Bachelor of Science in Chemical Engineering

Program Description

The Bachelor of Science in Chemical Engineering (CHEN) program was established in 2014 and started accepting students in Fall 2014. In Fall 2024, AURAK added a concentration to the program which provides a pathway for those students who are interested in petroleum engineering.

The CHEN program is a unique four-year undergraduate program. The program covers areas of sustainable engineering, global issues, and multidisciplinary problem solving and system analysis components across its curriculum to solve society and industrial most challenging problems. In addition, the program closely matches local professional opportunities and the direction of professions in chemical engineering and through the petroleum engineering concentration, to employment in that industry.

The CHEN program has 136 credit hours over the duration of eight semesters including six credit hours of internship program. The curriculum of the program covers reaction engineering, process design and control, fluid and material transportation, renewable energy, mass and heat transfer and water and environmental engineering. The program was prepared taking into consideration criteria set by the Accreditation Board for Engineering and Technology (ABET) and the Commission for Academic Accreditation (CAA) at the Ministry of Education, United Arab of Emirates. As mentioned earlier there is also a concentration which allows students to opt to take 24 Credits specifically for petroleum engineering.

The faculty in the Department of Chemical and Petroleum Engineering have graduated from well-known universities in the world, and their expertise covers a broad range of technical areas, including reaction engineering, process design, renewable energy and management, environmental engineering, and wastewater treatment.

The Bachelor of Science in Chemical Engineering is overseen by the School of Engineering and Computing and is designed to satisfy QF Emirates Level 7 requirements.

Program Mission

The Bachelor of Science in Chemical Engineering program at AURAK educates students to become qualified engineers who are capable of generating effective solutions by using engineering approaches in the field of Chemical Engineering and, for those studying the petroleum engineering, in the field of Petroleum Engineering. The graduates of the program will be well versed in technology and in social and environmental issues.

To fulfill this mission, the general Chemical Engineering program provides students with a thorough foundation in the basic tenets of Chemical Engineering and technologies and a broad introduction into chemistry, engineering materials, thermal sciences, reaction and separation sciences, energy and environment protection, chemical process design, integration and optimization and data science in chemical engineering. For those studying the petroleum concentration, students cover reservoir rock and fluid properties, drilling, petroleum reservoir engineering, well logging, production engineering and reservoir simulation.

The program provides a strong background for graduate study in the diverse areas branching out of the Chemical and Petroleum Engineering fields. The technical focus is complemented with topics in general education leading to a well-rounded member of the global society.

Program Educational Objectives

The Program Educational Objectives (PEOs) describe the expected accomplishments of the graduates of the Bachelor of Science in Chemical Engineering Engineering general pathway and concentration in Petroleum Engineering. The PEOs have been derived from and support the mission statement of AURAK. The chemical

engineering program has a strong focus on the integration of engineering, science, and process design with complementary areas of study in environmental engineering, fuels and energy, pharmaceutical, petrochemicals, materials, and renewable energy.

The graduates of the Chemical Engineering Program are expected to:

1. Pursue a successful professional career in engineering, scientific, or complementary disciplines through technical competence, effective communication, teamwork, and leadership;
2. Engaged in creating a positive impact with a sufficient awareness of the ethical, cultural, legal, and environmental issues; and
3. Maintain a lifelong interest in learning for personal and professional development.

In addition to the above, Graduates from the Petroleum Engineering concentration are expected to apply broad knowledge of upstream and downstream processes and emerging technology for maximum economic recovery and processing of oil, gas and related resources.

