

**COLLEGE OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
BSc STUDENT HAND BOOK**

**1442/1443 A.H.
2020/2021 A.D.**



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CIVIL ENGINEERING PROGRAM

Introduction

The Civil Engineering Program Manual provides information about the requirements for the Bachelor of Science (BSc) Program, in Civil Engineering. The Bachelor of Civil Engineering consist of one track. Students enrolled in Civil Engineering are primarily interested in the area of Civil Engineering,

ABOUT THE CE DEPARTMENT

The oldest and most elegant branch of engineering profession in engineering colleges all over the world and that is due to the fact that civil engineering is related to almost all aspects of civilization. Many of the important things in our lives that we take for granted are the product of civil engineering. Civil engineer deals with a wide variety of engineering aspects such as designing, construction, and maintenance of different structure (buildings, embankments, storage tanks, dams, roads, water and wastewater networks, irrigation and drainage networks, etc.), solving execution problems, managing engineering and construction projects, and it just does not end there. Civil engineer also has a significant role in planning and managing transportation systems, terrific safety, conservation and development of water resources, treatment and reuse of Wastewater, and the list extends.

The civil engineering curriculum in Qassim University is set to serve the broad range activities of the profession. It is designed to fulfill the student's need of sufficient and balanced content of different civil engineering topics. Initially such topics cover most, if not all, of the sub-disciplines of civil engineering. Students then choose to specialize in one or more sub-disciplines towards the end of the degree

Department Mission

The civil engineering department seeks to meet the needs of the Saudi society and the region through offering outstanding civil engineering programs in education, research, and community service.

CE BSc Program Mission

The civil engineering program mission is “Graduating distinguished civil engineers, and performing research and community services in an inspiring, energizing and governable environment to promote self-resources, adopt recent technologies and sustainably develop the Saudi society.”

Vision

A nationally and regionally recognized department providing high quality academic programs, research, and society services in the civil engineering fields.

Program Education Objectives

The electrical engineering department in cooperation with its constituencies has identified the following list of program educational objectives

- 1) Preparation of the graduates to have a successful career as civil engineers in governmental and private sectors.
- 2) Preparation of the graduates to pursue their professional development through self-learning and advanced degrees.
- 3) Preparation of the graduates to progress to positions of leadership in their profession.
- 4) Preparation of the graduates to effectively participate in the sustainable development of the Saudi Society.

Graduate Attributes:

The graduates of civil engineering program should be able to:

1. Possession of facts, information, ideas, issues, trends, theories and knowledge relevant to Civil Engineering.
2. The ability to analyze and critically evaluate information, concepts, methods and theories related to Civil Engineering.
3. The ability to develop new knowledge gained through innovative scientific research that generally contributes to Civil Engineering.
4. Possess the cognitive and technical skills to analyze and process data and information.

5. Possess effective communication, numerical and information technology skills.
6. The ability to independently create, design and implement research operations.
7. The ability to take appropriate decisions and assume the role of leadership, and address Engineering problems.
8. The ability to work in a team and solve real problems in the field by linking knowledge and its applications.
9. Awareness of professional ethics, ethics of scientific research, and ethics of dealing with technology and its tools.

NCAAA Program Learning Outcomes (PLO's)

The main goal of the Program Learning Outcomes (PLOs) is dedicated for the BSc program in department with information for evaluating student learning and identifying areas for instructional or curricular improvement. Table 1 shows the details of the PLOs:

Table 1. Program Learning Outcomes (PLOs) for CE Department

Knowledge and Understanding	
K1	Acquire knowledge of Basic sciences (Math, Physics, management, economy, etc.) and Basic Engineering sciences.
K2	Identify complex civil engineering problems by recognizing the principles of civil engineering subjects, basic sciences, and mathematics.
K3	Relate knowledge of Math, Statistics, basic sciences to their engineering specialization, together with in-depth knowledge of that specialization.
K4	Comprehensively Identify research and inquiry methodologies
Skills	
S1	Formulate , and solve complex civil engineering problems by applying principles of engineering, science, mathematics, and management
S2	Apply appropriate engineering techniques, and modern IT tools, including prediction and modeling to civil engineering constructions/installations/establishments to assess their characteristics and performance.
S3	Apply engineering design principles to produce solutions that meet specified needs, relevant to civil engineering, with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
S4	Communicate effectively with a range of audiences
S5	Conduct inquiries, investigations, and research for complex issues and problems.

S6	Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
Values	
V1	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.
V2	Acquire new knowledge, as needed, using appropriate learning strategies
V3	Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

ABET Students Outcomes (SO's)

The student outcomes as per the newly adopted Criteria for Accrediting Engineering Programs as approved by ABET (Website: <https://www.abet.org>) have redefined student outcomes labelled as (1) through (7). They are reproduced below and, as per ABET's recommendation, they are to be applied to the cycle starting in 2019-2020 and afterward.

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 function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Program Strategic Goals

The BSc. program goals of the Civil Engineering Department are the attributes (knowledge, skills, and behaviour) that the program graduates will be able to successfully demonstrate during a short time. In order to accomplish its mission. The civil engineering department in cooperation with its constituencies has identified the following list of Program Strategic Goals.

