

Civil Engineering Department

Diploma of Civil Engineering

Curriculum Document

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Curriculum Approved by:

ACK College Curriculum Committee

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Foreword

In this document, a curriculum for Diploma of Civil Engineering is explained. This diploma is designed to be offered by the Civil Engineering Department of the School of Engineering at the Australian College of Kuwait – ACK.

The diploma program is a (60) Credit Hour (CH) program. These Credit Hours are distributed among the (4) academic semesters, (15) CH each. All units offered by this program are mandatory.

PROGRAM STUDENTS LEARNING OUTCOMES

GENERAL ENGINEERING LEARNING OUTCOMES

For the Engineering Diplomas, graduates will have the ability to:

- a. **Apply** science and engineering fundamentals and industry-standard hardware and software tools to solving problems.
- b. **Prepare** and **conduct** tests in the practice area, and **analyze** and **interpret** data.
- c. **Perform** tasks and procedures in a support role.
- d. **Read** and **produce** engineering drawings.
- e. **Understand** and **apply** relevant standards and codes of practice.
- f. **Identify** and **apply** engineering design principles of a standardized nature.
- g. **Appreciate** and **apply** the principles of health and safety in the workplace.
- h. **Recognize** the impact of engineering practice in global, economic, environmental and societal contexts.

TECHNICAL LEARNING OUTCOMES FOR CIVIL ENGINEERING

1. **Demonstrate** knowledge of engineering construction terms, components and component elements used in construction projects.
2. **Explain** the properties of materials related to Civil Engineering.
3. **Analyze** simple components and structures relevant to civil engineering.
4. **Recognize** the principles of construction project management.
5. **Prepare** cost estimates for simple construction projects.
6. **Interpret** design plans for concrete and steel structures.
7. **Apply** elementary analytical techniques related to problems in geo-technics, hydraulics, and transportation systems.
8. **Classify** methods of concrete production and application.
9. **Conduct** standardized field and laboratory tests on materials related to civil engineering.
10. **Utilize** surveying methods appropriate for land measurement and construction layout.

Units Distribution

The Diploma of Civil Engineering includes (20) units, each equivalent to (3) Credit Hours (CH), distributed among four academic semesters as follows:

Semester 1

Unit Code	Unit name	Pre-Requisite	Credits	Delivery	
				Lect.	Lab.
15FFSP110	English for Engineering	NA	3	3	0
15FMAT116	Engineering Mathematics I	NA	3	3	0
15FMAT119	Applied Physics	NA	3	3	2
15FCVE110	Civil Engineering Technology: Ethics & Practices	NA	3	3	0
15FCVE111	Engineering Drawings I	NA	3	3	0

Semester 2

Unit Code	Unit name	Pre-Requisite	Credits	Delivery	
				Lect.	Lab.
15FMAT127	Engineering Mathematics II	15FMAT116	3	3	0
15FCVE121	Use Surveying in Engineering	15FMAT116 15FMAT119	3	3	2
15FCVE122	Engineering Drawings II	15FCVE111	3	3	0
15FCVE123	Basic Construction	15FCVE110	3	3	2
15FCVE124	Fluid Mechanics	15FMAT116 15FMAT119	3	3	2

Semester 3

Unit Code	Unit name	Pre-Requisite	Credits	Delivery	
				Lect.	Lab.
15FCVE210	Statics	15FMAT127 15FMAT119	3	3	2
15FCVE211	Roadway Design	15FCVE121 15FCVE122	3	3	2
15FCVE212	Civil Engineering Materials	15FCVE123	3	3	2
15FCVE213	Environmental Engineering	15FCVE110	3	3	0
15FCVE214	Basics of Geotechnical Engineering	15FMAT127 15FMAT119	3	3	2

Semester 4

Unit Code	Unit name	Pre-Requisite	Credits	Delivery	
				Lect.	Lab.
15FCVE220	Construction Management	15FCVE123	3	3	2
15FCVE221	Concrete Structures	15FCVE210 15FCVE212	3	3	2
15FCVE222	Steel Structures	15FCVE210 15FCVE212	3	3	2
15FCVE223	Strength of Materials	15FCVE210	3	3	2
15FCVE224	Engineering Project (PBL)	15FCVE212	3	0	3

Units Description

Semester (1)

1. 15FFSP110 – English for Engineering [3CH, 3 Lec, 0 Lab]

English for Engineering is a one semester unit designed to meet the needs of students in the Engineering Department to research and write extensively. It aims to equip students with the necessary skills and strategies to research and source reliable academic and engineering articles and read these sources to effectively identify and synthesize relevant information and incorporate these ideas in a review report. Within the review report, students will be expected to critically analyze the pertinent issues appropriate to their chosen topic and support their research question while adhering to the academic requirements of text structure, format and referencing.

