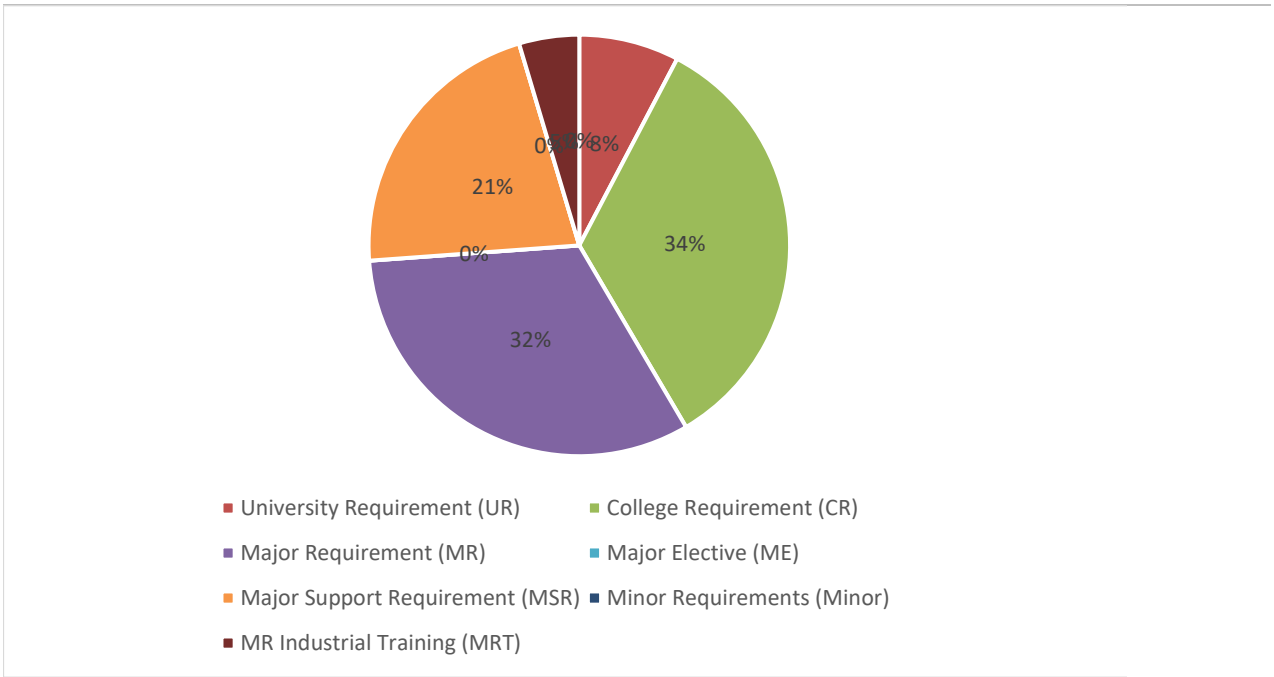
Diploma in Chemical Engineering 2025

An Exit Qualification from the 2025 Chemical Engineering Bachelor of Science Program Onward

Program Components



Course Type	CRD
University Requirement (UR)	5
College Requirement (CR)	22
Major Requirement (MR)	21
Major Elective (ME)	------
Major Support Requirement (MSR)	14
Minor Requirements (Minor)	------
MR Industrial Training (MRT)	------
Total Credits (CRD)	62

The language of teaching for this program is English.

