

B.Sc. in Chemical Engineering

Our program is intended to educate process engineers for the conventional and hi-tech chemical engineering industries. Following basic science courses, with strong emphasis on mathematics, physics and chemistry, the program provides a broad education in process fundamentals that include material and energy balances, thermodynamics and transport phenomena. These solid foundations lead to the study of the unit operations courses and reactor design. Finally, the students are directed to integrative courses that cover process and plant designs. The course curriculum in Chemical Engineering, as reflected in the required study schedule is presented in the Table 1 below. Note that the credit system is one credit point for each weekly hour of lecture per semester or two hours of recitation.

Table 1. Required Course Schedule for B.Sc. in Chemical Engineering

Cat. No.	Course	Credit	Cat. No.	Course	Credit
Semester 1			Semester 5		
104003	Calculus 1	5.0	054306	Principles of Chemical Eng. 2M	4.0
104006	Linear Algebra	4.0	054307	Separation Operations 1M	3.5
124114	Principles of Chemistry	4.0	054315	Thermodynamics B	3.0
134058	Biology 1	3.0	124214	Analytical Chemistry 2 Lab. (expanded)	2.0
324012	Technical English	3.0	054408	Intro to Chemical Reactor Eng.	2.5
	Total	19.0		Total	16.0
Semester 2			Semester 6		
054131	Introduction to Chemical and Biochemical Eng.	4.0	054305	Separation Operations 2	3.5
104004	Differential and Integral Calculus 2	5.0	054310	Chemical Eng. Lab.	2.5
114051	Physics 1	2.5	054314	Introduction to Process Dynamics and Control	3.0
125801	Organic Chemistry	5.0	054374	Process Analysis Using Numerical Methods	3.0
125101	Analytical Chemistry 1 for Engineers	1.5	054409	Chemical Reactor Eng.	2.5
394800	Physical Education Courses	1.0	054330	Chemical Process Simulation Lab.	1.0
	Total	19.0		Total	15.5
Semester 3			Semester 7		
104131	Ordinary Differential Equations/H	2.5	054400	Chemical Eng. Lab.2	2.5
114052	Physics 2	3.5	054401	Economics Analysis in Chemical Eng.	2.5
125102	Analytical Chemistry Lab.1 for Engineers	2.0	054402	Design and Analysis in Chemical Eng. M	2.5
134019	Protein Biochemistry	2.5	124601	Physical Chemistry Lab.	2.5
234127	Programming (Matlab)	4.0			
394800	Physical Education Courses	1.0			
	Total	19.0		Total	10.0
Semester 4			Semester 8		
054203	Principles of Chemical Eng.	4.0	054410	Plant Design M	3.5

	IM				
054215	Thermodynamics A	3.0			
104218	Partial Differential Equations/H	2.5			
114053	Physics 3	3.0			
124213	Analytical Chemistry 2 (expanded)	1.5			
124911	Organic Chemistry Laboratory	3.0			
	Total	17.0		Total	3.5

In addition to the core courses above, each student has to study elective courses (30.5 credit points). The program also provides a number of elective streams giving students to acquire expertise in the following areas:

- Materials in chemical engineering
- Environmental technologies
- Process systems engineering
- Engineering sciences
- Micro- and nano-technologies
- Biochemical processes
- General stream

The goal of the different elective routes is to motivate the students to take courses that are of primary interest in their career development. Each student is required to select an elective stream, each of which has core requirements and elective courses, as shown as in Table2. Students that find interest in several areas may select the general stream.

Table 2. Streams in Chemical Engineering

Materials Stream

Cat. No.	Course	Credit	Cat. No.	Course	Credit
<u>Required courses: one of the following</u>			054375	Semiconductor Devices	2.5
094480	Intro. to Probability and Statistics	3.5	054406	Final Project 1	3.0
014003	Statistics	3.0	054407	Final Project 2	3.0
<u>Required courses: two of the following</u>			054413	Polymers in Biotechnology	2.5
015007	Applied Mechanics OR	4.0	054451	Math. Models in Chem. Eng.	2.5
014103	Intro. to Eng. Mechanics OR	4.0	054452	Environmental Problems – Air Pollution	2.5
034028	Solids Mechanics I	4.0	056120	Electron Microscopy	2.0
314553	Intro. to Material Eng. M1	3.5	056140	Colloidal Systems	2.0
054373	Intro. to Solid State Chem.	2.5	056166	Surface Phenomena and Colloids	2.0
054369	Polymer Engineering Lab	2.5	056378	Statistical Thermodynamics in Chemical Eng.	2.0
054461	Process Control Lab	2.5	056383	Complex Fluids	2.0
056379	Membrane Process Lab	2.0	056390	Molecular Materials	2.0
014917	Principles of Quality Eng.	2.5	056391	Nano-based Sensors	2.0
035142	Energy Technology	2.5	127730	Structure Determination Using Physical Methods	2.5
044109	Intro. to Electrical Eng.	3.5	314309	Production and Processing of Materials	2.5
			314310	Material Selection	2.5

