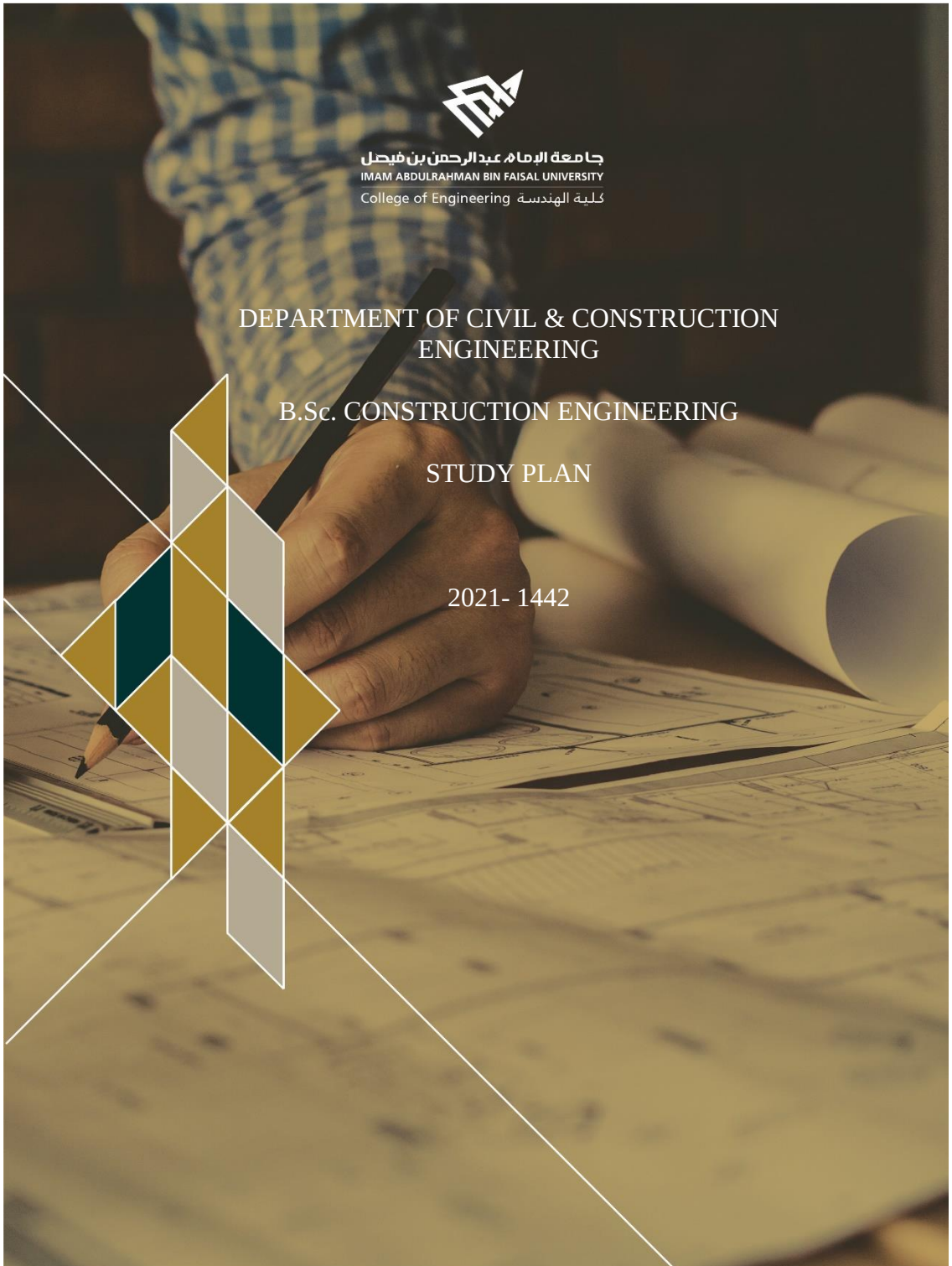
جامعة الإمام عبدالرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY
College of Engineering كلية الهندسة
DEPARTMENT OF CIVIL & CONSTRUCTION ENGINEERING
B.Sc. CONSTRUCTION ENGINEERING
STUDY PLAN
2021- 1442

جامعة الإمام عبد الرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY

COLLEGE OF ENGINEERING

DEPARTMENT OF CIVIL & CONSTRUCTION ENGINEERING

B.SC. PROGRAM

CONSTRUCTION ENGINEERING

CURRICULUM & COURSE DESCRIPTION

Rabi'I 1442H (Nov., 2021G)

Important Contacts

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Kingdom of Saudi Arabia

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Vision:

To be recognized as the leading provider of quality construction engineering education.

Mission:

To provide innovative knowledge and research outcomes in all areas of construction engineering through cutting edge technology and industrial alliance with greater focus on serving the community.

Program Educational Objectives:

The Construction Engineering program educational objectives are consistent with the university and college mission and the needs of its various constituencies and stakeholders. They are important for successful professional practice and the ability to pursue advanced degrees. The approved educational objectives of the program are as follows:

The Construction Engineering program prepares its graduates to:

- Implement technical, collaborative, and communication skills with leadership principles, to pursue careers in Construction Engineering.

- Seek higher degrees in Construction Engineering and embark on life-long learning.

- Seek professional licensure, discharge their professional Construction Engineering skills ethically, and being conscious of the impact of Construction Engineering projects on society as well as environment.

Student Outcomes:

The Department adopted ABET Student Outcomes (SO) "1-7", which the students of Construction Engineering program at Imam Abdulrahman Bin Faisal University will demonstrate before graduation:

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.

BSc. Program Curriculum

Construction engineering program consists of four years (136 credit hours) plus a preparatory year (32 credit hours), during which a student is taught English, Math, Physics, computer and scientific research skills, and computer applications. The language of instruction is English since a graduate of the program is expected to work within a team who communicates in English.

