
	CE 212	Plane surveying	Required	MATH 107	3	Department
	CE 206	Structural Analysis-I	Required	CE 202	3	Department
Level 7	ARAB 103	Arabic Writing	Required		2	Institution
	CE 306	Structural Analysis -2	Required	CE 206	2	Department
	CE 307	Properties and Testing of Concrete	Required	CE 205	2	Department
	CE 330	Hydraulics	Required	CE 230	2	Department
	CE 353	Geotechnical Engineering	Required	Geo 285	3	Department
	CE 354	Geotechnical Engineering Laboratory	Required		1	Department
	CE 343	Transportation and Traffic Engineering	Required	MATH 203	3	Department
	ME 327	Building Thermal Loads	Required	PHYS 131	2	Department
Level 8	IC 104	Political System in Islam	Required	IC 101		Institution
	CE 318	Design of Reinforced Concrete Structures	Required	CE306&CE307		
	CE 370	Water and Wastewater Engineering	Required	CE 330		Department
	CE 375	Steel Structures Design	Required	CE 306		Department
	College Elective-I	College Elective-1	Elective			College
Level 9	ECON 401	Engineering Economy	Required	Pass 90 cr	3	College
	CE 363	Foundation Engineering	Required	CE318&CE353	3	Department
	CE 331	Hydrology	Required	CE 330	3	Department
	CE 447	Highway Engineering	Required	CE205&CE343	2	Department
	CE elect.-1	Civil Engineering Elective -1	Elective		3	Department
	CE 491	Senior Design Project-1	Required	Pass 100 cr	3	Department
Level	MGMT402	Project Management	Required		3	College
	CE320	Construction Management	Required		3	Department
	CE elect.-2	Civil Engineering Elective -2	Elective		3	Department

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution, College or Department)
<b>10*</b>	College Elective-II	College Elective-2	Elective		3	Department
	Free Course-2		Required		3	College
	CE 492	Senior Design Project-2	Required	CE 492	2	Department
	GE 406	Summer Training	Required	Pass 100 cr	2	Department
<b>Level 10**</b>	MGMT402	Project Management	Required		3	College
	CE320	Construction Management	Required		3	Department
	College Elective-II	College Elective-2	Elective		3	Department
	Free Course-2		Required		3	College
	GE 407	Cooperative Training	Required	Pass 100 cr	7	College

\* For summer training students

\*\* For cooperative training students

There are 17 elective department courses in the study plan of CE program which listed in Table 5, the student must complete 2 courses (6 credit hours) of them.

Table 5: Civil Elective Courses

Course Code	Course Title	Credit hours				Pre-Req	Co-Req.
		LT	LB	TU	CR		
CE 317	Computer Applications	2	-	1	3	-	CE 491
CE 401	Concrete Technology	2	-	1	3	CE 307	-
CE 403	Advanced Reinforced Concrete Design	2	-	1	3	CE 318	-
CE 412	Advanced Steel Design	2	-	1	3	CE 375	-
CE 418	Structural Analysis – 3	2	-	1	3	CE 306	-
CE 443	Design of Pavement	2	-	1	3	CE 447	-
CE 448	Construction and maintenance of Highways	2	-	1	3	-	CE 447
CE 453	Advanced Geotechnical Engineering	2	-	1	3	CE 353	-
CE 457	Open Channel Hydraulics	2	-	1	3	CE 330	-
CE 458	Design of Water Structures	2	-	1	3	CE 330	-
CE 459	Groundwater Hydrology	2	-	1	3	CE 331	-
CE 462	Engineering Surveying	2	-	1	3	CE 212	-
CE 468	Rock Mechanics	2	-	1	3	CE 353	-
CE 469	Applications in Foundation Engineering	2	-	1	3	CE 363	-
CE 474	Design and Operation of Water and Wastewater Treatment Plants	2	-	1	3	CE 370	-
CE 475	Environmental Engineering	2	-	1	3	CE 370	-
CE 490	Selected Topics in Civil Engineering	2	-	1	3	-	CE 491

The flow diagram of study plan is shown in Figure 5.

