Associate Diploma in Electrical Engineering -2023

Program Components

Course Type	CRD
University Requirement (UR)	**5**
College Requirement (CR)	**9**
General Studies Compulsory (GSCC)	
Major Requirement (MR)	**45**
Major Support Requirement (MSR)	**7**
Major Elective (ME)[1]	
General Studies Elective (GSE)[2]	
Training (Internship) **Yes**	**2**
Total Credit (CRD)	**68**

Detailed Study Plan

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS101	General Physics I	3	3	4	MSR	…	NO
ENGL101	Communication Skills I	3	0	3	CR	…	NO
MATHS101	Calculus I	3	0	3	CR	...	NO
CSC103	Computer Programming for Scientists and Engineers	3	2	3	MSR	…	NO
EEDA 101	Electrical Circuits	3	1	3	MR	---	Yes
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Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
HIST 122	Modern History of Bahrain and Citizenship	3	0	3	UR		NO
HRLC107	Human Rights	2	0	2	UR	…	NO
ENGL102	Composition and Reading II	3	0	3	CR	ENGL 101	NO
EEDA 102	Electrical Installation I	2	3	3	MR	CSC 103 & EEDA 101 OR EENG 100	Yes
EEDA 212	Electrical Workshop I	1	6	3	MR	EEDA 101 OR EENG 100	Yes
ETDA 161	Electronics Fundamentals	3	1	3	MR	Maths 101 & PHYCS 101	Yes
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Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
EEDA 202	Electrical Installation II	2	3	3	MR	EEDA 102	Yes
EEDA 211	Power Systems	3	1	3	MR	EEDA 101 Or EENG 100	Yes
EEDA 231	Power Electronics I	2	3	3	MR	ETDA 161 OR EENG261	Yes
EEDA 241	Electrical Machines I	2	3	3	MR	EEDA 101 Or EENG 100	Yes
EEDA 280	Control Systems	3	1	3	MR	ETDA 161 OR EENG261	Yes
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Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
EEDA 242	Electrical Machines II	3	3	4	MR	EEDA 241	Yes

EEDA 243	Electrical Workshop II	1	6	3	MR	EEDA 231 & EEDA 241	Yes
EEDA 244	Maintenance and Repair of Electrical Motors	3	1	3	MR	EEDA 241	Yes
EEDA 213	Transmission and Distribution	3	1	3	MR	EEDA 211	Yes
EEDA 214	Electrical Power Generation	3	1	3	MR	EEDA 211	Yes
EEDA 293	Diploma Project	0	6	2	MR	Completion of 45 CRD	Yes
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Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
EEDA 297	Industrial Training	0	0	2	MR - Training	Completion of 45 CRD	Yes

Course Description

Course Code: EEDA 101 **Course Title: Electrical Circuits**
Circuit elements: Resistance, inductance and capacitance. Fundamental circuit laws, DC circuit analysis, Sinusoidal steady-stata analysis of AC circuits. Phasors and phasor diagrams, Apparent, active and reactive power. Energy storage in inductance and capacitance, three-phase circuits.
Magnetic circuits.

Course Code: EEDA 102 **Course Title**: Electrical Installation I
Electrical hazards and safety. Electric power supply systems. Installation fundamentals and distribution of supplies in buildings. Conduit systems. Cables. Design and arrangements of final circuits. Practical aspects of installation design; load current estimation including correction factors and voltage drop calculation. Selection of cables and protective devices. Resizing of cables for overloading. Protection against electric shock; direct and indirect contact, earthing and bonding.

Course Code: EEDA 202 **Course Title**: Electrical Installation II
Overcurrent protection; overload and short-circuit current protection. Electrical drawing techniques for commercial and industrial installations. Design and arrangements of industrial final circuits. Design aspects of industrial installation systems. Power cable layout methods; busbar and catenary, duct, trunk and cable tray systems. Special types of installations; fire alarm, bathroom, swimming pool, construction sites and agricultural premises. Inspection and testing of installations; equipment and techniques.