Each one credit hour is translated into fifty minutes of theoretical teaching and one hundred to one hundred fifty for lab/practical. The credits required for the degree of Bachelor of Science in Construction Engineering are distributed among eight semesters, the first two of which are assigned to basic science courses such as math, physics, and chemistry. The sequence of courses with detailed information is listed in the following Tables:

Table 1: CONSTRUCTION Engineering B.Sc. Curriculum
Total Credit Hours 170: (36 Preparatory + 134 Program)

1st Year: Preparatory		2nd Year: Freshman		3rd Year: Sophomore		4th Year: Junior		5th Year: Senior	
1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester
General English Language (7 Cr)	Arabic Language Skills (2 Cr)	History & Civilization of Kingdom (2 Cr)	Calculus II (4 Cr)	Oral Communication & Public Speaking (1 Cr)	Linear Algebra (3 Cr)	Technical Writing (2 Cr)	Research Methodology (1 Cr)	Professional Practice & Ethics (2 Cr)	Global Business Culture (2 Cr)
Math I (3 Cr)	English for Academic and Specific Purpose (3 Cr)	Library Skills (1 Cr)	Physics II (4 Cr)	Differential Equations (3 Cr)	Geology (2 Cr)	Probability & Statistics (3 Cr)	Engineering Economics (2 Cr)	Cash Flow Forecast & Finance Management (2 Cr)	Senior Design Project II (4 Cr)
Basic Design Studio I (3 Cr)	Physics (3 Cr)	English Composition (3 Cr)	Computer Programming (2 Cr)	Strength of Materials (3 Cr)	Thermodynamics (3 Cr)	Analysis of Indeterminate Structures (2 Cr)	Electro-Mechanical Systems (3 Cr)	Senior Design Project I (2 Cr)	Elective II ** (3 Cr)
Physical Education (1 Cr)	Computer Skills (2 Cr)	General Chemistry (3 Cr)	Engineering Drawings (3 Cr)	Dynamics (2 Cr)	Building Construction (2 Cr)	Fundamentals of Soil Mechanics (3 Cr)	Planning, Scheduling & Control (3 Cr)	Construction Safety & Protection (2 Cr)	Elective III ** (3 Cr)
Learning & Searching Skills (2 Cr)	Communication Skills (2 Cr)	Calculus I (4 Cr)	Statics (3 Cr)	Fluid Mechanics (3 Cr)	Concrete Material (2 Cr)	Cost Estimating (2 Cr)	Numerical Methods (3 Cr)	Design of Steel Structures (3 Cr)	Transportation Engineering (3 Cr)
Creed & Family in Islam (2 Cr)	Basic Design Studio 2 (3 Cr)	Physics I (4 Cr)	Islamic Ethics & Values (2 Cr)	Engineering Surveying (3 Cr)	Analysis of Determinate Structures (3 Cr)	Design of R/C Structures (3 Cr)	Foundation Design (3 Cr)	Elective I ** (3 Cr)	
	Math II (3 Cr)	Introduction to Engineering (1 Cr)			Summer Training I (0 Cr)	Formwork Design & Construction Methods (2 Cr)	Construction Contracts & Law (2 Cr)	Sanitary Engineering (3 Cr)	
						Entrepreneurship (2 Cr)	Summer Training II (0 Cr)		
(18 Cr)	**(18 Cr)**	**(18 Cr)**	**(18 Cr)**	**(15 Cr)**	**(15 Cr)**	**(19 Cr)**	**(17 Cr)**	**(17 Cr)**	**(15 Cr)**

Out of 170 Credits: Social Sciences: 43 Credits (21 %) Basic Sciences: 42 Credits (25%) Engineering: 91 Credits (54%)

* Taken during following summer ** The selection of technical elective course should be done under the supervision of the student advisor.

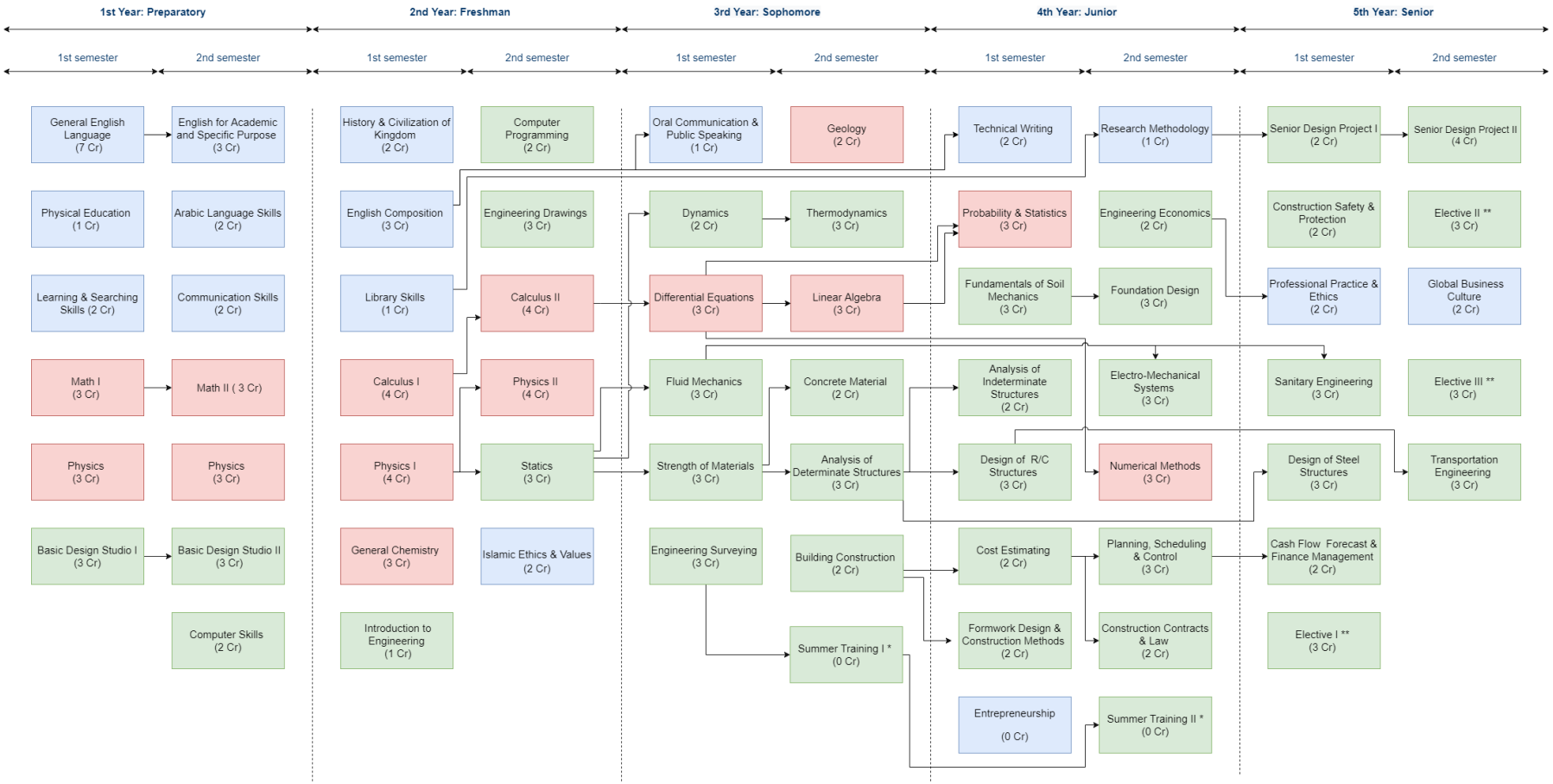
1st Year: Preparatory
2nd Year: Freshman
3rd Year: Sophomore
4th Year: Junior
5th Year: Senior
1st semester
2nd semester
General English Language (7 Cr)
English for Academic and Specific Purpose (3 Cr)
Physical Education (1 Cr)
Arabic Language Skills (2 Cr)
Learning & Searching Skills (2 Cr)
Communication Skills (2 Cr)
Math I (3 Cr)
Math II (3 Cr)
Physics (3 Cr)
Physics (3 Cr)
Basic Design Studio I (3 Cr)
Basic Design Studio II (3 Cr)
Computer Skills (2 Cr)
History & Civilization of Kingdom (2 Cr)
Computer Programming (2 Cr)
English Composition (3 Cr)
Engineering Drawings (3 Cr)
Library Skills (1 Cr)
Calculus II (4 Cr)
Calculus I (4 Cr)
Physics II (4 Cr)
Physics I (4 Cr)
Statics (3 Cr)
General Chemistry (3 Cr)
Islamic Ethics & Values (2 Cr)
Introduction to Engineering (1 Cr)
Oral Communication & Public Speaking (1 Cr)
Geology (2 Cr)
Dynamics (2 Cr)
Thermodynamics (3 Cr)
Differential Equations (3 Cr)
Linear Algebra (3 Cr)
Fluid Mechanics (3 Cr)
Concrete Material (2 Cr)
Strength of Materials (3 Cr)
Analysis of Determinate Structures (3 Cr)
Engineering Surveying (3 Cr)
Building Construction (2 Cr)
Summer Training I * (0 Cr)
Technical Writing (2 Cr)
Research Methodology (1 Cr)
Probability & Statistics (3 Cr)
Engineering Economics (2 Cr)
Fundamentals of Soil Mechanics (3 Cr)
Foundation Design (3 Cr)
Analysis of Indeterminate Structures (2 Cr)
Electro-Mechanical Systems (3 Cr)
Design of R/C Structures (3 Cr)
Numerical Methods (3 Cr)
Cost Estimating (2 Cr)
Planning, Scheduling & Control (3 Cr)
Formwork Design & Construction Methods (2 Cr)
Construction Contracts & Law (2 Cr)
Entrepreneurship (0 Cr)
Summer Training II * (0 Cr)
Senior Design Project I (2 Cr)
Senior Design Project II (4 Cr)
Construction Safety & Protection (2 Cr)
Elective II ** (3 Cr)
Professional Practice & Ethics (2 Cr)
Global Business Culture (2 Cr)
Sanitary Engineering (3 Cr)
Elective III ** (3 Cr)
Design of Steel Structures (3 Cr)
Transportation Engineering (3 Cr)
Cash Flow Forecast & Finance Management (2 Cr)
Elective I ** (3 Cr)

