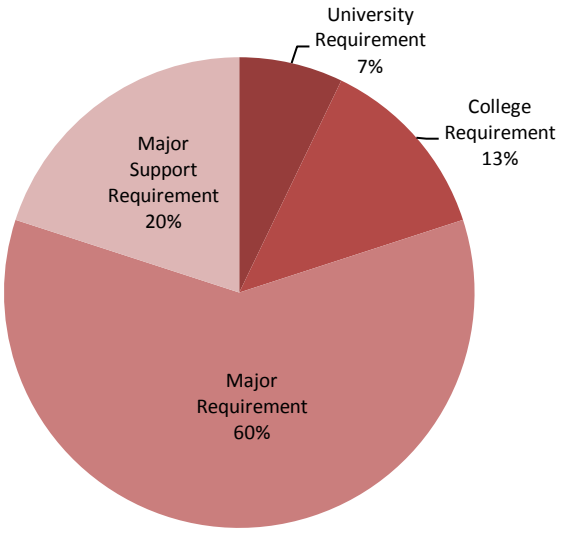
# Associate Diploma in Mechanical Engineering –2017

## Program Components

| Course Type | CRD |
|---|---|
| **University Requirement (UR)** | **5** |
| **College Requirement (CR)** | **9** |
| **Major Requirement (MR)** | **40** |
| **Major Support Requirement (MSR)** | **14** |
| **Training** (Internship) **Yes** | **2** |
| **Total Credit (CRD)** | **70** |




## Teaching Language: English

## 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 | 2 | 4 | MSR | ------ | No |
| ENGL 101 | COMMUNICATION SKILLS I | 3 | 0 | 3 | CR | ------ | No |
| CSC 103 | 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 |

### Year 1 - Semester 2

| Course Code | Course Title | Course Hours | | | Course Type | Pre requisite | Major GPA |
|---|---|---|---|---|---|---|---|
| | | LEC | PRAC | CRD | | | |
| ENGL 102 | Composition and Reading II | 3 | 0 | 3 | CR | ENGL 101 | No |
| MENG 110 | WORKSHOP PROCESSES | 1 | 3 | 2 | MR | ------ | Yes |
| MENG 160 | ENGINEERING GRAPHICS | 2 | 6 | 4 | MR | ------ | Yes |
| MENG 163 | STATICS | 3 | 1 | 3 | MR | PHYCS 111 | Yes |
| MENG 201 | MATERIALS SCIENCE | 3 | 1 | 3 | MR | CHEMY 101 | Yes |
| HRLC 107 | Human Rights | 2 | 0 | 2 | UR | ------ | No |

## 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 |
| EENG 109 | CIRCUIT THEORY | 3 | 1 | 3 | MSR | PHYCS 111 | No |
| MENG 210 | MANUFACTURING PROCESSES I | 3 | 1 | 3 | MR | MENG 110 | Yes |
| MEDA 222 | Strength Of Materials | 2 | 3 | 3 | MR | MENG 163 | Yes |
| MEDA 231 | Thermodynamics | 3 | 1 | 3 | MR | PHYCS 111 | Yes |
| MEDA 232 | Fluid Mechanics | 2 | 3 | 3 | MR | MATHS 101 | Yes |

## 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 | MENG 210 | Yes |
| MEDA 223 | Mechanics Of Machines | 2 | 3 | 3 | MR | MENG 163 | Yes |
| MEDA 214 | Manufacturing Technology II | 2 | 3 | 3 | MR | MENG 210 | Yes |
| MEDA 233 | Thermal Equipment | 2 | 3 | 3 | MR | MEDA 231 | Yes |
| MEDA 271 | Instrumentation And Control | 2 | 3 | 3 | MR | EENG 109 & MEDA 232 | Yes |
| MENG 290 | Junior Project | 0 | 3 | 1 | MR | Completion of 45 CRD | Yes |

**Training Requirement**

| Course Code | Course Title | Course Hours | | | Course Type | Pre requisite | Major GPA |
|---|---|---|---|---|---|---|---|
| | | LEC | PRAC | CRD | | | |
| MENG 390 | Industrial Training | 0 | 6 | 2 | MR-Training | Completion of 45 CRD | Yes |

## Course Description

**Course Code:** MENG 110 **Course Title:** Workshop Processes
Safety in workshop. Engineering materials. Measurements: linear and angular measurements, gauges and comparison measurements. Layout tools and procedures. Hand tools and bench works. Material removal processes: shaping, turning, milling, drilling and grinding. Casting and forming processes: sand casting, centrifugal casting, forging, rolling, and sheet metal works. Joining processes: gas welding, arc welding, resistance welding and plastic welding.