1. Preparation of the graduates to have a successful career as civil engineers in the governmental and private sectors.
2. Carry out scientific applied research and offer consultation services
3. Strengthen the communication, cooperation and partnership with the community.
4. Participate in adopting advanced technologies and introducing innovations.
5. Contribute effectively in the sustainable development of the Saudi society

Career Opportunities

- 1- All engineering administrations in the governmental authorities.
 - 2- The projects operation and maintenance administrations in the governmental authorities.
 - 3- The ministry of water and electricity.
 - 4- The ministry of municipal and village affairs.
 - 5- The Saudi commission for the engineers.
 - 6- The general institution for the waters refinement.
 - 7- The general institution for ports.
 - 8- The Saudi airlines.
 - 9- The military occupations management.
 - 10- The constructions and contracting companies.
 - 11- The electronics and communication companies.
 - 12- The power and electric energy companies.
 - 13- The Ministry of transportations.
 - 14- The Ministry of agriculture and water recourses.
 - 15- The general institution for the electricity.
 - 16- The water and sewage authority.
 - 17- The Saudi Arabia Aramco company.
 - 18- The Saudi company for the basic industries (SABIC)
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- 19- The unified Saudi company for electricity (SCECO).
 - 20- The construction material factories.

Admission Conditions

The admission to College of Engineering requires the completion of the preparatory year program of Qassim University. The number of students who can be accepted in the College of Engineering is determined yearly by the University Council taking into consideration the College capacity. Then, the students who have the desire to join the College of Engineering compete based on their GPA in the preparatory year program

ADMISSION TO THE CE PROGRAM

The admission in the department depends on:

- The student desire
- The Student GPA
- The capacity of the department

STUDYING SYSTEM

According to the educational plans; a student may complete any of the departmental programs in 8 semesters (4 years) after the Preparatory Year Program (PYP). A successful student may complete the full requirements of the selected program if he completed (after the PYP) a total of 139 credit-hours. In details, the 139 credit-hours include:

- University requirements (12 credit-hours),
- College requirements (48 credit-hours) and
- Program and/or Departmental requirements (73 credit-hours). Six credit hours have to be selected among the set of elective courses.
- The Free Courses: 6 credit hours have to be selected among the set of courses available in the university.

COLLEGE EDUCATION SYSTEM

The educational system in the college is based on two main semesters per educational year - each semester is fifteen weeks' length. In addition, an optional eight weeks' summer semester may be offered.

Course Requirements

According to the educational plans, a student may complete any of the engineering programs in 8 semesters (4 years) after the Preparatory Year Program (PYP). A successful student may complete the full requirements of the selected program if he completes, after the PYP, a total of 139 credit hours as shown in the table below.

Requirement		CR	%
University Requirements (12 CR)		12	8.63
College Requirements (48 CR)	Compulsory	42	30.22
	Elective	6	4.32
Program/Department Requirements (73 CR)	Compulsory	63	45.32
	Elective	10	7.19
Free Courses (6 CR)		6	4.32
Total		139	100

University Requirements

Twelve credit-hours are required by the University in order for graduation. A list of these courses comes next.

College Requirements

The college of engineering requires that student must complete 48 credit hours before graduation. Six out of the 48 credit hours are elective courses and the rest are Compulsory courses.

Program and/or Departmental Requirements

Each department requires the completion of 73 credit hours distributed between specialized courses offered by the department itself or offered by other departments of the college.

Free Courses

Six credit hours have to be selected among the set of courses offered by the university.

Academic Supervision

An academic advisor is assigned to each student. In addition, there is full-time staff in the Students Affairs Office to help them in this regard. The student is advised to meet with his academic advisor at least once per semester which should be prior to course registration. The academic advisor may assist the students on:

- Course choices, selections, and degree requirements.
- Selecting the elective and free course that match student's future development and career goals.
- Regulations, policies, and procedures on transfer credits, and academic curricula.
- Getting information about scholarships, coop training opportunities, fellowships, and undergraduate research opportunities within the department.
- Identifying and assessing alternatives and consequences of their decisions related to career goals.

Withdrawal

A student has the right to withdraw from an academic semester -without being considered fail within the withdrawal period announced in the academic calendar for the current semester. The withdrawal must be submitted to the college dean. No withdrawal is allowed during the last five weeks before the final examinations. If the college council accepted the student excuse, the council may search for additional chance of final examinations.

Transfer to the college of engineering

The college of engineering accepts the transfer applications from other colleges whether from Qassim University or from outside Qassim University. A transfer may be approved if the applicant completed his PYP and has achieved a minimum GPA set by the College council. The accepted applicant may transfer his previous achieved courses to the equivalent courses at the college of engineering in Qassim University.

Attendance

Regular engineering courses require full time attendance for academic success. The college requires that students should attend at least 75% of the lectures, practical and laboratorial sessions. A student failing to meet this limit in any of his registered courses will be prohibited from attending the final examination of this course. His GPA for this course will be ZERO.

Status of Discontinuity

A student is considered to be in a Status of Discontinuity in one semester if:

- 1- He did not, or failed to, register in one semester.
- 2- He withdrew from this semester.