Table 2-1: Construction Engineering Curriculum - First Year – Preparatory

1st Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
ISLM 181	Creed and Family in Islam	2	2 ; 0	Admission
ENGL 101	General English Language*	7	15 ; 5	Admission
MATH 111	Math I	3	3 ; 0	Admission
ARCH 121	Basic Design Studio I	3	0 ; 4	Admission
LRSK 141	Learning and Searching Skills	2	2 ; 0	Admission
PHEDU 162	Physical Education	1	0 ; 2	Admission
	Total Credit & Contact Hours:	**18**	**22; 11**	

2nd Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
ARAB 182	Arabic Language Skills	2	2 ; 0	Admission
ENGL 102	English of Academic and Specific Purpose	3	12 ; 0	ENGL 101
MATH 112	Math II	3	3 ; 0	MATH 111
ARCH 122	Basic Design Studio II	3	0 ; 4	ARCH 121
PHYS 132	Physics	3	3 ; 0	Admission
LRSK 142	Communication Skills	2	2 ; 0	Admission
COMP 131	Computer Skills	2	0 ; 4	Admission
	Total Credit & Contact Hours:	**18**	**22 ; 8**	

Cr: Credit Hours Lc: Lecture Hours; P: Practical Hours; Lb: Laboratory Hours

Table 2-2: Construction Engineering Curriculum - Second Year – Freshman

1st Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
HIST 281	History & Civilization of Kingdom	2	2 ; 0	None
HUMN 201	Library Skills	1	0 ; 2	None
ENGL 211	English Composition	3	3 ; 0	None
CHEM 221	General Chemistry	3	2 ; 2	None
MATH 261	Calculus I	4	3 ; 2	None
PHYS 271	Physics I	4	3 ; 2	None
ENG 251	Introduction to Engineering	1	٠ ; 2	None
	Total Credits & Contact Hours:	**18**	**13 ; 10**	

2nd Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
ISLM 282	Islamic Ethics & Values	2	2 ; 0	None
MATH 262	Calculus II	4	3 ; 2	MATH 261
PHYS 272	Physics II	4	3 ; 2	PHYS 271
COMP 212	Computer Programming	2	1 ; 2	None
ENG 222	Engineering Drawings	3	1 ; 4	None
ENG 232	Statics	3	3 ; 0	PHYS 271
	Total Credits & Contact Hours:	**18**	**13 ; 10**	

Cr: Credit Hours Lc: Lecture Hours; P: Practical Hours; Lb: Laboratory Hours

Table 2-3: Construction Engineering Curriculum - Third Year - Sophomore

1st Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
HUMN 301	Oral Communication & Public Speaking	1	1 ; 0	ENGL 211
MATH 331	Differential Equations	3	2 ; 2	MATH 262
ENG 311	Dynamics	2	2 ; 0	ENG 232
ENG 321	Fluid Mechanics	3	2 ; 2	MATH 262
ENG 341	Engineering Surveying	3	2 ; 2	None
ENG 351	Strength of Materials	3	2 ; 2	ENG 232
	Total Credits & Contact Hours:	**15**	**11 ; 8**	

2nd Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
MATH 302	Linear Algebra	3	2 ; 2	MATH 262
GEOL 312	Geology	2	2; 0	None
ENG 352	Thermodynamics	3	3 ; 0	ENG311
CONEN 322	Building Construction	2	2 ; 0	None
CONEN 332	Concrete Material	2	1 ; 2	ENG 351
CONEN 342	Analysis of Determinate Structures	3	3 ; 0	ENG 351
	Total Credits & Contact Hours:	**15**	**13 ; 4**	

1st Summer Training – One Month				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
CONEN 333	Summer Training I	0	0	ENG 341