Course Code: EEDA 211 **Course Title:** Power Systems
Review of three phase systems: Advantages, star and delta connection, real, apparent power, reactive powers. Main components of a power system: Alternators, Overhead lines, cables, power transformers, loads, and representation of Power system. Overhead lines: parameters calculation: Inductance, capacitance, earth effect, Bundling. Underground cables parameters calculation. Mechanical aspects in designing overhead lines. Power transformers: ratings, representation, and performance.

Course Code: EEDA 212 **Course Title**: Electrical Workshop I
Electrical safety procedures. Electrical installation work procedures; tools and equipment, joining materials. Supports land fixing methods for cabling and equipment. Installation procedures for industrial distribution boards. Power cable wiring; cable trays and trenches. Installing remote controlling, and pole changing of three-phase ac motors. Testing and inspecting single-phase and three-phase installation. CT selection and application in relaying. Overcurrent and differential relay settings. Reactive power compensation. Maintenance procedures for power equipment. HV measurement techniques. HV testing procedures for testing power equipment.

Course Code: EEDA 213 **Course Title**: Transmission and Distribution
Line models and performance, corona effect, magnetic field effect, power transfer capability, reactive power compensation. Insulators of overhead lines: construction, types, testing. DC transmission: principle and advantages. Grid systems. Sub-transmission. Load characteristic. Distribution transformers. Distribution substations. Voltage drops and power loss calculation. Distribution system and voltage regulation.

Course Code: EEDA 214 **Course Title**: Electrical Power Generation
Introduction: Main components of a Power plant. Conventional and renewable energy sources. Power Plants: Steam-Turbine, Gas-Turbine, Hydro-electric, diesel-electric, nuclear. Alternators: Capability Chart, synchronization, excitation systems, automatic voltage regulators, speed governors, cooling. Variable load on power system: Load curve, Load duration curve, related factors. Economics of power generation: Generation cost and tariff .Power factor improvement and most economical power factor.

Course Code: EEDA 231 **Course Title:** Power Electronics I

Characteristics of power semiconductor devices: Diode, thyristor, UJT. Thyristor ratings and Protection. Triggering circuits. Rectifiers: Uncontrolled and controlled, single and three phase, half and full-wave rectifiers. Harmonics, DC filters. Single phase AC voltage regulator.

Course Code: EEDA 241 **Course Title:** Electrical Machines I
Magnetic circuits. Single and three-phase transformers: Constructions, windings, equivalent circuit, connection groups, terminal marking, losses and cooling methods. Autotransformers. Voltage and Current transformers. Toroidal current transformers. High impedance transformers and phases shift transformers. Three phase induction motors: Principles of operation, construction, windings, equivalent circuit and performance, determination of equivalent circuit parameters, starting and speed control methods. Single phase induction motors: Types, characteristics, starting and speed control.

Course Code: EEDA 242 **Course Title:** Electrical Machines II
DC motors: construction, operating principles, mechanical power and torque, characteristics, armature reaction, starting and speed control, winding constriction. DC generators: voltage generation and control, excitation systems and types, equivalent circuits and various characteristics. Synchronous Generators: construction, types, rotating field and voltage generation, excitation systems, equivalent circuit and performance, operation on infinite bus. Synchronization Synchronous motors: starting method, power and torque, excitation and reactive power, V-curves. Servomotors and stepper motors.

Course Code: EEDA 243 **Course Title:** Electrical Workshop II
Design and construction of firing circuits for single and three-phase rectifiers, inverters and ac voltage controllers. Design of and construction of single phase transformer core and winding. Design and construction of coils for various purposes. Wiring of motor contactor circuits. General requirements for winding and rewinding of motor windings. Design and construction of motor windings and rewinding of burned out motor windings. Design and construction of firing circuits for electrical motors. Installation of Motor starting and stopping devices.