The validity of the causes is not an issue for discussion. It is permissible for a student to be in a discontinuity status for a maximum of two successive semesters, or a total of three non-successive semesters during his enrollment at QEC. Exceeding these limits ends up by terminating the student's enrollment at QEC.

Any student, who loses his QEC- studentship due to any of the discontinuity conditions mentioned above can appeal to be readmitted to the college based on the following conditions:

- 1- The student discontinuity did not exceed four semesters
- 2- He has to satisfy all the admission conditions announced at readmission.
- 3- He should keep the same university personal identification number (PIN) as well as his records he had prior to the discontinuity status.
- 4- The student's appeal must be approved by the College Dean.
- 5- The Dean, based on a recommendation from the associated department council, may require the student to retake any course that he has passed before.
- 6- If the student discontinuity exceeded four semesters, and it was not due misconduct, he can apply for admission as a new student or freshman. In this case all his academic records will be ignored.

Examinations and Grading System

The final grade of a specific course is the summation of the final exam grade and a grade corresponding to the class work during the semester. Each course has a total of 100 points. The grade of the semester work is within 50% to 60% of the total final grade of the course. The rest, however, is assigned for the final exam. A student must have a total of at least 60% of the total marks to pass a specific course. The grading system of QEC is explained in the next table:

Grade Letter	Numerical average %		Points
	From	To less than	
A+	more than or equal to	95	5.00

A	90	95	4.75
B+	85	90	4.50
B	80	85	4.00
C+	75	80	3.50
C	70	75	3.00
D+	65	70	2.50
D	60	65	2.00
F	Less than 60		1.00

A student's semester Grade Point Average (GPA) is calculated by dividing the cumulative point value of all his semester's courses by the total number of semester credit hours he registered for. The following is an example of a hypothetical student's report having six hypothetical courses.

Subject	Credit Hours	Grade Letter	Points	Point product
1	2	B+	4.50	$4.5 \times 2 = 9$
2	3	D	2.00	$2 \times 3 = 6$
3	3	C	3.00	$3 \times 3 = 9$
4	4	D+	2.50	$2.5 \times 4 = 10$
5	1	B	4.00	$4 \times 1 = 4$
6	5	C	3.00	$3 \times 5 = 15$
Total	18			53

This student's semester Grade-Point-Average (GPA) is $53/18 = 2.944$

The cumulative GPA of a student is calculated by considering all the achieved courses since he was first admitted to the college till the time his-GPA is required to be calculated at. The graduation grade of a student is considered based on his cumulative GPA according to the following table:

Cumulative GPA	Graduation Grade
From 4.5 and up	Excellent
From 3.75 to less than 4.5	Very good
From 2.75 to less than 3.75	Good
From 2.00 to less than 2.75	Sufficient

Academic Evaluation for Student Standing

It is expected from all QEC-students to be in good academic standing. A student with GPA less than 2 is not eligible for graduation. A student fails to maintain an accumulating GPA less than 2.0 in any semester will be warned. Three warnings will put the student in dismissing conditions from the college and the university rules -on this case- will be applied.

Education Resources

- Textbooks
- Lectures
- The World Wide Web (Internet)
- Seminars
- Conferences
- Training Courses

COLLEGE FACILITIES

Students Affairs Office

The college has a students' Affairs Office which is headed by an engineer and has two full-time expert members. The office is supported and linked to the Deanship of Admission and Registration. The office is equipped with computers connected to the university local network. The main tasks of this office are:

- The office helps in the registration of students, and supplies the necessary data concerning the students' enrolment and their progress. These documents help in the evaluation process.
 - The office staff has access to the registration program to help solve problems which face the students during the registration.
 - The office director participates in the committee which distributes the students after the first level to the different departments of the college.
 - The office monitors the attendance of the students so that the rules of exclusion of attending the final exams are firmly applied.
 - The Student Affairs Office arranges and controls all matters related to the midterm, final written exams and written outcomes achievement exam. In this regard, the office prepares the exams time table, assigns exams places, assigns exams supervisors, collects the exam questions from the faculty members, and arranges for supplying the answer sheets.
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- ② The office also participates in informing the students about any important activities, dates, news, rules through the college web-site and/or by cellular SMS's.

②

Students' Activities

The student affairs deanship supervises most of the students' activities. This includes cultural, recreational, and social activities. These activities enhance the students' learning ability as well as it demonstrates good chance for entertainment and stress relief. Samples of these activities are:

- 1- Cultural activities: in all fields
- 2- Social activities like traveling and visiting major industrial cities and large scale engineering projects.
- 3- Recreational activities such as arranging races in football, tennis and billiards.

In addition, the college has a mosque, a cafeteria, and a student club. The club is a complementary part to of the college mission and it is a center for student activities such as discussions, workshops, competitions, culture, training, sports, social and various student related activities. Students from various departments are enrolled as club members. Members usually contribute with their creative ideas, and discuss events for the future planned activities, during meetings held by the club. All teaching staff supporting student activities can participate in this club.

College Scientific Journal

The college of engineering supervises the publication of the bi-annual Qassim University Journal of Engineering and Computer Sciences. Contributions to this journal are not limited to staff members of the college but are open to contributors from inside and outside the Kingdom of Saudi Arabia. Papers are published after being refereed by national and international specialists. This journal is considered a good journal for publication and its papers are considered by the scientific councils in all KSA universities for promotion.