Cr: Credit Hours Lc: Lecture Hours; P: Practical Hours; Lb: Laboratory Hours

Table 2-4: Construction Engineering Curriculum - Fourth Year - Junior

1st Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
BUS 381	Entrepreneurship	2	2 ; 0	None
ENG 401	Technical Writing	2	2 ; 0	ENGL 211
MATH 411	Probability & Statistics	3	2 ; 2	MATH 302, MATH 331
CONEN 421	Analysis of Indeterminate Structures	2	2 ; 0	CONEN 342
CONEN 431	Fundamentals of Soil Mechanics	3	2 ; 2	None
CONEN 441	Cost Estimating	2	2 ; 0	CONEN 322
CONEN 451	Design of R/C Structures	3	2 ; 2	CONEN 342
CONEN 461	Formwork Design & Construction Methods	2	2 ; 0	CONEN 322
	Total Credits & Contact Hours:	**19**	**16 ; 6**	

2nd Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
HUMN 402	Research Methodology	1	1 ; 0	HUMN 201
ENG 412	Engineering Economics	2	2 ; 0	None
ENG 422	Electro-Mechanical Systems	3	3 ; 0	ENG 321
CONEN 432	Planning, Scheduling & Control	3	3 ; 0	CONEN 441
MATH 472	Numerical Methods	3	3 ; 0	MATH 331
CONEN 452	Foundation Design	3	2 ; 2	CONEN 431
CONEN 462	Construction Contracts & Law	2	2 ; 0	CONEN 441
	Total Credits & Contact Hours:	**17**	**16 ; 2**	

2nd Summer Training – Two Months				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
CONEN 444	Summer Training II	0	0	CONEN 333

Cr: Credit Hours Lc: Lecture Hours; P: Practical Hours; Lb: Laboratory Hours

Table 2-5: Construction Engineering Curriculum - Fifth Year - Senior

1st Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
HUMN 501	Professional Practice & Ethics	2	2 ; 0	ENG 412
CONEN 511	Cash Flow Forecast & Finance Management	2	2 ; 0	CONEN 432
CONEN 521	Senior Design Project I	2	0 ; 4	HUMN 402
CONEN 531	Construction Safety & Protection	2	2 ; 0	None
CONEN 541	Design of Steel Structures	3	2 ; 2	CONEN 342
CONEN 5xx	Elective I *	3	3 ; 0	**
ENVEN 471	Sanitary Engineering	3	3 ; 0	ENGN 321
	Total Credits & Contact Hours:	**17**	**14 ; 6**	

2nd Semester				
Course #	**Course Title**	**Cr**	**Cont Hrs** L ; P/Lb	**Pre-Requisite**
HUMN 502	Global Business Culture	2	2 ; 0	None
CONEN 522	Senior Design Project II	4	0 ; 8	CONEN 521
CONEN 5xx	Elective II *	3	3 ; 0	**
CONEN 5xx	Elective III *	3	3 ; 0	**
CONEN 442	Transportation Engineering	3	3 ; 0	CONEN 451
	Total Credits & Contact Hours:	**15**	**11 ; 8**	

Cr: Credit Hours Lc: Lecture Hours; P: Practical Hours; Lb: Laboratory Hours

* Requires consent of advisor/department chairman.
** Specific course pre-requisite should be determined by the department

Table 2-6: Construction Engineering Curriculum – Electives (All are 3 Credit Hours)

Electives (Each is 3 Credits)			
Course #	**Course Title**	**Course #**	**Course Title**
CONEN 503	Construction Productivity & Quality Management	CONEN 573	Topics in Structural Analysis
CONEN 513	Methods & Equipment for Construction	CONEN 583	Topics in Concrete Structures
CONEN 523	Topics in Construction Management	CONEN 593	Topics in Foundation Engineering
CONEN 533	Financial Management	CONEN 504	Topics in Steel Structures
CONEN 543	Highway Construction & Heavy Equipment	CONEN 514	Design of Fixed Offshore Structures
CONEN 553	Pavement Management System	CONEN 524	Industrial Structures
CONEN 563	Structure & Pavement Material Engineering	CONEN 534	Recent Topics in Construction Engineering

Course Descriptions

Courses offered in the Construction Engineering program are described below. Course number, number of credit hours, number of lectures, number of laboratories/practical, and required prerequisites are indicated. Courses are listed according to their order in the study plan curriculum shown in **Tables 2-1 to 2-6** listed in previous section.

Second Year Courses

Second Year - First Semester

HUMN 201: Library Skills

Credit Hours: 1	*Lectures: 0*	*Lab/Practical: 2*	*Prerequisite: None*

Distinguish among various library and information resources, recognize citation elements, search databases, use print indexes, locate books in a classified system. Use of libraries and information sources, both print and electronic, including locations and services of the University Library with an emphasis on basic library research tools and information literacy concepts. Library skills. Library research. Brainstorming. Library orientation. Call Numbers. Library cataloguing & Classification System (Library of Congress & Dewey Decimal). General care and maintenance of books and other library. Library language. Finding a book using the library computer. Introduction to Databases and efficient use of it for research purposes.

HIST 281: History & Civilization of Kingdom

Credit Hours: 2	*Lectures: 2*	*Lab/Practical: 0*	*Prerequisite: None*

A review of the historical and civilizational aspects of the Kingdom of Saudi Arabia, its cultural heritage, and the efforts of its rulers in building the political and civilizational rules and their role in serving Arab, Islamic, and humanitarian causes, and achieving the 2030 vision in the field of tourism and national heritage.

ENGL 211: English Composition

Credit Hours: 3	*Lectures: 3*	*Lab/Practical: 0*	*Prerequisite: None*

Investigation of topic-selection processes, development of thesis statements, outlining as it relates to support for a selected thesis statement, both in sentence and slug-style, and practice and emphasis on critical thinking skills.

CHEM 221: General Chemistry

Credit Hours: 3	*Lectures: 2*	*Lab/Practical: 2*	*Prerequisite: None*

This course will introduce the student to the basic vocabulary used in different branches of chemistry, and to major concepts in the field (e.g stoichiometry, thermochemistry, …) with emphasis on problem solving. The course topics include: Chemical foundations (units of measurement, uncertainty in measurement, significant figures and calculations, dimensional analysis, temperature, density, classification of matter); Atoms, molecules and ions, fundamental chemical laws, atomic structure, periodic table and periodicity; Nomenclature of compounds, percent composition, determining the formula of a compound, type of reactions and stoichiometry of reaction and calculations; Solution and solubility, properties of solutions, strong and weak, electrolytes, acid–base reactions, oxidation–reduction reactions, balancing oxidation–reduction equations, titrations; Molecular theory of gases, gas laws, effusion and diffusion, real gases, chemistry in the atmosphere; Thermochemistry, enthalpy and calorimetry, Hess's law; General concept of bonding and types of chemical bonding in molecules and ions. Basic concepts of organic chemistry including polymers. Laboratory: Qualitative and quantitative aspects of general chemistry.