Program Learning Outcomes

AURAK has adopted ABET's student outcomes for the Chemical Engineering Program. The outcomes for the program are for the student to acquire:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Degree Requirements

The Bachelor of Science in Chemical Engineering program requires the completion of 136 credits in the following areas:

Area	Credit
University General Education Requirements	33
School of Engineering and Computing Requirements	33
Chemical Engineering Program Requirements (Core Courses)	46
Chemical Engineering (General) or Petroleum Engineering (Concentration)	

Applied Courses	18
Technical Electives	6

University General Education Requirements **33 Credit Hours**

The program requires completion of the General Education Component. For information relating directly to the General Education requirements, please review the catalog section entitled, "General Education Component." You must speak with your advisor to ensure that the General Education Component requirements are satisfied. **The fifth writing intensive course for the BS Chemical Engineering and Petroleum Engineering Concentration is CHEN 471 Unit Operation Lab.**

Course Code	Course Title	Credits
ARAB 101 or ARAB 110	Arabic Language and Culture for Non-Native Learners I OR Arabic Language and Culture for Native Arabic Speakers I	3
ENGL 101	Composition **(Writing Intensive)**	3
CSCI 114	Applied Computational Thinking	3
CSCI 115	Applied Computational Tools	1
UNIV 100	University First-Year Transition	1
UNIV 200	Innovation, Entrepreneurship, and Sustainability **(Writing Intensive)**	3
PHIL 100 or ENGL 200	Critical Thinking and Reasoning **(Writing Intensive)** OR Advanced Composition **(Writing Intensive)**	3
MEST 100	Introduction to Islam in World Culture **(Writing Intensive)**	3
UAES 200	Survey of United Arab Emirates Studies	3
MATH 113	Calculus I	3
ECON 103	Principles of Microeconomics	3
CHEM 211	General Chemistry I	3
CHEM 212	General Chemistry I Lab	1

School of Engineering and Computing Requirements **33 Credit Hours**

Course Code	Course Title	Credits
ENGR 107	Introduction to Engineering	2
PHYS 110	University Physics I	3
PHYS 111	University Physics I Lab.	1
MATH 114	Calculus II	3
MATH 203	Linear Algebra	3
MATH 214	Elementary Differential Equations	3
PHYS 220	University Physics II	3
PHYS 221	University Physics II Lab.	1
ENGR 200	Engineering Statistics	3
ENGR 210	Sustainability in Engineering	2

ENGR 390	Internship I	3
ENGR 391	Internship II	3
MENG 323	Engineering Economy	3

Chemical Engineering Program Requirements **70 Credit Hours**

Program Requirements are 70 Credit Hours as follow:

Core Courses: **46 Credit Hours**

Courses include the following:

Course Code	Course Title	Credits
CHEM 213	General Chemistry II	3
CHEM 214	General Chemistry II Lab	1
MENG 241	Engineering Materials	3
CHEM 215	Organic Chemistry I	3
CHEM 315	Physical Chemistry	3
CHEN 202	Principles of Chemical and Petroleum Engineering	3
CIEN 251	Fluid Mechanics	3
CHEN 301	Computational Tools in Chemical and Petroleum Engineering	1
CHEN 312	Chemical Engineering Thermodynamic	3
CHEN 351	Chemical Reaction Engineering	3
CHEN 370	Heat and Mass Transport	3
CHEN 471	Unit Operation Lab (Writing Intensive)	1
CHEN 472	Separation Processes	3
CHEN 481	Process & Plant Design	3
CHEN 482	Chemical Process Dynamics & Control	3
CHEN 483	Advance Simulation Lab	1
CHEN 491	Senior Design Project I	3
CHEN 492	Senior Design Project II	3

Chemical Engineering (General)

Applied Core Courses: **18 Credit Hours**

Course Code	Course Title	Credits
BIOL 112	University Biology I	3
MENG 242	Materials Lab	1
CHEM 216	Organic Chemistry Lab	1
CHEM 316	Physical Chemistry Lab	1
CHEN 352	Chemical Reaction Lab	1
CHEN 372	Thermal and Fluid Sciences Lab	1
CHEN 404	Safety and Environmental Impact	3
CHEN 484	Process Integration and Optimization	3
CHEN 486	Data Science in Chemical Engineering	3

ENGR 450	Engineering Seminar	1

Technical Electives: **6 Credit Hours**

To be selected from the following list of courses:

Course Code	Course Title	Credits
CHEN 403	Fundamentals of Biochemical Engineering	3
CHEN 452	Introduction to Hydrogen Technologies	3
CHEN 462	Petroleum Refining Engineering	3
CHEN 463	Natural Gas Engineering	3
CHEN 464	Industrial Catalysis	3
CHEN 473	Water Desalination	3
CHEN 474	Industrial and Wastewater Treatment	3
CHEN 476	Fundamentals of Nanotechnology	3
CHEN 485	Carbon Capture, Utilization and Storage	3
CHEN 493	Special Topics in Chemical Engineering	3
ENGR 399	Undergraduate Research Project	3

Chemical Engineering (Petroleum Engineering Concentration)

Applied Core Courses **18 credit hours**

Course Code	Course Title	Credits
PENG 351	Reservoir Rock and Fluid Properties	3
PENG 362	Drilling Engineering	3
PENG 371	Petroleum Reservoir Engineering	3
PENG 381	Well Logging	3
PENG 384	Petroleum Production Engineering	3
PENG 473	Reservoir Simulation	3

Technical Electives: **6 Credit Hours**

To be selected from the following list of courses:

Course Code	Course Title	Credits
CHEN 404	Safety and Environmental Impact	3
CHEN 452	Introduction to Hydrogen Technologies	3
CHEN 463	Natural Gas Engineering	3
CHEN 485	Carbon Capture, Utilization and Storage	3
PENG 404	Petroleum Economics	3
PENG 464	Data Science in Petroleum Engineering	3
PENG 474	Applied Reservoir Simulation	3
PENG 483	Well Testing	3
PENG 486	Enhanced Oil Recovery	3

PENG 493	Special Topics in Petroleum Engineering	3
ENGR 399	Undergraduate Research Project	3

Chemical Engineering Four-Year Sample Schedule

Freshman Year, First Semester			Freshman Year, Second Semester		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
PHYS 110	University Physics I	3	ARAB 101 or ARAB 110	Beginner Level Arabic and Culture I Arabic Language and Culture for Native Arabic Speakers I	3
PHYS 111	University Physics I Lab.	1	MATH 114	Calculus II	3
ENGR 107	Introduction to Engineering	2	MEST 100	Introduction to Islam in World Culture	3
ENGL 101	Composition	3	PHYS 220	University Physics II	3
MATH 113	Calculus I	3	PHYS 221	University Physics II Lab.	1
UNIV 100	University Freshman Transition	1	CSCI 114	Applied Computational Thinking	3
CHEM 211	General Chemistry I	3	CSCI 115	Applied Computational Tools	1
CHEM 212	General Chemistry I Lab. I	1			
Total		**17**	**Total**		**17**
Sophomore Year, First Semester			**Sophomore Year, Second Semester**		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
CHEM 213	General Chemistry II	3	MENG 241	Engineering Materials	3
CHEM 214	General Chemistry II Lab.	1	MENG 242	Materials Lab.	1
ENGR 210	Sustainability in Engineering	2	CHEM 215	Organic Chemistry I	3
MATH 203	Linear Algebra	3	CHEM 216	Organic Chemistry Lab. I	1
UNIV 200	Innovation and Entrepreneurship	3	MATH 214	Elementary Differential Equations	3
BIOL 112	University Biology I	3	CHEN 202	Principles of Chemical and Petroleum Engineering	3
ECON 103	Principles of Micromechanics	3	CIEN 251	Fluid Mechanics	3
Total		**18**	**Total**		**17**
Sophomore Year, Summer Semester					
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
ENGR 390	Internship I	3			
Junior Year, First Semester			**Junior Year, Second Semester**		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
CHEN 301	Computational Tools in Chemical and Petroleum Engineering	1	PHIL 100 or ENGL 200	Critical Thinking and Reasoning or Advanced Composition	3
ENGR 200	Engineering Statistics	3	CHEN 312	Chemical Engineering Thermodynamics	3
CHEM 315	Physical Chemistry	3	CHEN 351	Chemical Reaction Engineering	3
CHEM 316	Physical Chemistry Lab.	1	CHEN 352	Chemical Reaction Lab	1
MENG 323	Engineering Economy	3	CHEN 370	Heat and Mass Transport	3
UAES 200	Survey of United Arab Emirates Studies	3	CHEN 372	Thermal and Fluid Sciences Lab	1
Total		**14**	**Total**		**14**
Junior Year, Summer Semester					
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
ENGR 391	Internship II	3			
Senior Year, First Semester			**Senior Year, Second Semester**		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
CHEN 404	Safety and Environment Impact	3	CHEN 482	Chemical Process Dynamics and Control	3
CHEN 471	Unit Operation Lab	1	CHEN 484	Process Integration and Optimization	3
CHEN 472	Separation Processes	3	CHEN 486	Data Science in Chemical Engineering	3
CHEN 481	Process & Plant Design	3	CHEN 492	Senior Design Project II	3
	CHEN Technical Elective 1	3		CHEN Technical Elective II	3
CHEN 483	Advance Simulation Lab	1	ENGR 450	Engineering Seminar	1
CHEN 491	Senior Design Project I	3			
	Total	**17**		**Total**	**16**
Total 136 Credits					