# Study Plan

## Civil Engineering Department

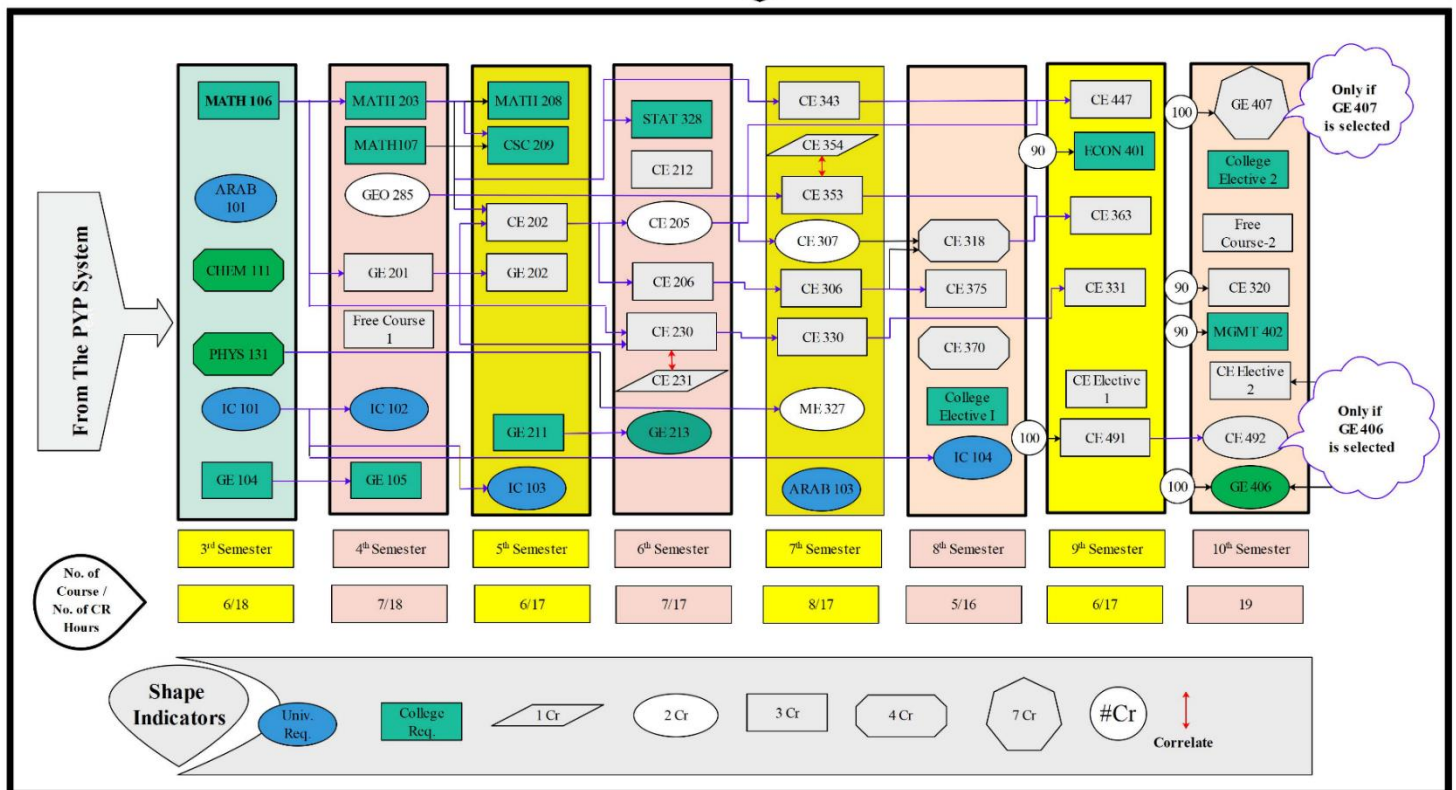


Figure 5: Flow Sheet of CE Program



## 12. Grading and Assessment System

Success in a course is usually based on the combination of grades assigned to coursework and final examination. Each course has a total of 100 points. The grade for the course work is 50% of the total mark, while the remainder is for the final examination. The pass mark in each course is 60%. The grading system at college of engineering-Unaizah, is shown in the following table. A student's grade point average (GPA) is

determined by dividing the cumulative point value of all courses attempted by the number of units in the student's semester schedule. The students are required to maintain a minimum term GPA of 2.0 out of 5.0.

Electronic Education Gate system is designed to register a course, calculate the GPA, print unofficial transcript, host all courses and student data, sort and report data using variety of parameters, ...etc. Moreover, all academic and administrative staff as well as students have access to Electronic Education Gate based on their level of priority. Students are allowed to register for a course if all prerequisites mentioned in the plan of study are met. Electronic Education Gate system is used to ensure that the course prerequisites are fulfilled. The summary of grading system in College of Engineering- Unaizah is shown in Table 5.