MATH 261: Calculus I

Credit Hours: 4	*Lectures: 3*	*Lab/Practical: 2*	*Prerequisite: None*

To introduce students to the basic concepts and methods of Calculus. Topics include: Functions and graphs, polynomials, exponential, logarithmic and trigonometric functions, Limits, continuity, and differentiability of functions of one variable. Techniques of differentiation. Implicit Differentiation. Local extrema, first and second derivative for local extrema. Concavity and inflection points. Curve sketching. Applied extrema problems. L'Hopital's rule, and applications. Integration, definite and indefinite integrals, fundamental theorem of calculus, integration by substitution, integration by parts, improper integrals, and applications.

PHYS 271: Physics I

Credit Hours: 4	*Lectures: 3*	*Lab/Practical: 2*	*Prerequisite: None*

This is an introductory course in Classical Mechanics. PHY 271 is the first of a two-semester general physics course. The primary subject of this course is Mechanics. Topics includes motions in multiple dimensions, vectors, forces and the laws of motion, circular motion, energy, momentum, and rotational motion. Elements of this subject material are found in all parts of nature. This is a four-credit hour course.

ENG 251: Introduction to Engineering

Credit Hours: 1	*Lectures: 0*	*Lab/Practical: 2*	*Prerequisite: None*

This course is designed to allow students to explore engineering through case studies, and problem-solving using computers. Students will learn about the various aspects of the engineering profession and acquire both technical skills and non-technical skills. The course topics include: Engineering profession, broad overview of the different fields of engineering, including professional societies and their student chapters, professional licensing and registration, professional codes of ethics, introduction to engineering design, and problem-solving techniques. Students learn design, teamwork, written and oral communication skills through participation in a conceptual design project

Second Year - Second Semester

MATH 262: Calculus II

Credit Hours: 4	*Lectures: 3*	*Lab/Practical: 2*	*Prerequisite: MATH 261*

The course topics include: Analytic geometry in calculus, polar coordinates, area in polar coordinates, tangent lines and arc length, conic sections. Three-dimensional space, vectors, parametric equations of lines and planes. Vector-valued functions, unit tangent, normal and binormal vectors, curvature. Partial derivatives, limits and continuity, chain rule, directional derivatives, gradients, maxima and minima of functions of two variables, Lagrange multipliers. Multiple integrals, double and triple integrals.

PHYS 272: Physics II

Credit Hours: 4	*Lectures: 3*	*Lab/Practical: 2*	*Prerequisite: PHYS 271*

This is an introductory course in Electricity and Magnetism. PHY 272 the second course in the calculus-based physics sequence covering introductory electricity and magnetism. Topics include Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance, circuits, magnetic forces and fields, Ampere's Law and induction. This is a four-credit hour course.

COMP 212: Computer Programming

Credit Hours: 2	*Lectures: 1*	*Lab/Practical: 2*	*Prerequisite: None*

This course aims at the provision of the concepts of algorithm, programming language, and program and developing basic problem solving skills to the learner. The course topics include: Overview of computer programming and programming languages (machine, assembly and High-level languages). Programming principles of algorithm and flow of control, including sequential execution, selection, iteration, and subroutine. Basics of a typical programming language (e.g. Matlab). Introduction to computer methods and algorithms for analysis and solution of engineering problems using numerical methods in a workstation environment (Numerical integration, roots of equations, simultaneous equation solving and matrix analysis).

ENG 222: Engineering Drawings

Credit Hours: 3	*Lectures: 1*	*Lab/Practical: 4*	*Prerequisite: None*

Students are introduced to fundamentals of engineering graphics and drawings (lines, curves and polygons) with the basics of manual drafting techniques and the use of drafting equipment, visualization of engineering drawing views or sections (plan, elevation and side view) from three dimensional isometric shapes such as machines and civil works, and principles of computer aided drafting and modeling using AutoCAD. Practice in creating and evaluating typical designs drawn from different specialty areas that include steel structures (components and connections), mechanical and electrical works.

ENG 232: Statics

Credit Hours: 3	*Lectures: 3*	*Lab/Practical: 0*	*Prerequisite: PHYS 271*

This course enable the students to learn the tools necessary to have a deeper understanding of the principles of applied mechanics and the modeling of force systems in engineering statics. The course topics include: Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, Section properties (centroids, area moments of inertia).

ISLM 282: Islamic Ethics & Values

Credit Hours: 2	*Lectures: 2*	*Lab/Practical: 0*	*Prerequisite: None*

The course deals with virtuous morals, ethics, and values that are derived from the Quran and the Sunnah.

Third Year Courses
Third Year - First Semester

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HUMN 301: Oral Communication and Public Speaking

Credit Hours: 1	*Lectures: 1*	*Lab/Practical: 0*	*Prerequisite: None*

In this course the students will develop their ability to speak confidently and effectively in a variety of public speaking situations. Students will prepare and present several different types of speeches that arts managers are often required to make. Particular attention is paid to style, persuasion, and credibility in public speaking.

MATH 331: Differential Equations

Credit Hours: 3 Lectures: 2 Lab/Practical: 2 Prerequisite: MATH 262

This Course is devoted to the solutions of linear 1st, 2nd and higher order differential equations by using different direct methods; Laplace transforms method, power series method and matrix methods for solving linear differential systems.

ENG 311: Dynamics

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: ENG 232

In this course the student are introduced to engineering dynamics principles through applications involving problem solving and creation of design solutions to engineering scenarios. The course topics include: Analysis of motions of particles and rigid bodies encountered in engineering in terms of kinematics (position, velocity, acceleration, absolute and relative motion) and kinetics that includes forces, work, energy, impulse, and momentum. Introduction to mechanical vibration.

ENG 351: Strength of Materials

Credit Hours: 3 Lectures: 2 Lab/Practical: 2 Prerequisite: ENG 232

Introduction to properties of materials (shrinkage, expansion, creep, tension, compression, shear, torsion, bending, fatigue, ductility, hardness). Stresses, strains, and deformations associated with torsion, axial, shear, moment, flexural loading of bars, shafts, beams. and pressure vessel loadings. Combined loadings and principle representations of the states of stress and strain at a point. Basic failure criteria. Introduction to stability including buckling of columns. Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Introduction to experimental stress analysis. Verification of analytical equations through strain gage measurements of axially, torsionally, and flexurally loaded specimens. Preparation of technical reports.

ENG 321: Fluid Mechanics

Credit Hours: 3 Lectures: 2 Lab/Practical: 2 Prerequisite: MATH 262

Fundamental concepts of fluid mechanics, fluid properties, fluid statics, hydrostatic forces, buoyancy and flotation, fluid dynamics and general equations of motion, types of flow, continuity and Bernoulli equations, flow through pipes and nets, open channel flow, stream-flow measurements and calculations, pumping tests.

