

## Academic Form-38: PROGRAM MATRIX

Faculty	Engineering
Program	Chemical Engineering
Award	Bachelor in Chemical Engineering
Credit Units	69
Academic Year	2023/2024

Level	Semester 1					Semester 2				
	Course Code	Course Name	Pre-requisite	Core/ Elective	Units	Course Code	Course Name	Pre-requisite	Core/ Elective	Units
1	ENGG1013	Engineering Drawing and Computer drafting	None	Core	1	ELEC1100	Principles of Electrical Circuits	None	Core	2
	UNIR1100	Communication Skills I	None	Core	2	MATH1100	Calculus & Linear Algebra	MATH1000	Core	2
	MATH1000	Mathematical Foundations	SET 3 MATH	Core	2	ENGG1010	Applied Mechanics	None	Core	2
	CHEM1020	General Chemistry	None	Core	2	ENGG1023	Engineering of Materials	None	Core	2
	COMP1500	Introduction to Programming	None	Core	2	UNIR1001	Oman & Islamic Culture	None	Core	1
2	MATH2100	Calculus & Statistics	MATH1100	Core	2	CHEM2002	Process Systems Analysis	None	Core	2
	CHEM2000	Chemistry for Engineers	CHEM1020	Core	2	CHEM2056	Physical & Surface Chemistry	CHEM1020	Core	2
	CHEM2001	Introduction to Chemical Engineering	None	Core	2	CHEM2004	Fundamentals of Fluid Mechanics	None	Core	2
	ELEC2113	Instrumentation & Measurement	ELEC1100	Core	2	UNIR2100	Communication Skills II	None	Core	2
	UNIR2001	Entrepreneurship	None	Core	2	UNIR1002	Arabic Language Skills	None	Core	1

3	CHEM3011	Separation Processes I	CHEM2001	Core	2	CHEM3012	Separation Processes II	CHEM2001	Core	2
	CHEM3008	Chemical Process Industries	None	Core	2	CHEM3010	Process Modeling and Dynamics	CHEM2001	Core	2
	CHEM3000	Heat Transfer	None	Core	2	CHEM3003	Process Engineering Thermodynamics	None	Core	2
	ENGG3700	Numerical Analysis & Optimization	None	Core	2	UNIR3100	Communication Skills III	None	Core	2
4	ENGG4801A	Thesis Project	None	Core	2	ENGG4801B	Thesis Project	None	Core	2
	CHEM4005	Reaction Engineering	CHEM3003	Core	2	ENGG4000	Renewable & Sustainable Energy	None	Core	2
	CHEM4004	Process & Control Systems Design	CHEM3010	Core	2	CHEM4015	Waste treatment processes	None	Core	2
	CHEM4007A	Process Design Practice	CHEM2002	Core	2	CHEM4007B	Process Design Practice	CHEM4007A	Core	2

Level 1	Course Requirement
<p>MATH1000: This course aims to cover four Modules that will be necessary for any engineering degree or career including: functions, limits, derivatives and its applications, integration and its application, complex numbers vectors, and as well as applicable methods. The course covers many aspects of analyzing functional relationships. Graph sketching is useful in picking trends and modeling economic or physical systems. The course will cover limits and continuity of functions. Carrying on from this, the calculus of derivatives and its applications will be introduced. Furthermore, theories and applications of integration, complex numbers and vectors will be explored.</p>	Shared (Faculty)
<p>ENGG1010: To develop a broad understanding of the way in which forces affect bodies either at rest or in motion. In addition, to teach the fundamentals of objects in a state of force equilibrium and objects in motion.</p>	Shared (Faculty)
<p>ENGG1013: The course aim is designed to be covered in 4 modules which will broadly focus on the basics of engineering drawing utilising free hand sketching, engineering drawing, and computer aided drafting and solid modelling. The fundamental principles of orthographic projection as well as the topics of dimensioning, sectional views, isometric and perspective pictorials views. In addition, Computer Aided Drafting is also covered and practiced using AutoCAD.</p>	Shared (Faculty)
<p>CHEM1020: General Chemistry deals with the Properties of gases, solids, &amp; solutions, phase changes, Thermochemistry, Equilibria with applications to acid – base chemistry &amp; to solubility of salts, Electrochemistry and kinetics. This course will introduce the students the fundamental concepts about various states of matter. It will enhance their knowledge on mass and energy conversion. In general terms it covers the basic principles of chemistry.</p>	Shared (Faculty)
<p>ENGG1023: To introduce students to the fundamentals of structures, processes and properties of engineering materials.</p>	Shared (Faculty)
<p>ELEC1100: The course provides the necessary skills in the analysis and design of electrical circuit and components, which are fundamental to the study of electrical systems, electronics, computer systems and communications systems. The course covers the fundamental parameter of electrical system such as Voltage, current, power, energy, resistance, capacitance, and inductance. DC Circuit analysis theorems such as Ohms law Kirchhoff's laws node analysis, mesh analysis, Thevenin's theorem, Norton's theorem are covered. The concept of AC circuit including sinusoidal waveform interpretation and the basic RLC circuit analysis also covered.</p>	Shared (Faculty)

