

# Bachelor of Engineering Technology (Electronics & Controls)

## Curriculum Document

Australian College of Kuwait

**(September 2015)**

## FOREWORD

In this document, a curriculum for Bachelor of Engineering Technology (Electronics and Controls) is explained. This Bachelor is designed to be offered by the Electrical Engineering Department of the School of Engineering at the Australian College of Kuwait – ACK.

The bachelor is a (85) Credit Hour (CH) program with an additional 4CH optional internship unit. These Credit Hours are distributed among (4) academic semesters. All units offered by this program are mandatory except the internship unit which is optional.

## BACHELOR OF ENGINEERING TECHNOLOGY PROGRAM LEARNING OUTCOMES

1. **Solve** broadly-defined engineering problems **using** theory-based analytical techniques.
2. **Design** components and systems in the engineering discipline.
3. Work as part of a team to **implement** and **complete** engineering projects.
4. **Design** and **implement** tests in the practice area, and **analyze** and **interpret** data.
5. **Supervise** and **mentor** technical and non-technical support staff in the workplace.
6. **Ensure** health and safety in the workplace.

## TECHNICAL LEARNING OUTCOMES FOR BACHELOR OF ENGINEERING TECHNOLOGY (ELECTRONICS AND CONTROLS) PROGRAM

1. **Differentiate** and **select** electronic, communication and power devices and systems.
2. **Evaluate** and **select** industry-standard instrumentation and measurement equipment in electrical engineering projects.
3. **Formulate** and **develop** software solutions and programs for programmable systems.
4. **Analyze** and **relate** analog and digital signals to various electronic, control, and communication systems.
5. **Assemble** and **test** analog and digital electrical and electronic circuits.
6. **Demonstrate** and **apply** the knowledge of power systems analysis and renewable energy generation.
7. **Assemble** and **develop** electronics and mechatronics designs to different engineering applications.
8. **Distinguish** various feedback control systems and **implement** them in areas of automatic control and stability analysis.

## UNITS DISTRIBUTION

The units of the Bachelor of Engineering Technology (Electronics and Controls) are distributed as follows:

First Semester				
Unit code	Old Code	Unit name	Pre-requisites	Credit
151ELE311	MATH1116	Introduction to Computing with C++ (PBL)	N/A	6
151ELE312	ENGI2167	Digital Logic	N/A	3
151ELE313	ELEC2160	Process Measurements	N/A	6
151ELE314	ELEC2167	Machines and Controls	N/A	3
151MAT314	MATH2104	Math III	N/A	4
Second Semester				
Unit code	Old Code	Unit name	Pre-requisites	Credit
151ELE321	ENGI2101	Engineering Economics	151MAT314	3
151ELE322	ELEC2163	Linear Integrated Circuits	N/A	3
151ELE323	ELEC2168	Programmable Logic Controllers (PBL)	N/A	6
151MAT325	MATH2205	Math IV	151MAT314	4
151ELE325	ELEC2165	Signals & Controls	151ELE314	3
Summer Semester				
Unit code	Old Code	Unit name	Pre-requisites	Credit
151ELE432	N/A	Internship	151ELE323	4
Third Semester				
Unit code	Old Code	Unit name	Pre-requisites	Credit
151ELE431	ELEC2162	Control Systems	151ELE314, 151ELE325	6
151MAT413	MATH1206	Differential and Integral Calculus	151MAT325	4
151MAT312	MATH1109	Statistics	N/A	4
151ELE434	ELEC3164	Microelectronic Design Tools (PBL)	N/A	6
151ELE435	ELEC3163	Digital Signal processing	151ELE322	3
151ELE436	ELEC2166	Industrial Electronic Circuits	151ELE322	3
Fourth Semester				
Unit code	Old Code	Unit name	Pre-requisite	Credit
151ELE441	ELEC3161	Embedded Operating Systems (PBL)	151ELE311	6
151ELE442	ELEC3166	Applied Wireless Systems	N/A	3
151ELE443	ELEC3737	Selected Topics	151ELE435	3
151ELE444	ELEC3165	Applied Integrated Circuit Systems	151ELE322	3
151ELE445	ELEC2169	Technological Thesis (PBL)	N/A	3

## UNITS DESCRIPTION

### **151ELE311 Introduction to Computing with C++ (4hr-L, 2hr-Lab)**

Prerequisite: Grade 12 Academic Mathematics.