Table 5 :Grading system at College of Engineering- Unaizah:

Letter Grade	Numerical Point	Average
A+	95-100	5.0
A	90-less than 95	4.75
B+	85-less than 90	4.5
B	80-less than 85	4.0
C+	75-less than 80	3.5
C	70-less than 75	3.0
D+	65-less than 70	2.5
D	60-less than 65	2.0
F	Below 60	1.0

College of Engineering- Unaizah is serious about creating an honest and ethical learning environment. Dishonest actions such as cheating and plagiarism, or disruptive behavior that violates its rules and conduct expectations will not tolerate. Offenders will be subject to punishment in accordance with student disciplinary regulations as issued by the University Council.

- ❖ Student may submit their appeals or suggestions to the department head.



- ❖ Students' academic appeals are mainly categorized by the form of 'Add/drop courses, absent excuses, Rechecking of exams and Make up exams'.
- ❖ The student is accountable to place an appeal through his academic advisor using case specific appeal form. All appeal forms are available on the Faculty's website from where student can fetch. These forms are also available with academic advisors. Academic advisors are accountable to consult with the student in detail to spot students' need and provide guidance to fill out the appeal form. During this consultation process, academic advisors are responsible to fetch necessary record from corresponding student file to support his opinion. When an appeal has been finalized and submitted by the student, academic advisors are accountable to attach necessary supporting documents with this appeal and forward this appeal to the academic advising unit through the University's correspondence tracking system for further evaluation.
- ❖ The coordinator of academic advising unit is accountable to check completeness and to verify the ground of each appeal based on university's regulations and college rules and program requirements.
- ❖ If an appeal complies with all requirements, it has been carry forwarded to the decision making authority; else, it has been returned to the correspondent academic advisor. The decision making authority provides decision on the majority appeal cases by 10 days.
- ❖ Successful appeal for rechecking of exam is forwarded to the program coordinator.
- ❖ Program coordinator is accountable to form an evaluation committee and send the review request to that committee. The evaluation committee should consist of at least three people (i.e. Program coordinator, subject coordinator, member of that subject's knowledge group) and is accountable to provide the outcome within 3 days.
- ❖ The program regulation is published to the students on the college website in the flowing link: <https://enuc.qu.edu.sa/content/pages>

### 13. Short description of CE program courses:

#### PHYS 131 General Physics

Electromagnetism: Coulomb's law in the electric fields, Gauss law, Electric potential, Energy stored, Capacitance and dielectrics, Current and resistance, Electric energy and power, Direct current circuits, Kirchoff "s Rules, Magnetic fields, Motion of a charged particle in a magnetic field, Sources of the Magnetic fields, Ampere's law, Faraday 's law, in the inductance, Mutual inductance, Alternative current circuits, rms values, Impedance, Resonance, Power in RLC circuits. Nuclear Physics: Photoelectric effect, Atomic spectrum, Bohr model, Nuclear structure, Radioactivity Decay, Half-life, Radioactive Decay.

### **GE 104 Basics of Engineering Drawing**

Freehand Sketching, Geometrical construction and basics of lettering, Orthographic projection, Sectional views, Isometric views, Dimensioning, Basics of Computer Aided Design.

### **CHEM 111 General Chemistry**

Stoichiometry: SI Units, chemical formulas, the mole, methods of expressing concentration, Calculations based on chemical equations. Gases: laws, kinetic theory, deviation and van der Waals equation. Thermochemistry: Types of enthalpy changes, Hess Law and its applications, first law of thermodynamics. Solutions: Type of solutions and laws related, colligative properties. Chemical kinetics: Law of reaction rate, reaction order, factors affecting the rates. Chemical Equilibrium: Relation between  $K_c$  &  $K_p$ , Le Chatelier's principle and factor affecting equilibrium. Ionic equilibrium: Acid and base concepts, pH calculations of acid, base and buffer solutions. Atomic Structure: emission spectrum, Bohr's theory de Broglie's hypothesis, quantum numbers, electronic configuration of elements, consequences of the periodic table.

In practical part, the student should do at least 14 experiments.