Prerequisite: None

2. 15FMAT116 – Engineering Mathematics I [3CH, 3 Lec, 0 Lab]

This unit covers essential training in indices, standard form and engineering notations, algebra, solving simultaneous equations, solving quadratic equations, inequalities, logarithms, exponential functions, areas of common shapes, circles, volumes and surface areas of common solids, irregular areas and volumes and mean values of waveforms, introduction to trigonometry, trigonometric waveform, trigonometric identities and equations, complex numbers.

Prerequisite: None

3. 15FMAT119 – Applied Physics [3CH, 3 Lec, 2 Lab]

This unit covers measurement, units, accuracy, scalars, vectors, resultants and components of vectors, linear motion, momentum, impulse, forces, moments, work, energy, power, friction, and thermal expansion, and atomic model, experiment planning and reporting.

Prerequisite: None

4. 15FCVE110 – Civil Engineering Technology: Ethics and Practices [3CH, 3 Lec, 0 Lab]

In this unit, students explore the role of engineers in ethically developing and maintaining sustainable socio-technical systems. They holistically investigate environmental, social, cultural and global impacts arising from use of renewable and non-renewable energy and resources. Students review civil engineering projects to assess their sustainability and also review professional capabilities expected of engineering associate. They evaluate personal strengths and weaknesses and develop personal improvement plans. This unit also describes the performance outcomes, skills and knowledge required to manage own performance and professional development. Particular emphasis is given on setting and meeting priorities, analyzing information and using a range of strategies to develop further competence. The unit covers accessing, inputting and storing information used in manufacturing, engineering or related environments, using computing technology.

Prerequisite: None

5. 15FCVE111 – Engineering Drawings I [3CH, 3 Lec, 0 Lab]

This unit covers demonstration and practice in surface identification and projection techniques. Topics include freehand sketching, graphic geometry, orthographic projection, sectional and auxiliary views, dimensioning, intersections, developments, and introduction to working drawings and an overview of computer graphics.

Prerequisite: None

Semester (2)

6. 15FMAT127 – Engineering Mathematics II [3CH, 3 Lec, 0 Lab]

This unit covers essential training in functions and their curves, introduction to differentiation, methods of differentiations, some application of differentiation, logarithmic differentiation, standard integration, integration using algebraic substitutions, area under and between the curves, volumes of solids revolution, vectors and the theory of matrices and determinants.

Prerequisite: 15FMAT116

7. 15FCVE121 – Use Surveying in Engineering [3CH, 3 Lec, 2 Lab]

This unit covers the use of current industry standard survey equipment to perform basic measurement and layout tasks on construction sites. Basic measurements include levelling traverse, horizontal traverse, observing short distances to industry standards and detail surveys using the grid levelling method. Volumes are calculated from spot heights.

Prerequisite: 15FMAT116 & 15FMAT119

8. 15FCVE122 – Engineering Drawings II [3CH, 3 Lec, 0 Lab]

This unit covers manipulation of the coordinate system, working with layouts (paper space), polylines and splines, blocks, attributes, dynamic blocks, external referencing, centroids and moments of inertia of complex 2D shapes, exporting to and importing from other formats.

Prerequisite: 15FCVE111

9. 15FCVE123 – Basic Construction [3CH, 3 Lec, 2 Lab]

This unit covers identification of codes/ standards used in the construction of low rise buildings, approval processes, site characteristics, structural components and materials used in low rise construction. In particular, students will learn about town planning, zoning, relevant regulations and the corresponding authorities. Furthermore, site characteristics, its effects on structure, design, and construction methods will be identified. Finally, concrete types, reinforced concrete, bricks and brickwork, steel and formwork structures will be introduced.

Prerequisite: 15FCVE110

10. 15FCVE124 – Fluid Mechanics [3CH, 3 Lec, 2 Lab]

Fluid mechanics covers properties of fluids, manometers and pressure measurement, hydrostatic pressure, forces exerted by fluids, hydraulic jack, and principle of continuity, Bernoulli's equation, flow measurement, momentum equation, and energy losses. In particular, students will learn how to relate fundamental properties to fluid characteristics, how to use energy approach to solve flow problems, and how to apply Bernoulli's equation to real life situations. Principles of force equation to impulse momentum and Newton's second law of motion will be asserted to compute the force both on bend in pipelines and on moving objects.

Prerequisite: 15FMAT116 & 15FMAT119

Semester (3)

11. 15FCVE210 – Statics [3CH, 3 Lec, 2 Lab]

This unit covers scalar/vector quantities, force, Newton's laws, free body diagrams, moments, equations of equilibrium, reactions to beams, trusses by method of joints and method of sections, shear force diagrams, bending moment diagrams.

Prerequisite: 15FMAT119 & 15FMAT127

12. 15FCVE211 – Roadway Design [3CH, 3 Lec, 2 Lab]

This unit covers the completion of the detailed design and documentation of urban road layout in Civil Construction. It covers types of roads, standards for drafting roads, terrain model (contours, features, road reserve), horizontal alignment (centerline traverse, super elevation, cross fall, changes/stations), vertical alignment (gradients, vertical intersection points, properties of vertical curves, types of vertical curves, cut/fill), cross sections, culvert details, plotting requirements.