MATH1100: The course provides an exposition of appropriate results in the study of basic differential equations, matrices, and vector calculus with emphasis on methods and techniques that have proved relevant in a wide variety of applications.	Shared (Faculty)
COMP1500: The aim of the course is to expose the student to the concept of computer programming for engineers by learning the essential techniques of programming in C++ language.	Shared (Faculty)
UNIR1001: يتضمن هذا المقرر عرضاً لمدخل دراسة الثقافة الإسلامية، وأهميتها، ومصادرها وخصائصها، ومقوماتها، والمعالم الثقافية التي امتازت، ودور الثقافة الإسلامية في بناء الشخصية المسلمة، وكيفية مواجهة التحديات المعاصرة التي تعصف بالأمة المسلمة اليوم، وأساليب الغزو الفكري، كما يستعرض إسلام أهل عمان، وأبرز ملامح الثقافة الإسلامية في المجتمع العماني، ودور العمانيين في بناء الحضارة الإسلامية ونشر الإسلام، وإسهاماتهم في المجالين التجاري والحضاري.	University Requirement
UNIR1100: This course is designed to provide students with the required skills required to communicate effectively and efficiently at their future work place and increase their career prospects. Being directed towards the work environment, the course intends not just to familiarize students with the functional language they will need to employ in their future jobs, but also to build up their confidence in communicating in English and increase their fluency.	University Requirement
<b>Level 2</b>	<b>Course Requirement</b>
CHEM2000: This course provides details on: Intermolecular Forces: Liquids, Solids, and Phase Changes, The Properties of Mixtures: Solutions and Colloids, Organic Chemistry: Saturated Hydrocarbons, Unsaturated Hydrocarbons, Polymers, Alcohols, Ethers, Phenols, and Thiols, Aldehydes and Ketones, Carboxylic Acids and Esters.	Shared (Program)
CHEM2001: This course introduces students to the basic analysis tools of process engineers – mass and energy balances. It also exposes students to the way process engineers work, think and communicate their ideas. It is the cornerstone course for all process engineering disciplines and introduces students to teaching and learning approaches in the Division of Chemical Engineering.	Shared (Program)
CHEM2002: The course introduces a systems approach to understanding and analysing the structure and behaviour of industrial processes. The context and needs that give rise to process systems are examined along with the concepts of unit operations & unit processes. Understanding the nature of individual units and complex flowsheets is done through analysis of degrees of freedom & solvability issues. Techniques for the decomposition of large, complex systems to smaller problems are developed. Application of computer-aided flowsheeting tools facilitate process analysis, which includes economic & environmental impacts.	Shared (Program)
CHEM2004: This is an introductory course to the fundamentals of fluid mechanics and their applications to engineering problems. Among the main topics considered are: Introduction to basic fluid	Shared (Program)