PHYSICAL FACILITIES

In addition to the specialized laboratories in each department -which will be explained in the hereafter- the college contains a number of laboratories, drawing halls, teaching halls and computer laboratories which will serve all the college departments. These physical facilities are:

-
- Workshop
 - Computer laboratories
 - Drawing halls
 - Active learning halls
 - Teaching halls

Workshop

A workshop with many equipment and tools is used in conjunction with teaching GE 105: Basics of Eng. Technology. The workshop is located in the Department of Mechanical Engineering and has Lathes, Milling machines, Shaper, Drill Press, Band Saws, Grinder, Welding and Hydraulic Cutter.

Students of the junior levels get trained in the workshop and perform experimental exercises for different industrial programs. Moreover, the students carry out manufacturing of equipment and experimental models for their graduation projects. The workshop is utilized also in research projects performed by the college staff members.

Computer Laboratories

The college has two computer laboratories supervised by teaching staff members. The laboratories are well equipped with extensive licensed software libraries and up• to-date printers and scanners. The laboratories are utilized in graduation projects and in teaching computer sciences as well as these engineering courses which require computer application. The computer facilities include the service of electronic mail, internet. The capacity of each laboratory is about 40 students.

Drawing Halls

The college has two halls for engineering drawing. These halls are utilized in teaching GE 104: Basics of Engineering Drawing. The halls are equipped with thirty drawing tables equipped with all facilities necessary for drawing.

Active Learning Halls

Four new active learning halls are constructed and well prepared for engineering design courses (GE 211 & GE 213). Two halls are assigned for each course. The active learning halls are prepared with the necessary equipment required for creating the appropriate active learning environment. In these courses teams of students (usually five students each) meet to discuss the assignments and to perform active learning procedures.

Teaching Halls

The college contains a number of teaching halls. The halls are equipped with the most recent educational equipment like whiteboards, overhead projectors, internet connections, electric supplies, air conditioners and more.

DEGREE REQUIREMENTS

The following are the requirements for the degree of Bachelor of Science in Engineering for different programs offered by QEC. A hypothetical course is given next as an example of how to read codes and terminologies.

Course Code Course Title

Requires 1 hr lecture weekly Requires 2 hr in lab weekly

This course is 3 Credit hours Requires 1 hr exercise weekly

GE 000 – Reading this bulletin: 3 (1, 2, 1)

This bulletin must be read by students prior to apply for engineering college.

Pre-requisite: GE 001 → Course GE 001 must be attended in conjunction with GE 000

Co-requisite : GE 002 → Course GE 002 must be passed before registering for GE 000

The following set of symbols, *arranged in alphabetic order*, is used in this bulletin:

Symbol	Meaning
ARAB	Arabic Language
CE	Civil Engineering
CEN	Computer Engineering
CHEM	Chemistry
CSC	Computer Science
ECON	Economy
EE	Electrical Engineering
GE	General Engineering

Symbol	Meaning
GEO	Geology
IC	Islamic Culture
MATH	Mathematics
ME	Mechanical Engineering
MGMT	Management
PHYS	Physics
STAT	Probability & Statistics

University-Course Requirements

The following courses are required by the University for graduation.

College of Engineering - Degree Requirements

No	Course Code	Course title	CR	LT	LB	TU	Pre-Req.	Co-Req.
1	ARB 101	Linguistic skills	2	2	-	-	-	-
2	ARB 103	Arabic Writing	2	2	-	-	-	-
3	IC 101	Introduction to Islamic culture	2	2	-	-	-	-
4	IC 102	Islam and Community Building	2	2	-	-	IC 101	-
5	IC 103	Economic System in Islam	2	2	-	-	IC 101	-
6	IC 104	Political System in Islam	2	2	-	-	IC 101	-
Total credit hours: 12								

College-Course Requirements

Compulsory Courses

No	Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
1	CHEM 111	General Chemistry	4	3	2	-	-	-
2	CSC 209	Computer Programming	3	2	2	-	MATH 107 MATH 203	-
3	ECON 401	Engineering Economy	3	3	-	1	Pass 90 cr	-
4	GE 104	Basics of Engineering Drawing	3	1	4	-	-	-
5	GE 105	Basics of Engineering Technology	2	1	2	-	GE 104	-
6	GE 211	Introduction to Engineering Design-I	3	2	4	-	-	-
7	GE 213	Introduction to Engineering Design-2	2	2	2	-	GE 211	-
8	MATH 106	Integral Calculus	3	3	-	1	-	-
9	MATH 107	Linear Algebra & Analytic Geometry	3	3	-	1	-	-
10	MATH 203	Differential and Integral Calculus	3	3	-	1	MATH 106	-
11	MATH 208	Differential equations	3	3	-	1	MATH 203	-
12	MGMT 402	Project Management	3	3	-	1	Pass 90 cr	-
13	PHYS 131	General Physics	4	3	2	-	-	-
14	STAT 328	Probabilities and statistics	3	3	-	1	MATH 203	-
Total credit hours: 42								