### **GE 105 Basics of Engineering Technology**

Introduction; Function and planning of workshop; Properties of materials and their applications; Non-ferrous Metals - Ferrous Alloys Production of Iron and Steel, Plain Carbon and Alloy Steels - Tool Steels and the Iron-Carbon Diagram - Heat Treatments of Steels: Heating, Quenching, Tempering, Annealing, Aging, and Surface Hardening, Destructive and Nondestructive Testing of Metals. Workshop metrology; Basic bench work operations; Machining operations; Tools, equipment and machinery used in basic workshop processes: turning, milling, grinding, forging, sheet metal-work; Welding processes: gas welding, arc welding, spot welding. Casting processes: sand casting, die casting; Industrial safety.

### **MATH 106 Integral Calculus**

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.

### **MATH 107 Linear Algebra & Analytic Geometry**

Introduction to the conic sections, The parabola; translation of coordinate axes, The ellipse, The Hyperbola, Rotation of axes; second degree equation. Systems of linear equations and matrices: Introduction, Gaussian elimination, Matrices and matrix operations, Inverses; Rules of matrix arithmetic, Elementary matrices and a method for finding matrix inverse, Further results on systems of equations and invert- ability, Diagonal, Triangular and symmetric Matrices. Determinants: Determinants by cofactor expansion, evaluating determinants by row reduction, Properties of the determinant function, a combinatorial approach to determinants Vectors in 2-space and 3-space: Introduction to vectors, Norms of a vector; vector arithmetic, Dot product, Lines and planes in 3-space.

### **MATH 203 Differential and Integral Calculus**

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. Stoke's theorem.

### **GE 201 Statics**

Force systems; vector analysis of forces, moments and couples in 2 and 3 dimensions. Equilibrium of force systems. Analysis of structures; plane trusses and frames. Distributed force system; centroids and composite bodies. Area moments of inertia. Friction.

### **GEO 285 Engineering Geology**

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.

### **MATH 208 Differential Equations**

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.

### **GE 211 Introduction to Engineering Design-I**

Written communication (letters, memos, reports, applications, proposals), Oral communication (presentations, meetings, interviews), Effective communication skills (providing instructions, resolving conflicts, negotiating, sharing ideas), Engineering design or how engineers approach and solve problems; process and product design; quality principles; working in teams; presentation, organization and assessment of technical work, preparation of brief reports on assigned work, self-regulation or the behaviors associated with taking personal responsibility for time management, learning new material, setting goals, etc.

### **CSC 209 Computer Programming**

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.

### **CE 202 Mechanics of Materials**

Stress, strain; Hook's law. Moduli of elasticity and rigidity, and Poisson's ratio. Statical determination of axial force, shear force, bending moment and torque in bars, beams and circular shafts. Load-shear-moment relationship in beams. Section kinematics; strain and stress distribution and their resultants. Normal and shear stress distributions in beams of different shapes and the shear flow. Transformation of stress and strain, Mohr's circle. Spherical and cylindrical pressure vessels. Elastic buckling of columns.

### **GE 213 Introduction to Engineering Design-2**

Computer or mathematical modeling of process and product, continuation of quality principles, working in teams, presentation, organization and assessment of technical work, preparation of brief reports on assigned work, self-regulation or the behaviors associated with taking personal responsibility for time management, learning new material, setting goals, etc.

### **CE 205 Properties of Structural Materials**

Engineering materials: properties, testing, specifications, statistical evaluation; bricks, lime, gypsum, timber, wood, metals, and glasses. Testing machines. Measuring

devices Tests: tension, compression, bending, shear, hardness, impact. Nondestructive tests.

### **CE 230 Fluid Mechanics**

Fluid properties, Fluid static's and kinematics'. Dynamics of an ideal fluid. Flow of real fluids. Viscous effect and fluid resistance. Fluid measurements and introduction to pump.

### **CE 231 Fluid Mechanics Laboratory**

Laboratory experiments covering Fluid measurements, flow through pipes, open channel, centrifugal pump. Measurement of temperature, atmospheric pressure, coefficient of viscosity for liquids, Hydrostatic pressure, Orifice flow, coefficient of velocity, and coefficient of discharge, Flow over weirs, Reynolds Number, Bernoulli's theorem, Pizometric tubes, Pitot tube, Fluid friction and coefficient of friction in pipes, Pump characteristics.

### **CE 212 Plane Surveying**

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.