Detailed Study Plan

Year 1 - Semester 1

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ARAB 110, or HIST 122, or ISLM 101	Arabic Language Skills, or Modern History of Bahrain and Citizenship, or Islamic Culture	3	0	3	UR	------	NO

CHEMY 101	General Chemistry I	3	2	4	CR	------	NO
ENGL 101	Communication Skills I	3	0	3	CR	------	NO
MATHS 101	Calculus I	3	0	3	CR	------	NO
PHYCS 111	Fundamentals of Physics	3	2	4	MSR	------	NO
	Total	15	4	17			

Year 1 - Semester 2

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 102	General Chemistry II	3	2	4	MSR	CHEMY 101	NO
CHEN 101	Chemical Engineering Principles I	2	2	3	MR	CHEMY 101 MATHS 101	YES
ENGL 242	Report Writing and Presentation	3	0	3	CR	ENGL 101	NO
HRLC 107	Human Rights	2	0	2	UR	------	NO
MATHS 102	Calculus II	3	0	3	CR	MATHS 101	NO
	Total	13	4	15			

Year 2 - Semester 3

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 220	Organic Chemistry for Chemical Engineering	2	2	3	MSR	CHEMY 102	NO
CHEN 202	Chemical Engineering Principles II	2	2	3	MR	CHEN 101 CHEMY 102	YES
EENG 263	Circuits and Electronics	2	2	3	MSR	MATHS 101 PHYCS 111	NO
MATHS 205	Differential Equations	3	0	3	CR	MATHS 102	NO
STAT 276	Statistical Data Analysis for Engineering	3	0	3	CR	MATHS 102	NO
	Total	12	6	15			

Year 2 - Semester 4

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEN 211	Chemical Engineering Thermodynamics I	2	2	3	MR	CHEN 202	YES
CHEN 213	Fluid Mechanics	2	2	3	MR	CHEN 202 MATHS 205	YES

CHEN 314	Heat Transfer	2	2	3	MR	CHEN 213	YES
CHEN 315	Mass Transfer	2	2	3	MR	CHEN 213	YES
CHEN 316	Applied Physical Chemistry	2	2	3	MR	CHEN 202 STAT 276 EENG 263	YES
	Total	10	10	15			

Course Description

Description of Major Courses

Course Code: CHEN 101 **Course Title:** Chemical Engineering Principles I
Units and dimensions. Introduction to chemical process calculations. Processes and process variables. Process flowcharts. Material balances on single and multiple-unit processes, without and with chemical reactions, including bypass and recycle. Introduction to single-phase systems: solid/liquid densities, ideal gases, introduction to non-ideal gases EOS, the compressibility factor. Tools: spreadsheet software (e.g., Microsoft® Excel).

Course Code: CHEN 202 **Course Title:** Chemical Engineering Principles II
Introduction to multiphase systems: single-component phase equilibrium, Gibbs phase rule, one condensable component, multicomponent gas-liquid systems. Forms of energy and energy conservation law. Energy balance on closed and open systems. Tables and charts of thermodynamic data. Combined material and energy balances on non-reactive and reactive processes. Computer-aided balance calculations. A case study on a chemical process. Tools: spreadsheet software (e.g., Microsoft® Excel).

Course Code: CHEN 211 **Course Title:** Chemical Engineering Thermodynamics I
First law of thermodynamics. Applications of the first law for closed, open, steady and unsteady systems. Volumetric properties of pure fluids. Heat effects. The second law of thermodynamics, heat engines, heat pumps and refrigerators, reversible and irreversible processes, Carnot cycle and performance indicators. Entropy and entropy relations. Applications of the second law to steady-flow devices. Vapor power cycles and vapor-compression refrigeration cycles. Tools: spreadsheet software (e.g., Microsoft® Excel), programming and computing environment (e.g., MATLAB®).

Course Code: CHEN 213 **Course Title:** Fluid Mechanics
Classification of fluids. Fluid statics. Flow of fluids in closed conduits. Friction factor. The mechanical energy balance. Bernoulli's equation and fluid flow measurements. Characteristics of pumps. Compressible flow. Momentum balance. Navier-Stokes equations. Dimensional analysis. Laminar boundary layer. Universal velocity distribution. Flow past regular bodies, flow through packed beds, fluidization. Tools: spreadsheet software (e.g., Microsoft® Excel), programming and computing environment (e.g., MATLAB®).