Course Code: EEDA 244 **Course Title**: Maintenance and Repair of Electrical Motors
Fault diagnostic in various electrical motors. Failures and maintenance: General aims, overhaul procedures, Standard maintenance procedures, Removal of motors from site, Cleaning. Assessing need for refurbishment or replacement of components. Preventive maintenance. Condition monitoring. Optimal maintenance strategies. Identifying causes of failures. Rewinding three-phase motors: Taking data, stripping the winding, group winding, placing coils in slots, rewinding for dual voltage and dual speed, identifying dual voltage terminal tags. Maintenance and repair of DC motors: Most common problems of DC motors. Identifying the winding faults. Winding procedure and post winding procedures. Preventive maintenance of DC motor windings.

Course Code: EEDA 280 **Course Title:** Control Systems
Main components of control systems. Open and closed loop systems. Feedback systems. Block diagrams. Transducers, synchros and amplifiers. Inspection, testing and care of control system components. Microcontroller and microcomputer applications in control systems. Description of transient and steady-state response of position, pneumatic and hydraulic control systems, and actuators frequency response of simple electric network, stable and unstable systems.

Course Code EEDA 293 **Course Title** Diploma Project
Each student is required to select and electrical engineering project and work under a faculty advisor. The project can be completed either at College of Engineering or on site an industrial setting upon completion of the project, the student must submit written report outlining the various phases of the project and also must give an oral presentation.

Course Code EEDA 297 **Course Title** Industrial Training
Each student must practice in a training program in relevant industry where he/she is expected to gain practical experience in a real engineering situation. At the end of the training period, the student must submit a formal report.

University Requirements Courses Descriptions

Course Code: HIST 122 **Course Title:** Modern History of Bahrain and Citizenship

Spatial identity of Bahrain: Brief history of Bahrain until the 18th century; the historical roots of the formation of the national identity of Bahrain since the 18th century; the modern state and evolution of constitutional life in Bahrain; the Arabic and Islamic dimensions of the identity of Bahrain; the core values of Bahrain's society and citizenship rights (legal, political, civil and economic); duties; responsibilities and community participation; economic change and development in Bahrain; Bahrain's Gulf, Arab and international relations.

Course Code: HRLC 107 **Course Title:** Human Rights Principles

This course deals with the principles of human rights in terms of the definition of human rights, scope, sources with a focus on the International Bill of Human Rights; The Charter of the United Nations; Universal Declaration of Human Rights; The International Covenant on Economics, Social and Culture rights; Convention against Torture and other Cruel, Inhuman or Degrading Treatment or Punishment; Mechanics and the Constitutional Protection of Rights and Public Freedoms in Kingdom of Bahrain.

College Requirement Courses Descriptions

Course Code: ENGL 101 **Course Title**: Communication Skills I
This course focuses on reading skills and strategies and language development. The reading section concentrates on high-interest contemporary topics and encourages students to increase speed and efficiency. The writing component, integrated to the reading materials, reviews grammatical structures, develops language accuracy and introduces paragraph writing. Students are required to upgrade their grammar, reading, and listening skills on the internet.

Course Code: MATHS 101 **Course Title**: Calculus I
Algebra. Functions and graphs. Trigonometry. Conic sections. Limits and continuity. Derivatives and integrals. Applications of derivatives which include mean value theorem, extrema of functions and optimization. Definite integrals and the Fundamental Theorem of Calculus.

Major Support Requirement Courses Descriptions

Course Code: PHYCS 101 **Course Title:** General Physics I
Units and measurements; brief review of vectors; Newton's laws of motion; projectile motion; work and energy; impulse and momentum; rotational dynamics; equilibrium of a rigid body; periodic motion.

Course Code **ETDA 161** **Course Title** Electronic Fundamentals
Semiconductor concepts, PN junction diode: Characteristics, modeling, and applications. Zener and Special purpose diodes. Ideal. Operational amplifier (Opams): Characteristics, modeling, and linear and nonlinear applications. Bipolar Junction Transistors (BJTs) and Field Effect Transistors)FETs): Characteristics, DC analysis, Biasing and AC analysis, Single stage amplifiers, Switches.

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