Prerequisite: 15FCVE121 & 15FCVE122

13. 15FCVE212 – Civil Engineering Materials [3CH, 3 Lec, 2 Lab]

This unit provides students with a systematic and coherent framework for understanding the classification, properties, selection and use of materials in engineering. This gives students an opportunity to develop their awareness of the various types of materials used in engineering practice. The unit also covers the different testing methods to obtain the mechanical properties of steel and concrete; concrete mixing and placing practices; timber grading, bituminous materials; non-destructive testing.

Prerequisite: 15FCVE123

14. 15FCVE213 – Environmental Engineering [3CH, 3 Lec, 0 Lab]

This unit covers the solar system, earth (oceans and atmosphere), human story (hunters/gathers, agriculture, industrial revolution to present), population and the environment, climate change, energy crisis, effect of dams on the environment, salivation, road ecology.

Prerequisite: 15FCVE110

15. 15FCVE214 – Basics of Geotechnical Engineering [3CH, 3 Lec, 2 Lab]

This unit covers basics of soil mechanics, soil properties, grading, Atterberg limits, classification and identification of soils, compaction, and soil permeability.

Prerequisite: 15FMAT119 & 15FMAT127

Semester (4)

16. 15FCVE220 – Construction Management [3CH, 3 Lec, 2 Lab]

This unit covers roles and organizational behavior of the construction industry. It develops the students' competency in the areas of quantity take-off (utilizing AutoCAD and MS Excel), cost estimation (utilizing MS Excel), and scheduling (utilizing MS Project). Furthermore, the students gain an understanding of Quality Management and Risk Management principles as they apply to construction projects.

Prerequisite: 15FCVE123

17. 15FCVE221 – Concrete Structures [3CH, 3 Lec, 2 Lab]

This unit covers the properties of aggregates, cement, and other materials used to mix concrete. The design of concrete mix is explained in detail. Different phases of construction and quality control of concrete structures are included in the unit material. Also, the basic theories of beams, slabs, columns, footings and structural walls are discussed.

Prerequisite: 15FCVE210 & 15FCVE212

18. 15FCVE222 – Steel Structures [3CH, 3 Lec, 2 Lab]

This unit covers the supervision of civil steel structures construction tasks in Civil Construction. It includes the requirements for ensuring that the planning, preparing, initiating, monitoring, adjusting and reporting of civil steel structures construction tasks are carried out in accordance with the accepted industry principles. The students gain a deep understanding of Revit and its structural application.

Prerequisite: 15FCVE210 & 15FCVE212

19. 15FCVE223 – Strength of Materials [3CH, 3 Lec, 2 Lab]

This unit covers design of bolted and welded joint using a limit state approach, properties of plane figures (perimeter, area, first moment of area, second moment of area, radius of gyration), bending stress, combined stress (axial and bending), thin walled pressure vessels, beam deflection by formula, beam deflection by area moment, torsion of shafts.

Prerequisite: 15FCVE210

20. 15FCVE224 – Engineering Project (PBL) [3CH, 0 Lec, 3 Lab]

This Project Based Learning unit is devoted to develop and improve student learning through team work and manufacturing simple products in the ACK workshop based on a Project Based Learning (PBL) approach. It includes the implementation and practicing of safety rules and the identification of civil engineering hand tools and demonstration of their correct use to engineering standards.

Prerequisite: 15FCVE212

Assessment Framework

The assessment framework for the Diploma of Civil Engineering is based on the following principles:

1. An Academic semester at ACK is 16 weeks.
2. The number of teaching weeks in an academic semester at ACK is 13 weeks.
3. There is one week devoted to Midterm assessments “at week 8” and two weeks devoted for final assessments “weeks 15 and 16”.
4. The final semester exams will be spread over two weeks according to the departmental plans and schedule logistics.
5. Unit delivery approach (e.g. PBL, workshops, etc.)

Based on the above principles, the assessment framework will be as follows:

Conventional units:

Week #	Task	Grade weight distribution for a Unit with a lab	Grade weight distribution for a Unit without a lab
1			
2			
3			
4	Assessment tool #1	5	5
5			
6			
7			
8	Midterm Exam	30	40
9			
10			
11	Assessment tool #2	5	5
12			
13			
14	Labs	20	0
15 & 16	Final Exam	40	50
Total		100	100

Project Based Learning units:

Week #	Task	Grade weight distribution
1-13	Formative	0
13	Portfolio	100
Total		100

Drawing units:

Week #	Task	Grade weight distribution
1		
2		
3		
4		
5	Assessment tool #1	10
6		
7		
8	Midterm Assessment	30
9		
10		
11	Assessment tool #2	10
12		
13		
14		
15 & 16	Final Assessment	50
Total		100

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