Course Code: CHEN 314 **Course Title:** Heat Transfer
Modes of heat transfer. Mechanism of conduction in gases, liquids and solids. Steady-state heat conduction in one and two dimensions, transient heat conduction. Convection, equations of momentum and heat transport. Dimensionless correlations for free and forced convection. Heat transfer with phase change: boiling, condensation, and evaporation. Thermal radiation. Heat exchangers. Tools: spreadsheet software (e.g., Microsoft® Excel), chemical process flowsheet package (e.g., AspenTech products).

Course Code: CHEN 315 **Course Title:** Mass Transfer
Fundamentals of mass transfer. The control volume approach to the mass transfer processes. Diffusion coefficients. Mass transfer across phase boundary. Mass transfer coefficients. Convective mass transfer correlations. Rate based mass transfer operations in chemical engineering: drying, absorption, membrane separation. Adsorption: mechanisms and types of adsorption, adsorption isotherms, breakthrough curves, sizing of adsorption packed bed. Tools: spreadsheet software (e.g., Microsoft® Excel).

Course Code: CHEN 316 **Course Title:** Applied Physical Chemistry
The rate of reaction and its relation to chemical reaction equilibria. The general mole balance equation for reactors, conversion, and reactor sizing. Stoichiometry and rate laws. Collection and analysis of rate data. Reaction mechanisms: active intermediates and non-elementary rate laws, fundamentals of enzyme kinetics and inhibition. The adsorption

theory. Electrochemistry: electrochemical cells, cell potential under standard and non-standard conditions, application of electrochemistry. Tools: spreadsheet software (e.g., Microsoft® Excel), programming and computing environment (e.g., MATLAB®).

Description of Major Support Requirement Courses

Course Code: CHEMY 102 **Course Title:** General Chemistry II

Gaseous equilibrium (equilibrium constant, Kc and Kp); acids and bases (water dissociation, pH, weak acids and bases, salts); acid-base and precipitation equilibria (buffers, indicators, titrations, pH curves); thermochemistry (calorimetry, enthalpy, thermochemical equations, heats of formation, first law of thermodynamics); rate of reaction, rate and concentration, concentration and time, activation energy, rate and temperature, catalysis, mechanisms; electrochemistry; voltaic cells; cell voltages. Organic chemistry (alkanes, alkenes, alkynes, isomerism, nomenclature, arenas, functional groups, reaction). Related practical work.

Course Code: CHEMY 220 **Course Title:** Organic Chemistry for Chemical Engineering
Isomerism; alkanes and cycloalkanes; geometric isomerism; alkenes and alkynes; petroleum; gasoline; and octane number, aromatic compounds; polycyclic aromatic hydrocarbons, Phenols and thiols, ethers and epoxides; aldehydes and ketones; tautomerism; carboxylic acids and their derivatives. Related practical work.

Course Code: EENG 263 **Course Title:** Circuits and Electronics
Fundamentals of circuit theory: Ohm and Kirchoff Laws; series/parallel AC/DC circuits; basic DC/AC circuit analysis tools and theorems; transient and steady-state analysis of RLC circuits. Fundamentals of power systems: single and three-phase balanced and unbalanced systems. Fundamentals of electronics: basic semiconductor devices; diode and transistor types with applications; ideal operational amplifier with applications. Related laboratory experiments.

Course Code: PHYCS 111 **Course Title:** Fundamentals of Physics
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.

College Requirement Courses Descriptions

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: 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 242 **Course Title:** Report Writing and Presentation
To develop theoretical and practical skills of technical report writing and oral presentation. Students are to be given a number of specific technical report tasks to complete and present orally.

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: MATHS 102 **Course Title:** Calculus II
Applications of definite integrals, including areas, volumes and surface areas of solids of revolution, arc length and centroids. Transcendental functions, indeterminate form and L'Hopital's Rule. Techniques of integration and improper integrals. Infinite series, power series. Maclaurin and Taylor Theorem.