ENG 341: Engineering Surveying

Credit Hours: 3	*Lectures: 2*	*Lab/Practical: 2*	*Prerequisite: None*

Introduction and chain surveying. Compass surveying and plane table. Leveling and applications. Theodolite surveying. Engineering surveys (reconnaissance, preliminary and location surveys for engineering projects). Tachometric surveying. Control surveying. Survey adjustments. Astronomical surveying.

Third Year - Second Semester

MATH 302: Linear Algebra

Credit Hours: 3	*Lectures: 2*	*Lab/Practical: 2*	*Prerequisite: MATH 262*

Systems of linear equations, row reduction and echelon forms, solution sets of linear systems, linear transformations. Matrix algebra, matrix operations, inverse of a matrix, matrix factorizations, subspaces of the Euclidean n-space, dimension and rank. Determinants, Cramer's rule. Eigenvalues and eigenvectors, diagonalization. Inner product, length, and orthogonality, Gram-Schmidt process.

GEOL 312: Geology

Credit Hours: 2	*Lectures: 2*	*Lab/Practical: 0*	*Prerequisite: None*

This course explores the fundamentals of geology applied to construction engineering problems. Topics include rock and mineral types, soil properties, rock mechanics, geologic structures, active tectonics and earthquake hazards, slope stability and landslides, groundwater, rivers and flood hazards. Instruction is conducted through lecture and field trips..

CONEN 322: Building Construction

Credit Hours: 2	*Lectures: 2*	*Lab/Practical: 0*	*Prerequisite: None*

Building construction cover a wide range of topics, including, site preparation, brick works, roofing systems, electrical systems, plumbing systems, building mechanical systems, plastering, painting, flooring, waterproofing and moisture control.

CONEN 332: Concrete Material

Credit Hours: 2	*Lectures: 1*	*Lab/Practical: 2*	*Prerequisite: ENG 351*

The influence of constituent materials (cements, water, aggregates and admixtures) on the properties of fresh and hardened concrete, concrete mix design, handling and placement of concrete, and the behavior of concrete under various types of loading and environment. Concrete material specifications and inspections. Laboratory exercises, which utilize sieve analysis tests for aggregates and standard concrete test methods, are an integral part of the course.

ENG 352: Thermodynamics

Credit Hours: 3	*Lectures: 3*	*Lab/Practical: 0*	*Prerequisite: ENG 311*

Basic concepts and definitions, properties of pure substances, system and control volume, working fluid, processes and cycles, work, heat and energy, ideal gases, state equation. Pure substance and phase changes, thermal equilibrium. First law of thermodynamics, internal energy and enthalpy, first law of thermodynamics for closed and open systems. Principles of heat transfer, conduction, convection and radiation. Steady state and transient conductive heat transfer with convection and radiation as applied to building materials and geometries. Heating and cooling load analysis including building shapes, construction type, infiltration, occupancy and ventilation rates

CONEN 342: Analysis of Determinate Structures

Credit Hours: 3	*Lectures: 3*	*Lab/Practical: 0*	*Prerequisite: ENG 351*

Classification of loads, supports and reactions. Stability and determinacy of structures. Analysis of statically determinate structures including beams, frames, arches and trusses. Calculating internal forces and drawing normal force, shear force and bending moment diagrams. Introduction to influence line for determinate structures.

CONEN 333: Summer Training I

Credit Hours: 0	*Lectures: 0*	*Lab/Practical: 0*	*Prerequisite: ENG 341*

In the summer of Sophomore level, every Construction Engineering student is obliged to make a summer practice of 30 working days in campus or recommended site by the instructor, doing surveying engineering applications. Observations from the summer practice must be documented and presented in the form of a clear and concise technical report.

Fourth Year Courses
Fourth Year - First Semester

ENG 401: Technical Writing

Credit Hours: 2 *Lectures: 2* *Lab/Practical: 0* *Prerequisite: ENGL 211*

This course focuses on the effective process of written, oral, and visual technical communication for academic settings. Topics include various forms of academic and personal essay-writing. Original essay writing and class criticism and discussion. Model essays and essays on the craft of writing reading and discussion for verbal logic, communicative power, and visceral appeal.

MATH 411: Probability and Statistics

Credit Hours: 3 *Lectures: 2* *Lab/Practical: 2* *Prerequisite: MATH 302 & MATH 331*

In this course, students will acquire an understanding of probability and statistics through mathematical formulas, and examination of data. Students will apply probability and statistics concepts through class activities and projects related to the engineering field. Topics include Presentation of data, textual, tabular and graphical, sampling techniques. Measures of central tendency, mean, median, mode. Measures of variation, range, variance, standard deviation. Probability distributions, counting techniques, uniform, binomial, normal, and exponential distributions. Test of hypothesis, test concerning means, variation, and proportion. Analysis of variance, combinatorial mathematics, fundamental principles of counting, binomial theorem.

CONEN 421: Analysis of Indeterminate Structures

Credit Hours: 2 *Lectures: 2* *Lab/Practical: 0* *Prerequisite: CONEN 342*

Deflections of structures. Analysis of indeterminate structures, including beams, frames, and trusses. Analysis to include methods of consistent deformations, three-moment equations. Influence line for determinate and indeterminate structures.

CONEN 431: Fundamentals of Soil Mechanics

Credit Hours: 3 Lectures: 2 Lab/Practical: 2 Prerequisite: None

Origin and composition of soils, soil structure. Soil compaction, permeability, seepage and flow nets, consolidation, and shear strength. Earth pressure on retaining walls and sheet piles. Stability of slopes and excavations. Mechanical tests: sieve analysis, permeability, resistance to shearing stress, consolidation/expansion. Index tests: granulometry, Atterberg limits, solid density, and water content. Rheologic tests: viscosity, yielding stress, deformation rate. Infrastructure for sampling and in-field testing.

CONEN 441: Cost Estimating

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: CONEN 322

Quantity takeoff methods. Conceptual estimating, estimating costs for construction material, labor, equipment, project overhead, markup and profit, unit costs, production rates, and pricing methods, balanced bid, and budget preparation for projects. subcontract bid analysis and bid procedure.

CONEN 451: Design of Reinforced Concrete Structures

Credit Hours: 3 Lectures: 2 Lab/Practical: 2 Prerequisite: CONEN 342

Behavior of reinforced concrete members. Design philosophies and current practices. Design of flexural members, to include: rectangular, T-beams sections. Design of one-way and two-way slabs. Design of tied and spiral columns. Design of hollow-block (ribbed) slabs.

CONEN 461: Formwork Design and Construction Methods

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: CONEN 322

Types of forms, Formwork objectives, formwork design and building, heavy construction equipment, methods of tunneling, and bridge systems.