**Course Code:** MENG 160 **Course Title:** Engineering Graphics
Introduction to AutoCAD, basic AutoCAD 2-D drawing and modifying commands: isometric and oblique views, orthographic projection, sectional and auxiliary views, linear dimensioning, fundamentals of interpenetrations and developments of surfaces. Limits and fits: geometric tolerances, fasteners and fastenings, surface finish notations, welds and welding symbols and representations of standard elements.

**Course Code:** MENG 163 **Course Title:** Statics
Introduction to statics, forces in plane, forces in space, equilibrium of particles and rigid bodies in two and three dimensions, centroid and center of gravity, distributed forces, moment of inertia, analysis of trusses, frames and machines, forces in beams, friction in square-threaded screws and bolts, method of virtual work.

**Course Code:** MENG 201 **Course Title:** Materials Science
Introduction and classification of materials. Bonding. Structure of Materials. Imperfections in solids. Phase diagrams and microstructure. Diffusion. Phase transformations. Mechanical behavior of materials. Viscoelasticity. Electrical and magnetic properties. Effect of environment on behavior of materials. Introduction to failure analysis. Materials selection in mechanical design. Case studies. Use of computers in materials science.

**Course Code:** MENG 210 **Course Title:** Manufacturing Processes I
Production of iron and steel. Production of aluminum. Metal casting: sand casting, die casting, and investment casting. Bulk deformation processes: hot and cold working, forging, rolling, extrusion and drawing. Joining of materials: welding of metals, adhesive joining.

**Course Code:** MENG 290 **Course Title:** Junior Project
The course is meant to develop creative design skills in the students by exposing them to some ongoing important projects in the country and requiring them to submit report on a chosen project highlighting various design components. Field trips may be arranged in coordination with the industry. The project will emphasize independent learning and teamwork. The lectures will include introduction to chemical engineering profession, description of various areas of specialization, professional report writing techniques and the role of chemical engineers in the society.

**Course Code:** MEDA 214 **Course Title:** Manufacturing Technology II
Sheet metal work processes. Metal cutting: Principles of metal cutting, orthogonal and oblige 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:** MENG 390 **Course Title:** Industrial Training

In this industrial training course all students in the program must participate in an approved training program in the relevant industry. At the completion of 300 hours of supervised training each student must submit a formal report and conduct an oral presentation.

# College Requirement and Major Support Courses Descriptions

**Course Code:** CSC 103 **Course Title:** Computer Programming for Scientists and Engineers
Introduction to computers, their uses, development, components, hardware, and software. Internal representation and numbering systems. Algorithmic problem solving principles. Introduction to a modern programming language (e.g. C++). Input/Output, conditional statements, iteration, files, strings, functions and arrays. Lab assignments to practice programming.

**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:** ENGL 102 **Course Title:** Composition and Reading II
A continuation of English 101 which further develops the students' skills in reading and writing. The course exposes students to wider range of reading material aimed at developing their understanding of different styles of English.

**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:** EENG 109 **Course Title:** Circuit Theory
Circuit elements; resistors, inductors and capacitors. Ohm's law. Dc circuit analysis tools. Phasors and sinusoidal AC circuit analysis. Bridge circuits. Power, power factor and energy in AC circuits. Analogy between thermo-mechanical systems and electrical systems.

**Course Code:** CHEMY 101 **Course Title:** General Chemistry I
Significant figures, chemical formulas and equations; mass relations, limiting reactions and theoretical yield; Physical behavior of gases; electronic structure, periodic table, covalent bonding; Lewis structures, Molecular structures, hybridization; molecular orbitals, solutions; colligative properties. Related practical work.

**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.

# 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

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.