Exclusion: Unavailable to students with credit for MATH 185.

The computer as a problem solving device. The importance of structure in problem solving and programming is emphasized. Students are expected to write and run C++ programs, including branches, loops, arrays, functions, file processing, and basic classes. Course includes lab component.

Credits: 6

Prerequisite: None

### **151ELE312 Digital Logic (3hr-L, 1hr-Lab)**

This course includes an introduction to Boolean algebra, encoders, decoders, shift registers and asynchronous and synchronous counters. Design of asynchronous circuits, synchronous sequential circuits, and finite state machines is covered. Programmable logic is introduced. K-map techniques are taught. Digital analysis software is used.

Credits: 3

Prerequisite: None

### **151ELE313 Process Measurements (4hr-L, 2hr-Lab)**

The concept of process measurement as used in process industries. Includes an in-depth study of transducers for pressure, temperature, level, and flow. Hands-on applications.

Credits: 6

Prerequisite: None

### **151ELE314 Machines and Controls (3hr-L, 1hr-Lab)**

Study of DC and AC machines that focus on the application of voltage and torque calculations to the selection of generators and motors in typical circuit applications. Students will gain experience in the laboratory working with machines in a controlled environment. Study of industrial machine control systems includes start/stop and speed control of DC and AC motors.

Credits: 3

Prerequisite: None

### **151MAT314 Math III (4hr-L, 2hr-T)**

Applications of the derivative, Newton's Method, curvilinear motion, maximum and minimum problems, derivatives of sine and cosine functions and introduction to integration.

Credits: 4

Prerequisite: None

**151ELE321 Engineering Economics (3hr-L, 1hr-T)**

Deals with the economics of decision-making. After introduction of fundamental concepts and cash flow diagrams, interest factors are dealt with in detail. Students apply the concepts to a variety of engineering designs and management issues, both locally and internationally.

Credits: 3

Prerequisite: 151MAT314

**151ELE322 Linear Integrated Circuits (3hr-L, 1hr-Lab)**

Linear integrated circuit applications are examined. Emphasis on operational amplifier circuits including comparators, inverting and non-inverting amplifiers, signal generators, and active filters. Op-amp DC and AC performance are analyzed. Other circuits studied include the 555 timer.

Credits: 3

Prerequisite: None

**151ELE323 Programmable Logic Controllers (4hr-L, 2hr-Lab)**

The role of special use computers in the electrical power industry. Develops expertise in logic controller programs.

Credits: 6

Prerequisite: None

**151MAT325 Math IV (4hr-L, 2hr-T)**

Differentiation of transcendental functions and applications, areas and volumes by integration, methods of integration, and introduction to differential equations.

Credits: 4

Prerequisite: 151MAT314

**151ELE325 Signals & Controls (3hr-L, 1hr-Lab)**

This course will introduce the classification of signals and systems, signal and system properties and their applications, linear time-invariant systems, periodic signal and Fourier series, continuous-time Fourier transform, Laplace transform, z-transform and their application mainly in control and communication systems.

Credits: 3

Prerequisite: 151ELE314

**151ELE432 Internship (5 hours x 6 weeks x 5 days = 150 hours)**

This course covers the professional experience, through training in the execution of real life engineering projects. Practical training aims at developing practical skills for the student so that he/she might develop an awareness of job requirements and become qualified to practice a specialization in a sound and systematic way. It might also help a student to find or locate later job opportunities at the same training site if he/she is able to demonstrate competence and obtain the satisfaction of the Field Supervisor and those responsible at the site.