### **CE206 Structural Analysis - 1**

Types of structures, supports and loads. Idealization of structures and loads. Geometric stability and determinacy. Analysis of determinate trusses, beams, plane frames and arches; reaction computation; axial force, shear force and bending moment diagrams. Internal force releases. Load-shear-moment relationship. Differential equation of elastic curve. Deflections by integration, moment-area, conjugate-beam and virtual work methods. Influence lines of determinate structures.

### **CE 306 Structural Analysis – 2**

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

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

Cement: manufacture, properties, types of cement, tests. Aggregates: types, properties, grading, tests. Mixing water, Concrete: proportions, mixing, handling, placing, fresh and hardened properties, tests, curing.

### **CE 330 Hydraulics**

Steady flow in closed and open channels. Pipes networks. Dimensional analysis and similitude. Non-uniform flow. Back water curves and hydraulic jump. Pump.

### **CE 353 Geotechnical Engineering**

Flow of water in soil, soil compaction, Consolidation of soils. Settlement of structures. Shear strength of soils. Introduction to Stability of slopes. Site investigation.

### **CE 354 Geotechnical Engineering Laboratory**

Moisture density relationships. Soil indices. Classifications and identification of soils. Permeability properties of soil. Soil compaction. Unconfined strength. Soil consolidation. Shear strength properties of soil.

### **CE 343 Transportation and Traffic Engineering**

Transportation systems. Components of transportation systems. Vehicle motion, flow, and performance. Continues flow. Terminals. Introduction to transportation demand. Components of traffic system. Traffic stream characteristics. Traffic engineering studies. Traffic safety. Capacity of urban streets and intersections. Congestion management.

### **ME 327 Building Thermal Loads**

Air-Conditioning Systems, Moist Air Properties and Conditioning Processes, Comfort and Health, Heat Transmission in Building Structures, conduction, convection, radiation, thermal resistance, Space Heating Load, Solar Radiation, The Cooling Load, Heat balanced method, Thermal bridge

### **GE 202 Dynamics**

Kinematics of a particle: curvilinear motion, and relative motion; Kinetics of particles: Newton's law, work and energy, impulse and momentum, and impact; Kinematics of a rigid body in plane motion: relative velocity and acceleration, and rotating axes; Kinetics of a rigid body in plane motion: translation, fixed axis rotation, general equation of motion, work and energy, and impulse and momentum.

### **GE 401 Engineering Economy**

Introduction to Engineering Economy – Interest formulas and economics equivalence – Cash flow estimation and diagrams – Nominal and effective interest rates - Comparison of alternatives and decision making based on economic considerations - Application of present worth and annual worth analysis - Break Even point and analysis – Depreciation and depletion methods – Economic analysis of Public sector projects – Cost Estimation – Evaluating of Replacement and retention alternatives.

### **CE 318 Design of Reinforced Concrete Structures**

Fundamentals and design theories based on ultimate strength design and elastic concept. ACI Code requirements. Load factors. Analysis and design of reinforced concrete members subject to flexure, shear and diagonal tension in accordance to ACI strength method. Development length of reinforcement. Deflection and crack controls. Reinforcement detailing of different structural elements and connections

### **CE 320 Construction Engineering**

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.

### **CE 370 Water and Wastewater Engineering**

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

### **CE 375 Steel Structures Design**

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. Industrial building project. All according to AISC specifications.

### **CE 363 Foundation Engineering**

Types of foundation. Bearing capacity of shallow foundation. Bearing capacity of deep foundations. Pile foundations and caissons. Sheet piling.

### **CE 331 Hydrology**

The hydrologic cycle. Fundamentals of meteorology, temperature, humidity, wind, precipitation, evaporation. Infiltration physics, Infiltration equations. Stream-flow and runoff, Groundwater flow and aquifers, wells, and intrusion in coastal aquifers. Stream-flow hydrographs. Unit hydrographs for various durations and its applications.



### **CE 447 Highway Engineering**

Highway planning and capacity. Geometric design. Intersections. Highway materials and drainage. Bituminous mixtures design. Flexible pavement design. Highway construction. Pavement evaluation and maintenance. Laboratory sessions on tests of aggregates and asphalts, mix design for hot asphalt concrete mixtures including Marshall and SuperPave.