Chemical Engineering (Petroleum Engineering Concentration)
Four-Year Sample Schedule

Freshman Year, First Semester			Freshman Year, Second Semester		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
PHYS 110	University Physics I	3	ARAB 101 or ARAB 110	Arabic Language and Culture for Non-Native Learners I or Arabic Language and Culture for Native Arabic Speakers I	3
PHYS 111	University Physics I Lab.	1	MATH 114	Calculus II	3
ENGR 107	Introduction to Engineering	2	MEST 100	Introduction to Islam in World Culture	3
ENGL 101	Composition	3	PHYS 220	University Physics II	3
MATH 113	Calculus I	3	PHYS 221	University Physics II Lab.	1
UNIV 100	University First-Year Transition	1	CSCI 114	Applied Computational Thinking	3
CHEM 211	General Chemistry I	3	CSCI 115	Applied Computational Tools	1
CHEM 212	General Chemistry I Lab. I	1			
	Total	**17**		**Total**	**17**
Sophomore Year, First Semester			**Sophomore Year, Second Semester**		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
CHEM 213	General Chemistry II	3	MENG 241	Engineering Materials	3
CHEM 214	General Chemistry II Lab.	1	CHEM 215	Organic Chemistry I	3
ENGR 210	Sustainability in Engineering	2	MATH 214	Elementary Differential Equations	3
MATH 203	Linear Algebra	3	CHEN 202	Principles of Chemical and Petroleum Engineering	3
UNIV 200	Innovation, Entrepreneurship, and Sustainability	3	CIEN 251	Fluid Mechanics	3
ECON 103	Principles of Microeconomics	3	PENG 351	Reservoir Rock and Fluid Properties	3
	Total	**15**		**Total**	**18**
Sophomore Year, Summer Semester					
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
ENGR 390	Internship I	3			
Junior Year, First Semester			**Junior Year, Second Semester**		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
PHIL 100 or ENGL 200	Critical Thinking and Reasoning or Advanced Composition	3	CHEN 312	Chemical Engineering Thermodynamics	3
ENGR 200	Engineering Statistics	3	CHEN 351	Chemical Reaction Engineering	3
CHEM 315	Physical Chemistry	3	CHEN 370	Heat and Mass Transport	3
MENG 323	Engineering Economy	3	PENG 362	Drilling Engineering	3
UAES 200	Survey of United Arab Emirates Studies	3	PENG 371	Petroleum Reservoir Engineering	3
CHEN 301	Computational Tools in Chemical and Petroleum Engineering	1	PENG 384	Petroleum Production Engineering	3
	Total	**16**		**Total**	**18**
Junior Year, Summer Semester					
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
ENGR 391	Internship II	3			
Senior Year, First Semester			**Senior Year, Second Semester**		
Course Code	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
CHEN 471	Unit Operation Lab	1	CHEN 482	Chemical Process Dynamics and Control	3
CHEN 472	Separation Processes	3	CHEN 492	Senior Design Project II	3
CHEN 481	Process & Plant Design	3	PENG 381	Well Logging	3
CHEN 483	Advance Simulation Lab	1	PENG 473	Reservoir Simulation	3
	Technical Elective 1	3		Technical Elective II	3
CHEN 491	Senior Design Project I	3			
	Total	**14**		**Total**	**15**
Total 136 Credits					