Fourth Year - Second Semester

HUMN 402: Research Methodology

Credit Hours: 1 Lectures: 1 Lab/Practical: 0 Prerequisite: HUMN 201

In this course, students learn the tools to be familiar with their theses in terms of research questions and design, methodology, data collection, and analysis. Topics include Research methodology concepts and definitions. Research ethics. Problem identification. Research plan preparation. Data gathering and collection. Data presentation and analysis. Design of research report. Case study.

ENG 412: Engineering Economics

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: None

The course is designed to educate the students about the principles of economics when applied to engineering field. Topics include basic concepts of engineering economics, economic equivalence, time value of money. In this course, students will learn how to formulate single cash-flow, equal payment series, and gradient series. Nominal and effective interest rates, debt management. The students will perform analysis on engineering economic projects and will evaluate different alternatives using traditional engineering economic analysis techniques. Students will learn the concepts of depreciation, income taxes and will prepare simple financial statement while performing the project cash flow analysis.

ENG 422: Electro-Mechanical Systems

Credit Hours: 3 Lectures: 3 Lab/Practical: 0 Prerequisite: ENG 321

Principles and applications of electrical components of constructed facilities, basic electrical circuit theory, motors, transformers, control, and building distribution systems. Principles and applications of mechanical systems, refrigeration system design, components, and system selection criteria including room air distribution, air quality standards, ducting and piping systems. Fire fighting systems, components, fire alarm, and detection system. Vertical transportation system.

CONEN 432: Planning, Scheduling and Control

Credit Hours: 3 Lectures: 3 Lab/Practical: 0 Prerequisite: CONEN 441

Concept of project planning, definition of planning techniques [Bar chart, arrow network, program evaluation and review technique (PERT), critical path method(CPM), line of balance technique(LOB)], work breakdown structure, logic, networking by using CPM technique, scheduling, and control models. Resource allocation and leveling, optimal schedules, documentation and reporting, time and cost control, progress monitoring, and evaluation. Computer applications by primavera software package.

MATH 472: Numerical Methods

Credit Hours: 3 Lectures: 3 Lab/Practical: 0 Prerequisite: CONEN 441

This Course is devoted to find the numerical solutions for a given function by using several methods such as Fixed- point, Bisection, Fasle, Newton- Raphson, and Secant methods. Furthermore, this course is devoted also to find the numerical solutions of systems of linear and non-linear equation by using several methods such as iterative methods of Jacobi, Gauss-Seide, SOR, Qaussian elimination technique and LU- Factorization. Finally, the numerical integration, numerical solutions of first-order differential equations by using Taylor's, Runge-Kutta, Euler's and Admas Bashforth methods and numerical solutions the Parabolic, Hyperbolic and Elliptic partial differential equations will be covered in this course.

CONEN 452: Foundation Design

Credit Hours: 3 Lectures: 2 Lab/Practical: 2 Prerequisite: CONEN 431

Bearing capacity of soils. Site investigation. Mechanics and methodology of foundation engineering; selection and design of foundation systems, including isolated, combined, strip, strap and raft foundations on soft, firm, and expansive soils. Special problems. Introduction to deep foundations.

CONEN 462: Construction Contracts and Law

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: CONEN 441

Types of construction contracts, contract documents, BOT contracting, bidding process, tendering methods, project delivery systems, FIDIC, and dispute and dispute resolution in construction.

BUS 381: Entrepreneurship

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: None

The course deals with the concept of entrepreneurial thought and the importance of entrepreneurship on the personal and economic levels. Reviews how to convert Ideas into applied projects according to the principles and plans of establishing successful commercial projects, and achieving the Kingdom's 2030 vision in the field of creating job opportunities by supporting entrepreneurship.

CONEN 444: Summer Training II:

Credit Hours: 0 Lectures: 0 Lab/Practical: 0 Prerequisite: CONEN 444

In the summer of Junior level, every Construction Engineering student is obliged to make a summer practice of at least 30 working days in a professional construction company, in order to gain field experience in the construction of large projects. Every student will be asked to prepare and present a clear and concise technical report addressing the experience he gained during the summer.

Fifth Year Courses:

Fifth Year - First Semester

HUMN 501: Professional Practice and Ethics

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: ENG 412

This course examines ethical frameworks and moral issues related to the profession. Topics include: Examination of the non-technical issues dealt with by design professional, including: professional ethics, marketing and business development, professional engagement, personnel and project management, risk management, professional liability insurance, and dispute resolution.

CONEN 511: Cash Flow Forecasting, and Finance Management

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: CONEN 432

Project cost accounting, labor, equipment, and work quantities time and cost reporting, time cost envelop, income and expenses cash flow forecasting, and cost of capital lock-up.

CONEN 521: Senior Design Project I

Credit Hours: 2 Lectures: 0 Lab/Practical: 4 Prerequisite: HUMN 402

Individual research in a field of special interest under the supervision of a faculty member as a requirement for the B.Sc. degree, culminating in a written report/thesis. The central goal of which is a substantive paper or written report containing significant analysis and interpretation of a previously approved topic. The Graduation Project is divided between two semesters. Methodology is developed and pre-data are collected in the first semester. Experiment is run, data is analyzed, and conclusion are sought in the second semester.

CONEN 531: Construction Safety and Protection

Credit Hours: 2 Lectures: 2 Lab/Practical: 0 Prerequisite: None

Management of safety and protection in the construction environment. Examines basic elements of a safety and health program for construction. Examines basic elements of safety and health program for the construction procedures.

CONEN 541: Design of Steel Structures

Credit Hours: 3 Lectures: 2 Lab/Practical: 2 Prerequisite: CONEN 342

Behavior and design of structural members and connections using Load and Resistance Factor Design (LRFD) methods. Tension members, compression members, beams and beam-columns. Typical shear and moment connections, welded and bolted.

ENVEN 471: Sanitary Engineering

Credit Hours: 3 Lectures: 3 Lab/Practical: 0 Prerequisite: ENG 321

Water sources and selection. Water demand. Water and wastewater characteristics, Quality and health impacts. Water and wastewater treatment unit operations. Water storage and distribution within buildings and municipality Wastewater reclamation and reuse. Solid and hazardous wastes engineering and management.

CONEN 5xx: Electives I

Credit Hours: 3	*Lectures: 3*	*Lab/Practical: 0*	*Prerequisite: Chair Consent*

A student selects under the supervision of his advisor a course in a minor field in Construction Engineering where he prefers to start his career after graduation.

Fifth Year - Second Semester

HUMN 502: Global Business Culture

Credit Hours: 2	*Lectures: 2*	*Lab/Practical: 0*	*Prerequisite: None*

This course enhances the student's awareness and understanding of cross-cultural communication in a business context and to develop the student's cross-cultural analytical skills. Topics include: Trade, Trade finance management, Logistics and supply chain, e-Business, International marketing and trade compliance. Cultural diversity, cultural awareness for business, global marketplace, clients' specific business needs, successful interaction with international teams, International Business Skills, Building International Teams, Generic Cultural Awareness, manners, and cross-cultural, or intercultural communication. e-Business, International marketing and trade compliance.