### **CE 317 Computer Applications**

Problem formulation. Preparing problem model. Constitutive modeling of different engineering materials. Using FEM-based software packages in design and solving engineering problems. Results verification and interpretation. The used software packages will vary depending on job market requirements. Examples of packages include, but not limited to, SAP 2000, PLAXIS, Geo-Slope Suit, ANSAS, STAD Pro, Mud Flow, Pipe Net,....etc.

### **CE 401 Concrete Technology**

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, ferrocement and polymer impregnated; durability problems of concrete in the Gulf environment; preventive measures, specifications and construction techniques for local conditions

### **CE 403 Advanced Reinforced Concrete**

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.

### **CE 412 Advanced Steel Design**

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

### **CE 418 Structural Analysis – 3**

Theoretical development and computer implementation of special structures, space trusses, space frames, plates, shells, domes, Soil structure interaction, Introduction to structural dynamics

### **CE 443 Design of Pavement**

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

### **CE 448 Construction and maintenance of Highways**

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.

### **CE 453 Advanced Geotechnical Engineering**

Fundamental relations of elasticity and plasticity in soil masses; deformation properties of cohesionless and cohesive soils; advanced strength concepts in soils and stress path; advanced slope stability analysis; introduction to soil dynamics.

### **CE 457 Open Channel Hydraulics**

Steady and unsteady flow in open channels. Uniform and non-uniform flow. Back water curve and its analysis. Sediment transport. Design of erodible channel. Dimensional analysis and modeling. Spillway and siphon spillway.

### **CE 458 Design of Water Structures**

Design of inlet and outlet structures for irrigation canals. Cross structures; culverts, siphons and aqueducts. Energy dissipation downstream hydraulic structures. Design of Spillways, syphon spillways and dams.

### **CE 459 Groundwater Hydrology**

Introduction to Surface and Groundwater Hydrology, Hydrological cycle and major processes. Monitoring of hydro-meteorology. Precipitation, meteorological, and stream flow data analysis, storage and supply of groundwater; basic differential equations for flow in confined and unconfined aquifers. Steady and unsteady groundwater flow problems;

groundwater recharge; saline water intrusion and environmental aspects of groundwater; groundwater in Saudi Arabia.

### **CE 462 Engineering Surveying**

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.

### **CE 468 Rock Mechanics**

Rock and rock mass classifications. Index properties and their measurements in field and laboratory. Initial stresses and their measurements, deformability, strength and failure criteria. Foundations on Rock and Stability of soil and rock side slopes with computer applications.

### **CE 469 Applications in Foundation Engineering**

Special cases of soil bearing capacity, Computer analysis and design of combined and mat foundation; Analysis and design of pile foundations, Slope stability, Analysis and design of mechanically stabilized earth retaining walls, and Computer applications.

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

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.

### **CE 475 Environmental Engineering**

Introduction to pollution problems and impact of development on the environment. Liquid waste disposal: overland, in streams, lake and sea. Solid wastes: management, characteristics, storage, collection, disposal, and recycling. Air pollution: sources, pollutants, effects and control. Noise pollution: sources, effect and control.

### **CE 490 Selected Topics in Civil Engineering**

The contents of this course will be determined according to the recent topics in this field which will serve the work market or according to the interest area of the instructor to enhance the experience and knowledge of the student

### **CE 491 Senior Design Project - 1**

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 quantities, and the total operating cost of the project. The graduation project shall continue for two semesters. At the end of the each semester, there will be a seminar held for the working team of students to present the details of the completed part of the project. The working team will be orally examined and evaluated based on the presentation as well as the oral discussion.

### **CE 492 Senior Design Project – 2**

The student shall continue with his pre-assigned 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 is a continuation for CE 491 and should be comprehensive and includes all the necessary preliminary field studies, visibility studies, final design drawings, bill of quantities, and the total operating cost of the project. The students shall continue this part 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.

## **14. Laboratories:**

Laboratory plays an extremely important role in civil engineering education. The undergraduate courses are supplemented with an extensive laboratory work in order to furnish the student with a sufficient experimental experience in various fields of civil engineering through the use of the most modern techniques of measurements, instrumentations and analysis. The department has a number of laboratories in all fields of Civil Engineering. These include:

- 1) Concrete Materials Laboratory
- 2) Soil Mechanics Laboratory
- 3) Plane Surveying Laboratory

### **14.1 Concrete and Materials Engineering Laboratory**

The concrete and materials engineering lab is considered one of the most Concrete and Materials Engineering Laboratory important laboratories in the field of civil engineering. The

current laboratory equipment is a new breakthrough in the quality of the tests that can be conducted in the laboratory. The laboratory can also carry out experiments and special studies that include the structural safety inspection of the facilities through tests on samples or models, or outside the laboratory, such as non-destructive field tests on concrete implemented in existing facilities. Figure 6 shows some of equipment in Concrete and Materials Engineering Laboratory.



