

# Associate Diploma in Mechanical Engineering - 2023

## Program Components

<b>Course Type</b>	<b>CRD</b>
<b>University Requirement (UR)</b>	<b>5</b>
<b>College Requirement (CR)</b>	<b>9</b>
<b>Major Support Requirements (MSR)</b>	<b>15</b>
<b>Major Requirement (MR)</b>	<b>39</b>
<b>Training (Internship) Yes</b>	<b>2</b>
<b>Total Credit (CRD)</b>	<b>70</b>

## Detailed Study Plan

### Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
PHYCS 111	Fundamentals of Physics	3	3	4	MSR		NO
ENGL 101	COMMUNICATION SKILLS I	3	0	3	CR		NO
CSC103	Computer Programming for Scientists and Engineers	3	2	3	MSR	...	NO
MATHS 101	CALCULUS I	3	0	3	CR		NO
CHEMY 101	General Chemistry	3	3	4	MSR		NO
TOTAL		15	8	17			

### Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ENGL102	Composition and Reading II	3	0	3	CR	ENGL 101	NO
MEDA 111	Workshop Technology	0	3	1	MR	PHYCS 111	Yes
MEDA 161	Fundamentals of Engineering Drawing	1	5	3	MR		YES
MEDA 121	Mechanics	3	1	3	MR	MATHS 101	YES
MEDA 112	Material Technology	2	3	3	MR	PHYCS 111	Yes
HRLC 107	HUMAN RIGHTS	2	0	2	UR		NO
<b>TOTAL</b>		<b>11</b>	<b>12</b>	<b>15</b>			

### Year 2 - Semester 3

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
EEDA109	Electrical Technology	3	3	4	MSR	PHYCS 111	NO
MEDA 213	Manufacturing Technology I	2	3	3	MR	MEDA 112	Yes
MEDA 222	STRENGTH OF Materials	2	3	3	MR	MEDA 121 OR MENG163	Yes
MEDA 231	Thermodynamics	3	1	3	MR	PHYCS 111	Yes
MEDA 232	Fluid Mechanics	2	3	3	MR	MATHS 101	Yes
<b>TOTAL</b>		<b>13</b>	<b>13</b>	<b>19</b>			

**Year 2 - Semester 4**

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MEDA 215	Quality Assurance in Manufacture	3	1	3	MR	MEDA 213 OR MENG210	Yes
MEDA 223	Mechanics of Machines	2	3	3	MR	MEDA121 OR MENG 163	YES
MEDA 214	Manufacturing Technology II	2	3	3	MR	MEDA 213 OR MENG210	Yes
MEDA 233	Thermal Equipment	2	3	3	MR	MEDA 231 OR MENG 231	Yes
MEDA 271	Instrumentation and Control	2	3	3	MR	EEDA 109 OR EENG 109 & MEDA 232	Yes
MEDA 293	Diploma Project	0	6	2	MR	Completion of 45 CRD	Yes
TOTAL		11	19	17			

**Training Requirement**

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
MEDA297	Industrial Training	0	0	2	MR - Training	Completion of 45 CRD	Yes
TOTAL		45	47	70			

## Course Description

**Course Code:** MEDA 111

**Course Title:** Work Shop Technology

Safety procedures in mechanical workshops, engineering materials, measurement methods, the use of Werner, micrometres, protractor, different rulers. Hand tools and its usage, the working bench, divider, hammer, saw, molds, maintenance tools. The basic operations: sand casting, extrusion, lathe machining, grinding, drilling, forming, welding, gas welding, arc welding, spot welding, forming: sheet metal forming, cutting bending, cylindrical forming, rivets fitting.

**Course Code:** MEDA 112

**Course Title:** Materials Technology

Introduction: Classification, structure, properties and applications of materials. Structural defects. Diffusion in solids. Phase diagrams. Phase transformations and development of microstructure. Industrial alloy systems. Strengthening methods. Metallography. Polymers, ceramics and composites: characteristics, applications, and introduction to processing. Failure of materials: Ductile and brittle fracture, Fatigue and creep. Toughening methods. Mechanical and non-destructive testing. Materials selection and design considerations. Computer applications in materials

**Course Code:** MEDA 121

**Course Title:** Mechanics

Vector manipulation, forces in plane and equilibrium of objects, moment and moments of couples, centroid and moments of inertia of composite areas, simple trusses and frames friction of square-threaded screws, wedges and belts, kinematics and kinetics of objects in linear and angular motions, linear and angular momentums, work, energy, power impulse and impact.

**Course Code:** MEDA 161

**Course Title:** Fundamentals of Engineering Drawing

Introduction to technical CAD and manual drawing, Visualizing, use of engineering drawing tools, types of lines, construction of different engineering objects, polygons, circles, tangents, ellipse, isometric projections, oblique projections, orthographic projections, sectional views, Auxiliary views, introduction to different electrical and mechanical designs.