Elective Courses

Two elective courses may be selected from the following courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
GE 412	Value Engineering	3	3	-	1	GE 213	-
MATH 244	Linear Algebra	3	3	-	1	MATH 107	-
MATH 254	Numerical Methods	3	3	-	1	MATH 106 MATH 107	-
MATH 328	Applied Operations Research	3	3	-	1	MATH 107	-
MGMT 411	Development of Management skills	3	3	-	1	GE 211	-

PREPARATORY YEAR PROGRAM

The Preparatory Year Program (PYP) is taken into consideration as levels 1 and 2 in the graduation program. In these levels, students study the following courses:

1st Level

Course Code	Course Title	Credit Hours
CSC 105	Computer Skills	4
ENG 0011	Preparatory English (1)	8
PHYS 110	Physics (1)	2
PSYCH 101	Thinking Skills and Learning Styles	2
STAT 100	Statistics	2
Total Hours		18

2nd Level

Course Code	Course Title	Credit Hours
CSC 111	Computer programming	3
ENG 0012	Preparatory English (2)	5
ESP 102	English for Engineering and Computer Science	2
MATH 105	Calculus	3
PHYS 115	Physics (2)	3
Total Hours		16

COURSES DESCRIPTION

The next section shows the degree of Bachelor of Science in Engineering for different programs offered by QEC.

Compulsory Courses

CHEM 111 - General Chemistry: 4 (3, 2, 0)

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.

CSC 209 - Computer Programming: 3 (2, 2, 0)

Introduction to computers and computing fundamentals in JAVA, Data Types, Variables, Operators, Control Structures, Simple input/output statement, Classes & Objects, Methods, Relational and logical expressions, IF-ELSE control structure, The WHILE statement, The FOR statement and looping structure, Introduction to Swing & graphical user interfaces, Arrays Matrix Methods, Vectors, String, Engineering Applications.

ECON 401- Engineering Economy: 3 (3, 0, 1)

Introduction to engineering economy. Interest formulas and equivalence. Bases for comparison of alternatives. Decision making among alternatives. Evaluating replacement alternatives. Break-even and minimum cost analysis. Cost accounting. Depreciation. Economic analysis of operations. Economic analysis of public projects.

GE 104 - Basics of Engineering Drawing: 3 (2, 2, 0)

Geometrical construction and basics of lettering, Sketching, Orthographic projection, Sectional and auxiliary views, Dimensioning, Introduction to computer graphics.

GE 105 - Basics of Engineering Technology: 2 (1, 2, 0)

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.

GE 211- Introduction to Engineering Design-I: 3 (2, 4, 0)

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

GE 213 - Introduction to Engineering Design-II: 2 (2, 2, 0)

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.

Pre-requisite: GE 211

MATH 106 - Integral Calculus: 3 (3, 0, 1)

Fundamental theorem of calculus, the definite and indefinite integral, numerical integration. Area, volume of revolution, work, arc length. Differentiation and integration of inverse trigonometric functions. The logarithmic, exponential, hyperbolic and inverse hyperbolic functions. Techniques of integration:substitution, by parts, trigonometric substitutions, partial fractions,

miscellaneous substitutions. Indeterminate forms, improper integrals. Polar coordinates.

Pre-requisite: MATH 105

MATH 107 - Linear Algebra & Analytic Geometry: 3 (3, 0, 1)

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 A^{-1} , Further results on systems of equations and inevitability, 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: 3 (3, 0, 1)

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.

Pre-requisite: MATH 106

MATH 208 - Differential equations: 3 (3, 0, 1)

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.

Pre-requisite: MATH 203

MGMT 402 - Project Management: 3 (3, 0, 1)

Basic Management Process approach, Defining Project, Project life cycle, Balancing competing demands with triple constraints, Strategies and planning, methods, Project planning and scheduling, integrated project planning, Quality management, Bar• charts and Gantt Chart, critical path methods, PERT method, resource leveling and allocation, time-cost trade off. Construction and organizational approaches, leadership elements, and decision making. Time and cost control, Project Closing. computer applications.

PHYS 131 - General Physics: 4 (3, 2, 0)

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, Kirchhoff "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.

STAT 328 - Probability and Statistics: 3 (3, 0, 1)

Some discrete probability distributions (Uniform, binomial, multinomial, hypergeometric, negative binomial, geometric and Poisson distributions, Mean and variance for these distributions, relationship between Poisson and hypergeometric with binomial distributions) Some continuous probability distributions (Uniform, standard Normal, Normal, Area under the normal curve, Application of the normal distribution, mean and variance, Normal approximation to the binomial) Fundamental sampling distributions and data descriptions (Random sampling, some important statistics, Sampling distribution (central limit theorem), Sampling distribution of mean and difference between two means for large samples (and for small samples taken from normal distribution), t-distribution (its applications) One- and Two-sample estimation Problems (Statistical Inferences, Classical method of estimation, Estimating the mean, Standard error of a point estimate, Prediction Interval, Estimating the difference between two means (for known and unknown (equal) variances), Estimating a Proportion, determination of the sample size at a specified error) One-and two-sample tests of hypotheses (Null and Alternative hypotheses, type I error, type II error, one and two tailed tests, P value, tests concerning a single mean, tests on two means (for variance

known and unknown), test on a single proportion) Simple Linear Regression (Least squares and the fitted model, Properties of the least square estimators, Inferences concerning the regression coefficients, prediction).