Figure 6: Concrete and Materials Engineering Laboratory

The devices available in the concrete and materials Lab are listed in Table 6.

Table 6: List of devices in the Concrete and Materials Lab

Device Name	No. of Devices
Universal Testing Machine	1
Vebe Consistometer	1
Air Meter	1
Aggregate Crushing Value Mould	1
Crack Detection Microscope	2
Drying Oven	1
Muffle Furnace	1
Vibrating Machine For Mortar Cube	1
Apparatus For Measurement Of Bulk Density Of Cement	1

Device Name	No. of Devices
Cement Mortar Mould	18
Bottles, Containers And Crucibles	6
Sample Container	5
Wash Bottle	4
Stop Watch	2
Compression Testing Machine	1
Original Schmidt Hammer	2
Ultrasonic Pulse Velocity device	1
PH METER	2
Water Distillation Apparatus	1
Vibrating Table	1
POKER Vibrator	1
SIEVE SHAKER	2
Length Comparator Digital Version	1
Large Capacity Sample Splitter	1
Universal Specimen Cutting Machine	1
Flow Table and Flow Mould	2
Le Chatelier Apparatus	1
Heat of Hydration Apparatus	1
Digital Balance	2
Steel Wheelbarrow	1
Cylinder Mould	60
Cube Mould	60
Bulk Density Measure	6
Glass Plate	3
Screw Driver Set	1
Automatic Mortar Mixers	2
ASTM Set of Sieves	2
Hammer Set	5

Device Name	No. of Devices
Sieve Brushers	4
Automatic Vicat Apparatus	2
Digital Concrete Schmidt Hammer	2
Digital Caliper	1

## 14.2 Soil Mechanics Laboratory

Soil Laboratory is one of the main laboratories in the Civil Engineering Department. The students can perform a set of basic tests in soil science and foundations according to the approved specifications. The following table illustrates some of the experiments conducted in the soil laboratory and foundations. Figure 7 shows some of equipment Soil Mechanics Laboratory.



Figure 7: Soil Mechanics Laboratory

The devices available in the concrete and materials Lab are listed in Table 7.



Table 7: List of devices in the Soil Mechanics Laboratory.

<b>Device Name</b>	<b>NO. of Devices</b>
<b>Constant Head And Falling Head Permeability</b>	1
<b>Sieve Set And Shaker</b>	2
<b>Casagrande Apparatus</b>	4
<b>Hydrometer</b>	4
<b>Proctor Apparatus</b>	1
<b>California Beraing Ratio</b>	2
<b>Oedometer</b>	1
<b>Van Test</b>	2
<b>Pocket Pentrometer</b>	4
<b>Point Load Apparatus</b>	1
<b>Unconfined Compressive Strength</b>	2
<b>Balance</b>	1
<b>Digital Balance</b>	2
<b>Bicnometer</b>	1
<b>Plastic Limit</b>	1
<b>Sand Cone</b>	4
<b>Oven</b>	1
<b>Digital Caliper</b>	1

### 14.3 Plane Surveying Laboratory

The laboratory contains the survey instruments, both traditional ones, such as tapes, cadastral and optical and digital theodolites. Modern instruments such as integrated meteorological stations and electronic distance measuring devices. The lab trains students on the practical part of the course for the students of the Civil Section. These experiments include training students to measure line lengths, measure horizontal and vertical angles, make longitudinal, transverse and grid budgets to measure different point heights, draw longitudinal segments and topographic maps. Figure 8 shows a general view of plan surveying laboratory.



Figure 8: Plane Surveying Laboratory

The devices available in the concrete and materials Lab are listed in Table 8

Table 8: List of devices in Plane Surveying Laboratory

Device Name	No. of Devices
Total Station	4
Automatic Level	5
Digital Theodolite	4
Optical Theodolite	1
Measuring wheel	2
Compass	5
Digital Level	2
Laser distance meter	1
GPS Handheld	2
Digital Planimeter	1
Optical Prism	0
Radio communication unit	2
Field glasses	2
stop Watch	3
Tapes	15