



Mechanical Engineering Department

Diploma of Mechanical Engineering

Curriculum Document

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Curriculum Approved by:

ACK College Curriculum Committee



Foreword

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

The diploma program is a (60) Credit Hour (CH) program with an additional 3CH internship unit. All units offered by this program are mandatory except for the internship unit which is optional. The (60) CH of this program are distributed among the (4) academic semesters, (15) CH each.

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 MECHANICAL ENGINEERING

1. Safely **use** workshop tools, welding, and machining equipment to **fabricate** basic mechanical engineering components.
2. **Explain** fundamentals of turbines, boilers, compressors, pumps, and refrigeration systems.
3. **Recognize** basics of piping systems and turbo-machinery.
4. **Select** and **troubleshoot** pumps and valves.
5. **Apply** the mechanical engineering aspects of energy management systems and HVAC.
6. **Apply** the fundamentals of electrical engineering and mechatronics to mechanical engineering designs.
7. **Explain** the properties of materials relevant to Mechanical Engineering.
8. **Prepare** basic mechanical engineering designs.
9. **Explain** pneumatic and hydraulic systems.
10. **Identify** different types of machine failures, conduct root cause analysis and condition monitoring.

Units Distribution

The diploma of Mechanical 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-Requirement	Credits	Delivery	
				Lect.	Lab.
15FFSP110	English for Engineering	N/A	3	3	0
15FMAT116	Engineering Mathematics I	N/A	3	3	0
15FMAT119	Applied Physics	N/A	3	3	2
15FMCE110	Mechanical Engineering Technology: Ethics and Practices	N/A	3	3	0
15FMCE111	Engineering Drawings I	N/A	3	3	0

Semester 2

Unit Code	Unit name	Pre-Requirement	Credits	Delivery	
				Lect.	Lab.
15FMCE120	Mechanical Engineering Workshop I	15FMCE110	3	0	3
15FMAT127	Engineering Mathematics II	15FMAT116	3	3	0
15FMCE121	Thermal Engineering	15FMAT116 15FMAT119	3	3	2
15FMCE122	Mechanical Engineering Materials	15FMCE110	3	3	2
15FMCE123	Introduction to Electrical Equipment and Components	15FMAT116 15FMAT119	3	3	2

Semester 3

Unit Code	Unit name	Pre-Requirement	Credits	Delivery	
				Lect.	Lab.
15FMCE210	3D-CAD Modeling	15FMCE111 15FMCE122	3	3	0
15FMCE211	Engineering Fluids and Applications	15FMCE121	3	3	2
15FMCE212	Mechanical Engineering Workshop II	15FMCE120	3	0	3
15FMCE213	Engineering Mechanics	15FMAT127 15FMAT119	3	3	2
15FMCE214	Preventive Maintenance Techniques	15FMCE122	3	3	0

Semester 4

Unit Code	Unit name	Pre-Requirement	Credits	Delivery	
				Lect.	Lab.
15FMCE220	Hydraulic and Pneumatic Systems	15FMCE211	3	3	2
15FMCE221	Pumps and Valves: Selection and Troubleshooting	15FMCE211	3	3	0
15FMCE222	Introduction to Mechatronics	15FMCE213 15FMCE123	3	3	2
15FMCE223	Energy Management	15FMCE211	3	3	2
15FMCE224	Engineering Project (PBL)	15FMCE212	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. 15FMCE110 – Mechanical 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 mechanical 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, analysing 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. 15FMCE111 – Engineering Drawings I [3CH, 3 Lec, 0 Lab]

This unit covers demonstration and practice in surface identification and projection techniques, orthographic multi-views projection, missing views, dimensioning, sectioning, axonometric projection, fits and tolerances, instrument drawing and computer-aided applications.

Prerequisite: None

Semester (2)

6. 15FMCE120 – Mechanical Engineering Workshop I [3CH, 0 Lec, 3 Lab]

This unit covers engineering workshop safety, hand tools, and fundamental aspects of different welding techniques. It includes the implementation and practicing of such safety rules and the identification of engineering hand tools and demonstration of their correct use to engineering standards.

Prerequisite: 15FMCE110

7. 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

8. 15FMCE121 – Thermal Engineering [3CH, 3 Lec, 2 Lab]

This unit covers the application of thermodynamic principles to engineering applications. It includes sustainability issues; fundamental scientific principles; thermodynamics properties of gases and liquids; heat transfer; closed and open systems; continuity, enthalpy and energy transfers related to compressors, boilers, turbine heat exchangers, heat engines, refrigerators and heat pump performance

Prerequisite: 15FMAT116 & 15FMAT119

9. 15FMCE122 – Mechanical 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. It also covers the effects of environment on engineering materials; principles of failure analysis; classification of materials and justification of the selection of materials and the factors that guide adoption of materials for particular purposes.