Credits: 4

Prerequisite: 151ELE323

**151ELE431 Control Systems (4hr-L, 2hr-Lab)**

An advanced study of theoretical, industrial control system techniques and concepts with emphasis on control system design, configuration, modeling, and performance evaluation.

Credits: 6

Prerequisite: 151ELE314, 151ELE325

**151MAT413 Differential and Integral Calculus (4hr-L, 2hr-T)**

Techniques of integration, applications to areas, volumes, work, liquid pressure and arc length, inverse trigonometric, hyperbolic functions, infinite sequences and series, and Taylor's Theorem.

Credits: 4

Prerequisite: 151MAT325

**151MAT312 Statistics (4hr-L, 2hr-T)**

Descriptive statistics, elementary probability, binomial and normal distributions, sampling distributions, estimations and hypothesis testing, regression, and correlation.

Credits: 4

Prerequisite: None

**151ELE434 Microelectronic Design Tools (4hr-L, 2hr-Lab)**

The student will be able to apply techniques in a wide variety of microelectronics design environments. This course provides experience in applying design tools such as Pspice, Xilinx Web Pack, and Mat Lab to basic systems solutions. Also included are applications of advanced industrial design tools such as Mentor Graphics, Cadence Analog Workbench, and CMC Design Flow for Digital Systems.

Credits: 6

Prerequisite: None

**151ELE435 Digital Signal Processing (3hr-L, 1hr-Lab)**

The student will develop a basic understanding of immensely powerful digital signal processing techniques, a skill needed by scientists as well as engineers, through demonstrations and the application of basic techniques. Complex number systems are treated as an advanced topic that underpins and extends the power of digital signal processing.

Credits: 3

Prerequisites: 151ELE322

**151ELE436 Industrial Electronic Circuits (3hr-L, 1hr-Lab)**

A study in the theory and analysis of solid-state devices using computer software to illustrate concepts.

Credits: 3

Prerequisite: 151ELE322

**151ELE441 Embedded Operating Systems (4hr-L, 2hr-Lab)**

The student will be able to use a variety of embedded operating systems in the application of development of electronic solutions for design challenges. In particular, the student will develop skills programming techniques, applications of embedded systems development platforms, and implementation of real-time systems using UNIX and Linux programming environments.

Credits: 6

Prerequisites: 151ELE311

**151ELE442 Applied Wireless Systems (3hr-L, 1hr-Lab)**

Students will be able to apply wireless design techniques using spread spectrum systems and enhance their understanding of wireless techniques used in all types of communications systems and products. An intuitive approach is used to provide a real feel for the technology, with applications to many types of wireless networks.

Credits: 3

Prerequisite: None

**151ELE443 Selected Topics (3hr-L)**

This course provides a forum for directed study on a number of issues and concerns within the present state of the electronics discipline and industry. Faculty as well as guest lecturers from academia, industry, and government will address students on pertinent topics and developments. Site visits, visual presentations, and student exercises will supplement these seminars.

Credits: 3

Prerequisite: 151ELE435



**151ELE444 Applied Integrated Circuit Systems (3hr-L, 1hr-Lab)**

The student will be able to design, analyze, and simulate circuits used as building blocks in very large scale integration (VLSI) electronic devices using CAE tools. Principles of semi-custom integrated circuit (IC) and their use in VLSI design are introduced. Skills are acquired in reconfiguration of field programmable gate arrays (FPGA) to change their function while resident in a system in use in the field, and dynamically to perform different functions at different times.

Credits: 3

Prerequisite: 151ELE322

**151ELE445 Technological Thesis (3hrs)**

A 3,000+ word thesis in the discipline area in which registration or certification is sought. See Department Chair.

Credits: 3

Prerequisite: None