properties, Fluid static and hydrostatic forces analysis, Bernoulli equation and its applications in fluid energy and head calculations, fluid kinematics and flow classifications, effects of fluid friction on pressure and velocity distributions with emphasis on pipe flow, dimensional analysis, and different pump types and calculating system head requirements.	
CHEM2056: Physical & Surface chemistry course attempts to understand matter by observing how it behaves under different conditions, and how it interacts with its environment. It underpins a number of other areas of science, including materials science, nanotechnology and biotechnology. This subject covers a number of key areas of physical chemistry, focusing on thermochemistry, rates of chemical reactions, acid-base and ionic equilibria, the properties of surfaces and phase changes.	Shared (Program)
MATH2100: This course aims to introduce four major topics to engineering students namely: types of series and test their convergence, descriptive statistics and data presentation, probability concepts, and convolution, integral, and partial differential equations (PDEs). The series analysis includes arithmetic, geometric series and their applications. Descriptive statistics cover mean, median, range, mode and standard deviation. Probability themes include experiments, outcomes, events, permutations and combinations, Random variables, probability distributions. In particular, the following themes will be introduced within the last topic: Laplace transform definition, Inverse Laplace Transform, linearity, shifting, Transforms of derivatives and integrals, differential equations, Unit step function, second shifting theorem, Dirac's Delta function, Differentiation and integration of transforms, Convolution and integral equations.	Shared (Faculty)
ELEC2113: This course introduces the fundamentals of measurement. It will introduce the students to the meter's construction and application, transducer and sensors operation, data Acquisition system and Signal Processing of measured signal. It allows the student to design and develop instrumentation system, data acquisition system using modern equipment and tools.	Shared (Faculty)
UNIR2001: This course is an introductory course in entrepreneurship and innovation. The course aims to expose undergraduate students of various academic backgrounds to business venturing and entrepreneurial activity. Students will apply themselves through developing their own business ideas and assessing them using knowledge and skills acquired during the course.	University Requirement
UNIR2100: The purpose of the course is to equip students with the necessary language skills that are required in communicating in an effective way. A major focus of the course will be on writing skills including paragraph organization, structure and using appropriate language for oral communication. This course also aims to familiarize students with the use of relevant language elements for describing graphs, charts and their trends.	University Requirement

UNIR1002: يعتني هذا المقرر بتطور مهارات اللغة العربية لدى الطلبة، وما يتعلق بها من قواعد نحوية وإملائية، كما يعتني بتقنيات الكتابة في مجموعة من الأنماط الوظيفية، كالسيرة الذاتية، وعرض الكتاب وتقدمه، وكتابة التقرير.	University Requierment
<b>Level 3</b>	<b>Course Requirement</b>
CHEM3000: This course is an introduction to engineering heat transfer. The course will cover the basics of heat conduction and convective heat transfer, and some very basic radiative heat transfer. The topics covered include steady and transient heat conduction, forced convection, natural convection, heat exchangers and radiation heat transfer. The text contains a large number of interesting applications such as heat transfer from different soruces, insulation, heat exchangers and heat dissipation using fins..	Shared (Program)
CHEM3003: This course provides an insight into to the fundamental principles, concepts, and laws/postulates of classical thermodynamics to applications that require quantitative knowledge of thermodynamic properties from a macroscopic to a molecular level. It covers their basic postulates of classical thermodynamics and their application to transient open and closed systems, criteria of stability and equilibria, as well as constitutive property models of pure materials and mixtures emphasizing molecular-level effects using the formalism of statistical mechanics. Chemical equilibria principles will be applied to reacting systems in order to analyze the equilibrium product compositions of these systems.	Shared (Program)
CHEM3008: This course introduces and reviews the chemical engineering knowledge as applied to the chemical and petrochemical process industries, with particular emphasis on applications to Sultanate of Oman.	Shared (Program)
CHEM3010: This course builds on the knowledge learned in Mathematical process modeling for design and control. Conservation principles, development of constitutive equations in models & analysis of resultant models for use in control & diagnosis of process faults. Model verification, calibration & validation based on process data.	Shared (Program)
CHEM3011: This course covers the topics: Diffusion, convective and interfacial mass transfer, and its application to continuous contact operations. Design of equilibrium-stage separation processes including distillation, gas-liquid absorption and stripping, liquid-liquid extraction, leaching and humidification. Equipment simulation using Aspen-HYSYS.	Shared (Program)
CHEM3012: This course deals with the change of substances (gases, liquids, solids) by means of physical, chemical and biological processes for industrial purposes. This definition shows that chemical engineering is a very large and diverse field. The number of these basic Unit Operations is not very large and relatively few of them are involved in any particular process. The complexity of chemical engineering results from the variety of conditions as to temperature, pressure, etc., under which the unit actions must be carried out in different	Shared (Program)