Elective Courses

GE 412 - Value Engineering: 3 (3, 0, 1)

Introduction, Defining value; overview of value engineering, Project budget; capitalized value. Determining value through cost, market, and income approaches. Models for value engineering. Function identification analysis and FAST diagrams. Weighted evaluation and decision analysis techniques. Bidding and Procurement. Developing a detailed implementation plan. Life cycle costs including maintenance and operating costs. Value engineering workflow.

Pre-requisite: GE 213

MATH 244 - Linear Algebra: 3 (3, 0, 1)

General review of vectors in space and its engineering applications, Euclidean n-space, linear transformation from n-space to m-space and its properties. General vector in space, subspaces, linear independence, row space, column space, and null space. Inner products in space, angle and orthogonality in inner product spaces, best approximation: least squares, orthogonal matrices. Eigenvalues and eigenvectors.

Pre-requisite: MATH 107

MATH 254 - Numerical Methods: 3 (3, 0, 1)

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, Introduction to numerical solutions for ordinary differential equations.

Pre-requisite: MATH 106, MATH 107

MATH 328 - Applied Operations Researches: 3 (3, 0, 1)

Introduction to operation research methodology and applications, Building of mathematical models, Linear programming models, The simplex algorithm, Duality

Civil Engineering Program -

and sensitivity analysis, Transportation and assignment models, Network models, Integer programming, Using Optimization Software.

Pre-requisite: MATH 107

MGMT 411 - Development of Management Skills: 3 (3, 0, 1)

Course definition and introduction to management and quality, Basics and definitions of management, Basics and definitions of quality, Qualities top issues. Kaizen Systems: Total Quality Management TQM, Totally Productive Maintenance, Suggestion System, Just in Time: Production System, Activities in small Groups QC. Leadership.

Pre-requisite: MATH 107

CIVIL ENGINEERING PLAN

Compulsory Courses

Departmental Courses:

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
CE 202	Mechanics of Materials	3	3	-	1	GE 201 MATH 203	
CE 205	Properties of Structural Materials	2	1	2	-	CE 202	-
CE 206	Structural Analysis – 1	3	3	-	1	CE 202	-
CE 212	Plane Surveying	3	1	2	1	MATH 107	-
CE 230	Fluid Mechanics	3	3	-	1	MATH 106 GE 201	-
CE 231	Fluid Mechanics Laboratory	1	-	2	-		CE 230
CE 306	Structural Analysis - 2	2	2	-	1	CE 206	-
CE 307	Properties and Testing of Concrete	2	1	2	-	CE 205	-
CE 318	Design of Reinforced Concrete Structures	4	4	-	1	CE 306 CE 307	-
CE 320	Construction Engineering	3	3	-	1	Pass 90 cr	-
CE 330	Hydraulics	2	2	-	1	CE 230	-
CE 331	Hydrology	3	3	-	1	CE 330	-
CE 343	Transportation and Traffic Engineering	3	3	-	1	MATH 203	-
CE 353	Geotechnical Engineering	3	3	-	1	GEO 285	-
CE 354	Geotechnical Engineering Laboratory	1	-	2	-	-	CE 353
CE 363	Foundation Engineering	3	3	-	1	CE 353 CE 318	-
CE 370	Water and Wastewater Engineering	4	4	-	1	CE 330	-
CE 375	Steel Structures Design	3	3	-	1	CE 306	-
CE 447	Highway Engineering	2	2	-	1	CE 205 CE 343	-
GE 406	Summer Training	2	1		2	Pass 100 cr	

Civil Engineering Program - Civil Engineering Plan

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
CE 491	Senior Design Project - 1	3	1	4	-	Pass 100 cr	-
CE 492	Senior Design Project - 1	2	1	2	-	CE 491	-
Total		57					

Courses from outside the Department (10 Credits)

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
GE 201	Statics	3	3	-	1	MATH 106	
GE 202	Dynamics	3	3	-	1	GE 201	
GEO 285	Engineering Geology	2	2	-	1	-	-
ME 327	Building Thermal Loads	2	2	-	1	PHYS 131	
Total		10					

Elective Courses

Civil Engineering Program - Civil Engineering Plan

Students should complete 6 credit hours from the following courses:

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

BSC PROGRAM CURRICULUM

3rd Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 101	Introduction to Islamic culture	2	2	-	-	-	-
ARAB 101	Linguistic skills	2	2	-	-	-	-
PHYS 131	General Physics	4	3	2	-	-	-
GE 104	Basics of Engineering Drawing	3	1	4	-	-	-
MATH 106	Integral Calculus	3	3	-	1	-	-
CHEM 111	General Chemistry	4	3	2	-	-	-
		18					

4th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 102	Islam and Community Building	2	2	-	-	IC 101	-
GE 105	Basics of Engineering Technology	2	1	2	-	GE 104	-
MATH 107	Linear Algebra & Analytic Geometry	3	2	-	1	-	-
MATH 203	Differential and Integral Calculus	3	2	-	1	MATH 106	-
GE 201	Statics	3	2	-	1	MATH 106	-
GEO 285	Engineering Geology	2	2	-	1	-	-
+++	Free Course – 1	3	-	-	-	-	-
		18					