CONEN 442: Transportation Engineering

Credit Hours: 3	*Lectures: 3*	*Lab/Practical: 0*	*Prerequisite: CONEN 451*

Theory and practice in highway design. Highway classification and design criteria, Location studies, design of vertical and horizontal alignment, intersections, and environmental factors. Highway drainage elements, design of bituminous and concrete pavements for highway, airports, and special heavy loading. Introduction to traffic engineering. Transportation characteristics, human and vehicle characteristics, traffic stream characteristics, and traffic volume studies. Roadway capacity, interchange capacity, accident analysis, speed studies, and travel time studies. Transportation planning, traffic safety management, traffic demand and impact studies. Introduction to traffic control devices, signing and guide signing, and pavement markings. Designing safe work zones, traffic signals, and traffic signal control systems.

CONEN 522: Senior Design Project II

Credit Hours: 4 Lectures: 0 Lab/Practical: 8 Prerequisite: CONEN 521

Individual research in a field of special interest under the supervision of a faculty member, culminating in a written report/thesis. The central goal of which is a substantive paper or written report containing significant analysis and interpretation of a previously approved topic. The Graduation Project is divided between two semesters. Methodology is developed and pre-data are collected in the first semester. Experiment is run, data is analyzed, and conclusion is sought in the second semester.

CONEN 5xx: Electives II,III

Credit Hours: 3 Lectures: 3 Lab/Practical: 0 Prerequisite: Chair Consent

A student selects under the supervision of his advisor courses in a minor field in Construction Engineering where he prefers to start his career after graduation.

ELECTIVE COURSES

CONEN 503: Construction Productivity and Quality Management

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

Introduction to the application of scientific principles to the measurement and forecasting of productivity in construction engineering. Conceptual and mathematical formulation of labor, equipment, and material factors affecting productivity. Notions of quality, quality transition, quality control and inspection, quality assurance, total quality management, a system approach to managing quality.

CONEN 513: Methods and Equipment for Construction

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

Site management. Techniques of building and civil construction; methods, materials, tools and equipment; traditional, mechanized and prefabrication construction systems. Construction detailing. Selection, sizing, matching and operation of construction equipment. Traditional and modern construction technologies. Evaluation and selection of appropriate construction technology. Value engineering. Sizing, operation and maintenance of construction equipment.

CONEN 523: Topics in Construction Management

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

This elective addresses some or all of the following topics: Risk management; Client and contractor firm organizations; Build-Operate and Transfer (BOT); Safety in construction projects; Conflict resolution in construction; Project life cycle cost and method statement; FIDIC and law.

CONEN 533: Financial Management

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

This course is designed to survey the field of finance and provide the foundation for more advanced finance coursework. Topics include sources of business and financial information, financial statement analysis, the time value of money, the nature and measurement of risk, financial institutions, investments and corporate finance.

CONEN 543: Highway Construction and Heavy Equipment

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

Earthmoving, compaction and stabilization, culvert and drainage installation, rock drilling and blasting. Pavement construction which includes the site organization, heavy equipments used in highway construction and methods utilized in the placement of asphaltic concrete pavement, portland cement concrete pavement, and asphalt surface treatments. Inspection and quality control. Contract administration and inspection in the placement of granular materials, asphaltic and portland cement concrete surface and asphalt surface treatments.

CONEN 553: Pavement Management System

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

In-depth treatment of the aspects of the system approach to pavement management. The objective of which is to achieve a good framework for pavement design, data/decision-making tools, pavement evaluation, economic evaluation, work's programming and prioritization and construction.

CONEN 563: Structure & Pavement Material Engineering

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

Reviews the analysis of strain in pavement structure, analytical method in pavement structure design, analysis of traffic load and its influence to pavement structure, advanced pavement material and its analysis method. Introduction to software for evaluating pavement structure. Students have the knowledge and comprehension concerning various alternative methods of pavement design, element and material which are used for the construction of road transportation infrastructure together with its supporting equipment.

CONEN 573: Topics in Structural Analysis

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

This elective addresses some or all of the following topics: Analysis of Indeterminate structures using moment distribution and slope deflection methods; Matrix structural analysis; Computer Applications to analyze beams, frames and trusses; Lateral loads on high-rise buildings; Structural systems for high-rise buildings; International building codes for lateral loads.

CONEN 583: Topics in Concrete Structures

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

This elective addresses some or all of the following topics: Slenderness effects in columns; Torsion in beams; Combined shear and torsion stresses; Design of flat slabs; Design of stairs; Computer applications in reinforced concrete design according to the American Concrete Institute (ACI).

CONEN 593: Topics in Foundation Engineering

Credit Hours: 3 Lectures: 3 Lab/Practical:0 Prerequisite: Passing all up to Junior

This elective addresses some or all of the following topics: Deep foundations (deep foundation capacity by SPT, deep foundation capacity by CPT, pile capacity by dynamic method (PDA), axial and uplift tests); Lateral capacity of deep foundations (lateral test, axial and lateral deformation of deep foundation, t-z method, q-z method, and p-y method); Analysis of pile groups.

CONEN 504: Topics in Steel Structures

Credit Hours: 3	*Lectures: 3*	*Lab/Practical:0*	*Prerequisite: Passing all up to Junior*

This elective addresses some or all of the following topics: Theories of ultimate behavior of metal structural members with emphasis on buckling and stability of members and frames; Torsion applied to beams, lateral-torsional buckling, combined bending and axial loading; design of connections.

CONEN 514: Design of Fixed Offshore Structures

Credit Hours: 3	*Lectures: 3*	*Lab/Practical:0*	*Prerequisite: Passing all up to Junior*

Introduction, Design criteria for environmental conditions, Platform shapes and weights, Wave forces, Member design, Joint design, Foundation piles, Load-out, transportation, installation, Corrosion and cathodic protection.

CONEN 524: Industrial Structures

Credit Hours: 3	*Lectures: 3*	*Lab/Practical:0*	*Prerequisite: Passing all up to Junior*

This course explores the Industrial structures which constitute the infrastructure of our energy, petrochemical, agriculture, and manufacturing sectors. understanding of the performance of industrial structures which requires a multi-disciplinary, holistic approach that incorporates the expertise of structural, chemical, and mechanical engineers, as well as materials scientists.

CONEN 534: Recent Topics in Construction Engineering

Credit Hours: 3	*Lectures: 3*	*Lab/Practical:0*	*Prerequisite: Passing all up to Junior*

This course covers advances and developments in construction engineering.

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