**Course Code:** MEDA 214

**Course Title:** Manufacturing Technology II

Sheet metal work processes. Metal cutting: Principles of metal cutting, orthogonal and oblique cutting, cutting tool materials, tool types, cutting fluids, machinability of metals, economics of metal cutting. Non-traditional machining process: Electrical-discharge machining, Electrochemical machining, applications. Numerical control machining: Principles of numerical control machines, types of control system, applications. Metrology: Principles of metrology, surface texture, straightness, flatness, roundness.

**Course Code:** MEDA 215

**Course Title:** Quality Assurance In Manufacture

Function and importance of quality in manufacturing. Definition of quality and its dimensions. International quality standards and specifications. Quality and reliability. Cost of quality. Processes and measurements: Process variability and measurement variability. Causes of process variability and drift. Introduction to statistical quality control: Control charts for variables and attributes. Acceptance sampling techniques.

**Course Code:** MEDA 222

**Course Title:** Strength Of Materials

Types of loads and stresses: axial, bending, torsional and combined stresses. Stress concentration. Principle stresses. Thin and thick walled pressure vessels. Strain measurement. Elastic failure criteria. Design of shafts, keys, couplings, screws and bearing selections. Standards for bolts, chains and wire ropes.

**Course Code:** MEDA 223

**Course Title:** Mechanics Of Machines

Definition of Mechanisms, Four-Bar linkage, Kinematics of Machinery; Velocity and Acceleration using graphical and Semi Graphical Methods, Graphical Design of Cams, Spur and Helical Gears, Gear trains, Force Analysis of Simple Machinery, Balancing of Rotors and Reciprocate Machines. The Course is geared towards application and practical problems, laboratory and shop are used to familiarize student with mechanisms.

**Course Code:** MEDA 231

**Course Title:** Thermodynamics

Energy, Systems, Properties, Processes, Cycles, Properties Tables, Ideal gases and ideal gas laws, First law of Thermodynamics, Flow work, Steady flow Devices, Specific heat capacity, Second law of thermodynamics, Gas cycles and internal combustion engines, vapour cycles, Gas mixtures and real gas behaviour, Psychometric chart, Combustion.

**Course Code:** MEDA 232                      **Course Title:** Fluid Mechanics

Pressure in a static fluid, The conservation laws, The continuity equation, Conservation of mass, Conservation of energy, Momentum, The transport laws, Flow and flow rate, Fluid flow, Momentum transfer, Ideal incompressible flow, internal flow with friction, internal flow systems, external flow propulsion, turbo machinery.

**Course Code:** MEDA 233                      **Course Title:** Thermal Equipment

Introduction to the thermal equipment, Flow energy equations, Performance of internal combustion engines, Load control, Basic of heat transfer, Modes of heat transfer, Overall heat transfer coefficient, Heat exchangers, Types and configurations, Propulsion, Aircraft performance, Refrigeration and air conditioning machines, Performance and maintenance.

**Course Code:** MEDA 271                      **Course Title:** Instrumentation And Control

Standard measuring systems Signal processing, Measurement errors, Electrical measurements, Transducers, measurements of displacement, Pressure, Flow, Temperature, and Vibration. Control fundamentals: Hydraulic, Mechanical and Electrical systems, Block diagrams, Transfer functions, Types of controls, Transient response, Dynamic characteristics, and System stability. Case studies of complete systems.

**Course Code:** MEDA 293                      **Course Title:** Project

This course is designed to present a practical assignment to the student. The project requires the integration of the core courses of the program and includes aspects of design, material selection and manufacturing processes. The student is required to submit a comprehensive report on the project.

**Course Code:** MEDA 297                      **Course Title:**

Each student must participate in a training program in the relevant industry where he/she is expecting to gain practical experience in a real engineering situation. At the end of the training period, the student must submit a formal report. The minimum acceptable period is 300 hours of supervised training.

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## University Requirements Courses Descriptions

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**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.

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## College Requirement Courses Descriptions

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**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.

**Course Code:** ENGL102      **Course Title:**

## Major Support Courses Descriptions

**Course Code:** CHEMY 101      **Course Title:** General Chemistry I

Significant figures, chemical formulas and equations; mass relations, limiting reactants and theoretical yield; Physical behaviour of gases; electronic structure, periodic table, covalent bonding; Lewis structures, Molecular structures, hybridization; molecular orbitals, solutions; colligative properties. Related practical work.

**Course Code:** EEDA 109      **Course Title:** Electrical Technology

Introduction to basic circuit of Electrical and Electronic Engineering. Provide the basic tools of circuit analysis and design, basic measurements, simple modeling.

**Course Code:** PHYCS 111      **Course Title:** Fundamentals of Physics for Engineering and Education

Vectors and scalars; straight line and projectile motion; Newton's laws of motion; work, energy and power, momentum and impulse; rotational motion; periodic motion; the electric field; Gauss's law; electric potential; capacitance and dielectrics; magnetic fields and magnetic forces.