Civil Engineering Program - BSc Program Curriculum

5th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 103	Economic System in Islam	2	2	-	-	IC 101	-
MATH 208	Differential equations	3	3	-	1	MATH 203	-
GE 211	Introduction to Engineering Design-I	3	2	4	-	-	-
CSC 209	Computer Programming	3	2	2	-	MATH 107 MATH 203	-
GE 202	Dynamics	3	3	-	1	GE 201	-
CE 202	Mechanics of Materials	3	3	-	1	GE 201 MATH 203	
		17					

6th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
STAT 328	Probabilities and statistics	3	3	-	1	MATH 203	-
GE 213	Introduction to Engineering Design-2	2	2	2	-	GE 211	-
CE 205	Properties of Structural Materials	2	1	2	-	CE 202	-
CE 230	Fluid Mechanics	3	3	-	1	MATH 106 GE 201	-
CE 231	Fluid Mechanics Laboratory	1	-	2	-	-	CE 230
CE 212	Plane Surveying	3	1	2	1	MATH 107	-
CE 206	Structural Analysis – 1	3	3	-	1	CE 202	-
		17					

Civil Engineering Program - BSc Program Curriculum

7th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ARAB 103	Arabic Writing	2	2	-	-	-	-
CE 306	Structural Analysis - 2	2	2	-	1	CE 206	-
CE 307	Properties and Testing of Concrete	2	1	2	-	CE 205	-
CE 330	Hydraulics	2	2	-	1	CE 230	-
CE 353	Geotechnical Engineering	3	3	-	1	GEO 285	-
CE 354	Geotechnical Engineering Laboratory	1	-	2	-	-	CE 353
CE 343	Transportation and Traffic Engineering	3	3	-	1	MATH 203	-
ME 327	Building Thermal Loads	2	2	-	1	PHYS 131	
		17					

8th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
IC 104	Political System in Islam	2	2	-	-	IC 101	-
CE 318	Design of Reinforced Concrete Structures	4	4	-	1	CE 306 CE 307	-
CE 370	Water and Wastewater Engineering	4	4	-	1	CE 330	-
CE 375	Steel Structures Design	3	3	-	1	CE 306	-
+++	College Elective – 1	3	3	-	-	-	-
		16					

Civil Engineering Program - BSc Program Curriculum

9th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
ECON 401	Engineering Economy	3	3	-	1	Pass 90 cr	-
CE 363	Foundation Engineering	3	3	-	1	CE 353 CE 318	-
CE 331	Hydrology	3	3	-	1	CE 330	-
CE 447	Highway Engineering	2	2	-	1	CE 205 CE 343	-
CE 4++	Civil Engineering Elective -1	3	3	-	-	-	-
CE 491	Senior Design Project - 1	3	1	4	-	Pass 100 cr	-
		17					

10th Level

Course Code	Course Title	CR	LT	LB	TU	Pre-Req.	Co-Req.
MGMT 402	Project Management	3	3	-	1	Pass 90 cr	-
CE 320	Construction Engineering	3	3	-	1	Pass 90 cr	-
CE 4++	Civil Engineering Elective -2	3	3	-	-	-	-
+++	College Elective – 2	3	3	-	-	-	-
+++	Free Course – 2	3	3	-	-	-	-
CE 492	Senior Design Project- 2	2	1	2	-	CE 491	-
GE 406	Summer Training	2	2	-	-	Pass 100 cr	-
		19					

COURSE DESCRIPTIONS

Compulsory Courses

CE 202 - Mechanics of Materials: 3 (3, 0, 1)

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.

CE 205 - Properties of Structural Materials: 2 (1, 2, 0)

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. Non destructive tests.

CE 206 - Structural Analysis - 1: 3 (3, 0, 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 212 - Plane Surveying: 3 (1, 2, 1)

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.

CE 230 - Fluid Mechanics: 3 (3, 0, 1)

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: 1 (0, 2, 0)

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 306 - Structural Analysis - 2: 2 (2, 0, 1)

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: 2 (1, 2, 0)

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 318 - Design of Reinforced Concrete Structures: 4 (4, 0, 1)

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: 3 (3, 0, 1)

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 330 - Hydraulics: 2 (1, 2, 0)

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

CE 331 - Hydrology: 3 (3, 0, 1)

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

CE 343 - Transportation and Traffic Engineering: 3 (3, 0, 1)

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.

CE 353 - Geotechnical Engineering: 3 (3, 0, 1)

Flow of water in soil, soil compaction, Consolidation of soils. Settlement of structures. Shear strength of soils. Lateral earth pressure.

CE 354 - Geotechnical Engineering Laboratory: 1 (0, 2, 0)

Moisture density relationships. Particle size analysis, Atterberg limits. Classifications and identification of soils. Permeability properties of soil. Soil compaction. Unconfined strength. Soil consolidation. Shear strength properties of soil.

CE 363 - Foundation Engineering: 3 (3, 0, 1)

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

CE 370 - Water and Wastewater Engineering: 4 (4, 0, 1)

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: 3 (3, 0, 1)

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 447 - Highway Engineering: 2 (2, 0, 1)

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.