processes and from the limitations as to materials of construction and design of apparatus imposed by the physical and chemical character of the reacting substances. The further development of the 'Unit Operations' concept showed that the process of abstraction can be carried on by analyzing unit operations in terms of fundamental principles such as mass and energy balances, phase equilibria, and transport of momentum, energy and mass.	
ENGG3700: The course is designed to be covered in 4 Topics which will broadly focus on Modeling and error analysis: Mathematical model, Round off error and Truncation error. Roots of equations: Bracketing methods, Open methods and Root of polynomials. Optimization and curve fitting: One-Dimensional Unconstrained Optimization, Least-Squares Regression and Interpolation. Numerical differentiation and integration: Newton-Cotes Integration Formulas, Integration of Equations and Numerical Differentiation	Shared (Faculty)
UNIR3100: The purpose of the course is to reinforce essay composition skills and introduce students to the practice of writing for academic purposes. It further develops academic writing skills including: note taking, paraphrasing, summarizing, direct quotation and Harvard style citation. The course will place equal or greater emphasis on composition skills such as: essay structure, paragraph structure, coherence and general language skills.	University Requirerment
<b>Level 4</b>	<b>Course Requirement</b>
CHEM4004: This course introduces students to the synthesis of a process flowsheet & process control system. Flexibility and operability of design. Control system synthesis for an entire flowsheet, basic instrumentation, feedback & feedforward control system design. Integration of process modeling skills.	Shared (Program)
CHEM4005: Reaction engineering deals with the performance analysis and design of equipment for carrying out chemical reactions. The analysis involves principles of chemical kinetics, thermodynamics, heat and mass transfer as well as fluid mechanics. In the present course it will be started with basic principles of chemical kinetics and reaction equilibrium, and then consider various ideal reactors in which the complexities arising from resistances associated with fluid flow as well as heat and mass transfer are gradually added. Both homogeneous as well as heterogeneous catalytic systems will be considered.	Shared (Program)
CHEM4007A: This is the capstone course in the chemical engineering curriculum, and its goal is to integrate the many skills that students have acquired from prior chemical engineering principles courses toward the goal of learning how to design a chemical process. Principles of chemical process design and conception. Computer-aided design and analysis. Representation of the structure of complex, interconnected chemical processes with recycle streams. Detailed heat and mass transfer equipment design. Comprehensive integrated	Shared (Program)

plant design. Optimal design. Ethics and professionalism. Health, safety, and the environmental issues	
CHEM4007B: This is the capstone course in the chemical engineering curriculum, and its goal is to integrate the many skills that students have acquired from prior chemical engineering principles courses toward the goal of learning how to design a chemical process. Engineering and economic analysis of integrated chemical processes, equipment, and systems. Comprehensive integrated plant design is delivered. Optimal design, Profitability. Methods of analyzing risk are provided, and the basic types of health, safety, and environmental regulations are explained, with references to government databases. Pollution prevention strategies and the assessment of plant safety are introduced through their relationships to hazard and operability (HAZOP) studies, the Dow Fire and Explosion Index, the Dow Chemical Hazards Index and to life-cycle analysis	Shared (Program)
CHEM4015: In this course, Conceptual design wastewater treatment plants, critical analysis of existing designs, energy considerations, nutrient balances and space and economic constraints are clearly discussed. Treatment requirements of wastewater streams, based on physicochemical and biological wastewater parameters as derived from quantitative characterisation method are explained.	Shared (Program)
ENGG4000: The course cover Energy and Sustainable Development, Non-Renewable Energy, Renewable Energy, Solar Energy, Photovoltaic, Wind Energy, OTEC Energy, Biomass Energy, Geothermal Energy, Fuel Cells, Hydrogen Economy, Energy Systems, Climate Change & Energy, Life Cycle Analysis, Atmospheric Pollution, Energy Sustainability Metrics, Energy Conservation & Optimization, Energetics/Exergetics, Sustainability and Business, Energy Storage & Management.	Shared (Program)
ENGG4801A: This course develops student's research and problem solving skills. The course involves specification, development and evaluation of an individual research project on a specific topic or problem within the broad fields of Engineering. The student is expected to systematically plan and manage the project, and to clearly present the work and its contribution in context of the current literature and prior art.	Shared (Program)
ENGG4801B: This course develops student's research and problem solving skills. The course involves specification, development and evaluation of an individual research project on a specific topic or problem within the broad fields of Engineering. The student is expected to systematically plan and manage the project, and to clearly present the work and its contribution in context of the current literature and prior art.	Shared (Program)



- 1 University requirement: a compulsory course for all students enrolled in the university.
- 2 Faculty requirement: a compulsory course for all students enrolled in the Faculty.
- 3 Programme requirement: a compulsory course for all students enrolled in the programme (a specialization course).
- 4 Programmes shared: a shared course across programmes.