Prerequisite: 15FMCE110

10. 15FMCE123 – Introduction to Electrical Equipment and Components [3CH, 3 Lec, 2 Lab]

This unit covers the context of electrical equipment and supply, reviews functions and features of devices, determines electrical supply and studies equipment and components required for engineering-related tasks. The unit also analyzes electrical motors and their control options for suitability. It teaches estimate power factor requirements for engineering applications and examines engineering application control.

Prerequisite: 15FMAT116 & 15FMAT119

Semester (3)

11. 15FMCE210 – 3D – CAD Modeling [3CH, 3 Lec, 0 Lab]

This unit covers 3D Computer Aided Design (CAD) environment using SolidWorks, creating and modifying 3D solid models, and producing output from the 3D model. It also includes the use of region and solid modeling techniques, section views, pre-drawn library files, extraction of properties and application of basic rendering techniques.

Prerequisite: 15FMCE111 & 15FMCE122

12. 15FMCE211– Engineering Fluids and Applications [3CH, 3 Lec, 2 Lab]

This unit provides students with an introduction to principal concepts, methods, and applications of fluid mechanics. Topics covered in this unit are properties of gases and liquids, fluid statics and dynamics, mass and momentum conservation for moving fluids, and flow through pipes. It also covers principles of turbo-machinery.

Prerequisite: 15FMCE121

13. 15FMCE212 – Mechanical Engineering Workshop II [3CH, 0 Lec, 3 Lab]

This unit covers basic bench work operations such as layout and mark dimensions, filing, cutting, tapping, shaping, drilling, cutting with hacksaw; and checking the components for conformance to specifications. Also, it covers knowledge and skills to perform butt welds, fillet welds and corner welds with Manual Metal Arc welding (MMA), Inert Gas Welding (MIG) and Gas welding processes on mild steel plate to engineering welding and safety standards.

Prerequisite: 15FMCE120

14. 15FMCE213 – Engineering Mechanics [3CH, 3 Lec, 2 Lab]

This unit covers the application of mechanics to devices, machines and systems and their components in order to identify key mechanical properties. It includes a range of basic analyzes of static and dynamic loads and moments, stresses and deflections, velocities and accelerations.

Prerequisite: 15FMAT127 & 15FMAT119

15. 15FMCE214 – Preventive Maintenance Techniques [3CH, 3 Lec, 2 Lab]

This unit covers the implementation of preventative maintenance strategy for a manufacturing enterprise. This unit may apply to a range of predictive or proactive maintenance strategies within a manufacturing environment. Topics include types of maintenance, failure detection and analysis, failure root cause analysis, condition monitoring and predictive maintenance, computerized maintenance management systems (CMMS), failure mode and effects analysis, equipment and operation management.

Prerequisite: 15FMCE122

Semester (4)

16. 15FMCE220 – Hydraulic and Pneumatic Systems [3CH, 3 Lec, 2 Lab]

This unit covers setting up and selecting components associated with single linear hydraulic and pneumatic systems. This unit refers to simple hydraulic and pneumatic circuits containing single linear actuators and motors.

Prerequisite: 15FMCE211

17. 15FMCE221 – Pumps and Valves: Selection and Troubleshooting

[3CH, 3 Lec, 0 Lab]

This unit covers basic concepts of pumps and valves which are the major components in all mechanical systems found in industrial plants, refineries, and petroleum sectors. It covers different types of pumps and valves, factors affecting pumps performance, pumps selection, types and function of different valves, and troubleshooting of pumps and valves.

Prerequisite: 15FMCE211

18. 15FMCE222 – Introduction to Mechatronics [3CH, 3 Lec, 2 Lab]

This unit covers the design, selection, analysis, and control of systems that combine mechanical elements with electronics components, including computers and or/microcontrollers. The unit focuses on essential topics in mechatronics including analog and digital devices, modeling and control of electro-mechanical systems, sensors, actuators and their applications to mechatronic systems

Prerequisite: 15FMCE123, 15FMCE213

19. 15FMCE223 – Energy Management [3CH, 3 Lec, 2 Lab]

This unit covers basic concepts in heating, ventilation, and air conditioning in relation to green buildings. Topics include heat transfer, energy resources, thermal comfort, building management systems, energy auditing and management.

Prerequisite: 15FMCE211

20. 15FMCE224 – Engineering Project (PBL) [3CH, 0 Lec, 3 Lab]

In this Project Based Learning unit, students will apply the knowledge and skills they have developed throughout their diploma program to a capstone project implemented in the workshop. They will manage the project, identify and apply required technical knowledge, develop a project problem definition from a loosely formed client brief and produce detail drawings and documentation. Students will demonstrate a system approach to design activities incorporating sustainability principles. They will operate in an ethical manner, communicate effectively and provide evidence of professional conduct and a commitment to lifelong learning.

Prerequisite: 15FMCE212

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