GE 406 - Summer Training: 2 (-, -, -)

The student starts the Cooperation Training during the summer that precedes his final year of study and continues to the end of the next semester in either the Governmental or Private sectors. At the end of training, student must prepare a detailed report which will be orally examined by a special committee of faculty professors.

CE 491 - Senior Design Project - 1: 3 (2, 2, 0)

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 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.

Pre-requisite: Pass 100 Cr

CE 492 - Senior Design Project - 2: 2 (1, 2, 0)

The course is the second part for the senior design project. It aims to expose the students to the practical experience of real civil engineering projects/projects components in order to gain the necessary experience which relates the design process to the full course work studied during the program. The previously selected team of students shall continue the design process for this part of the project. The students are responsible for and shall utilize all the knowledge and skills gained through the program as well as in order to complete the task. At the end, students will be examined in final project report which is done in the form of an oral presentation as a team.

Courses from Outside the Department

GE 201 - Statics: 3 (3, 0, 1)

Introduction to mechanics and vectors – Force system in 2D and 3 D – Moments and couples in 2D and 3D– Equilibrium of force system – Analysis of frames and structures - Distributed forces - Centroid of simple and composite bodies – Moment of inertia – Friction

GE 202 - Dynamics: 3 (3, 0, 1)

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.

GEO 285 - Engineering Geology: 2 (2, 0, 1)

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.

ME 327 - Building Thermal Loads: 2 (2, 0, 1)

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.

Elective Courses

CE 317 - Computer Applications: 3 (3, 0, 1)

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 Ne, etc.

CE 401 - Concrete Technology: 3 (3, 0, 1)

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 polymerimpregnated; durability problems of concrete in the Gulf environment; preventive measures, specifications and construction techniques for local conditions.

CE 403 - Advanced Reinforced Concrete: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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: 3 (3, 0, 1)

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.

LABORATORIES AND EQUIPMENTS

The Civil Engineering Department has established excellent laboratory facilities for undergraduate courses, graduate courses and research work. The main laboratories of the Department are listed as follows:

1. Fluid Mechanics Laboratory:

The laboratory is used for instruction in courses; Fluid Mechanics, CE-230, Fluid Mechanics Laboratory CE-231. The laboratory is equipped with Hydrostatic Pressure Apparatus to determine the hydrostatic force acting on a plane surface, Orifice & Free Jet Flow Apparatus to determine coefficients of velocity, contraction and discharge. There is also, Centrifugal Pump Characteristics to determine the characteristics of centrifugal pump and Laminar Flow Apparatus to show the stream lines.

2. Concrete Laboratory:

This laboratory is used for instruction in courses; Structural Materials, CE-203, Properties and Testing of Concrete, CE-304, Concrete Technology, CE-401 and Advanced Reinforced Concrete, CE-403. This laboratory is well equipped for carrying out basic tests on aggregates and cement, and for casting and testing concrete specimens (fresh and hardened). In addition to the undergraduate

students, this laboratory is also used by the graduate students for experimental and research work.

3. Environmental Engineering Laboratory:

This laboratory is used for instruction in courses; Water and Wastewater Engineering, CE-370 and Design and Operation of Water and Wastewater Treatment Plants CE-474. The equipment available includes: Incubator for B. O. D. Test, Digital D. O. Meter, TITRATOR for C. O. D. Test, Muffle Furnace for TSS and TS measurements, Spectrophotometer, Desiccators, Magnetic Stirrer, Vacuum Pump, Ph-meter, Turbidity meter, Peristaltic pumps, DATA LOGGER for measuring Water Quality Conductivity Dissolved Oxygen Colorimeter, Desalination unit.

4. Soil Mechanics Laboratory:

This laboratory is used for instruction in courses; Geotechnical Engineering, CE 353, Geotechnical Engineering Laboratory, CE-354, Foundation Engineering, CE 363 and Soil Improvement and Earth Structure Design. The laboratory is equipped with Atterberg's Limit Apparatus to determine cohesive soil indices, Sieves Sets to determine cohesionless soil gradation, Consolidation cells to determine cohesive soil compressibility characteristics. There is also, Direct Shear, unconfined compression and Triaxial Test Apparatus to determine soil shear strength parameters.

5. Transportation and Surveying Laboratory:

This laboratory is used for instruction in courses; Survey Basics, CE-112 and Project Surveying, CE-464. The laboratory is equipped with theodolites, EDM, total stations and level instruments for performing surveying field works such as distance, angle and elevation differences measurements, profiling, traversing, topographic surveying, mapping, and curve layout. In addition, it contains 3D scanner and GPS instruments.

6. Material Engineering Laboratory:

This laboratory is used for instruction in the course; Mechanics of Materials, CE-202. The laboratory is reasonably equipped for carrying out simple experiments to familiarize the undergraduate students with basic structural behavior and stress analysis and includes tests for tension, Poisson's ratio, stress concentration, flexure and torsion

7. Hydraulic Laboratory:

The laboratory is used for instruction in courses; Hydrology, CE-331, Hydraulic Engineering, CE-456 and Design of Water Structure, CE-458. It is also used for post graduate students and research activity.