Course Code: MATHS 205 **Course Title:** Differential Equations
Differential equations of first order and their solution. Separable and exact equations. Equations convertible to separable type. Higher order linear equations with constant coefficients (homogeneous and non-homogeneous). Power series method for second order linear equations. Variation of parameters. Laplace transform technique. Applications of differential equations.

Course Code: STAT 276 **Course Title:** Statistical Data Analysis for Engineering
Introduction to statistical methods for data analysis and interpretation. Statistical concepts, probability distributions, descriptive statistics and data visualization, confidence intervals, significance tests, Analysis of Variance (ANOVA), linear and nonlinear regression analysis. Principles of design of experiments, full factorial and fractional designs, statistical quality control. Tools: spreadsheet software (e.g. Microsoft® Excel) and programming environment (e.g. MATLAB®).

University Requirements Courses Descriptions

Course Code: ARAB 110 **Course Title:** Arabic Language Skills
This course focuses on basic Arabic skills including form, function, and meaning. It also helps the student to appreciate and understand structures and approach them from a critical point of view, through various genres in literature.

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.

Course Code: ISLM 101 **Course Title:** Islamic Culture
An introduction to the general outline and principles of Islamic culture, its general characteristics, its relationships with other cultures, general principles of Islam in beliefs, worship, legislation and ethics.

List of Courses

University Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
ARAB 110, or HIST 122, or ISLM 101	Arabic Language Skills, or Modern History of Bahrain and Citizenship, or Islamic Culture	3	0	3	UR	------	NO
HRLC 107	Human Rights	2	0	2	UR	------	NO
	Total	5	0	5			

College Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 101	General Chemistry I	3	3	4	CR	------	NO
ENGL 101	Communication Skills I	3	0	3	CR	------	NO
ENGL 242	Report Writing and Presentation	3	0	3	CR	ENGL 101	NO
MATHS 101	Calculus I	3	0	3	CR	------	NO
MATHS 102	Calculus II	3	0	3	CR	MATHS 101	NO
MATHS 205	Differential Equations	3	0	3	CR	MATHS 102	NO
STAT 276	Statistical Data Analysis for Engineering	3	0	3	CR	MATHS 102	NO
	Total	21	3	22			

Major Support Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEMY 102	General Chemistry II	3	3	4	MSR	CHEMY 101	NO
CHEMY 220	Organic Chemistry for Chemical Engineering	3	2	3	MSR	CHEMY 102	NO
EENG 263	Circuits and Electronics	2	2	3	MSR	MATHS 101 PHYCS 111	No
PHYCS 111	Fundamentals of Physics	3	3	4	MSR	------	NO
	Total	11	10	14			

Major Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEN 101	Chemical Engineering Principles I	3	1	3	MR	CHEMY 101 MATHS 101	YES
CHEN 202	Chemical Engineering Principles II	2	3	3	MR	CHEN 101 CHEMY 102	YES
CHEN 211	Chemical Engineering Thermodynamics I	3	1	3	MR	CHEN 202	YES
CHEN 213	Fluid Mechanics	3	2	3	MR	CHEN 202 MATHS 205	YES
CHEN 314	Heat Transfer	3	1	3	MR	CHEN 213	YES
CHEN 315	Mass Transfer	3	1	3	MR	CHEN 213	YES
CHEN 316	Applied Physical Chemistry	3	1	3	MR	CHEN 202 STAT 276 EENG 263	YES
	Total	20	10	21			

Training Requirement

Course Code	Course Title	Course Hours			Course Type	Pre requisite	Major GPA
		LEC	PRAC	CRD			
CHEN 396	Industrial Training	0	6	3	MRT	Completion of 90 credits	YES

or

CHEN 296	Industrial Training	0	6	3	MRT	Completion of 45 credits	YES

Dated: Jun 18, 2025