044239	Processes in Microelectronics	3.5	314311	Ceramic and Reflecting Materials	2.5
054132	Mini Project	1.0	314531	Electrochemical Engineering	2.5
054350	Polymers 1	2.5	314532	Electrochemistry, Corrosion and Protective Methods	2.5
054351	Polymers 2	2.5	316240	Principles of Crystallography	2.0
054371	Environmental Risk and Safety in the Chem. Industry	2.5	336401	Biomaterials	2.0

Environmental Technologies Stream

Cat. No.	Course	Credit	Cat. No.	Course	Credit
<u>Required courses: one of the following</u>		3.5	044109	Intro. to Electrical Eng.	3.5
094480	Intro. to Probability and Statistics		035142	Energy Technology	2.5
			017022	Bioprocesses in Environmental Eng.	2.5
014003	Statistics	3.0	017016	Soil in Environmental System	2.0
<u>Required courses: one of the following</u>			017009	Applications of Brackish and Recovered Water	2.5
014304	Technology and Environmental Protection	2.5	016327	Biological Treatment of Harmful Organic Materials	2.0
064419	Introduction to Microbiology	3.0	014917	Principles of Quality Eng.	2.5
<u>Required courses: two of the following</u>			054132	Mini Project	1.0
054371	Environmental Risk and Safety in Industry	2.5	054406	Final Project 1	3.0
054372	Catalytic and Biocatalytic Purification	2.5	054407	Final Project 2	3.0
054452	Environmental Problems – Air Pollution	2.5	054451	Math. Models in Chem. Eng.	2.5
<u>Required course:</u>			054412	Biochemical Engineering	3.5
056379	Membrane Process Lab	2.0	054454	Liquid – Solid Separations	2.5
014309	Water and Wastewater Eng.	2.5	054454	Industrial Wastes	2.5
014315	Principles of Environmental Eng.	4.0	056142	Membrane Processes	2.5
014319	Water Chemistry Lab	1.0	056391	Nano-based Sensors	2.0
014320	Water Chemistry	2.5	127109	Environmental Chemistry	2.5

Systems Engineering Stream

Cat. No.	Course	Credit	Cat. No.	Course	Credit
<u>Required courses: one of the following</u>			056142	Membrane Processes	2.5
094480	Intro. to Probability and Statistics	3.5	056379	Membrane Process Lab	2.0
014003	Statistics	3.0	044239	Processes in Microelectronics	3.5
<u>Required courses:</u>			044109	Intro. to Electrical Eng.	3.5
054414	Process Design and Control	4.0	054373	Intro. to Solid State Chem.	2.5
054461	Process Control Lab	2.5	054375	Semiconductor Devices	2.5
054354	Selected Process Chem. Eng.	2.5	054412	Biochemical Engineering	3.5
054350	Polymers 1	2.5	035142	Energy Technology	2.5
054351	Polymers 2	2.5	054132	Mini Project	1.0
054369	Polymer Engineering Lab	2.5	054406	Final Project 1	3.0
014917	Principles of Quality Eng.	2.5	054407	Final Project 2	3.0
054371	Environmental Risk and Safety in the Chem. Industry	2.5	054451	Math. Models in Chem. Eng.	2.5
054452	Environmental Problems – Air Pollution	2.5	056391	Nano-based Sensors	2.0

Science of Engineering Stream

Cat. No.	Course	Credit	Cat. No.	Course	Credit
<u>Required courses: one of the following</u>			124408	Quantum Chemistry	3.5
094480	Intro. to Probability and Statistics	3.5	054132	Mini Project	1.0
014003	Statistics	3.0	054371	Environmental Risk and Safety in the Chem. Industry	2.5
<u>Required courses: two of the following</u>			054373	Intro. to Solid State Chem.	2.5
054451	Math. Models in Chem. Eng.	2.5	054375	Semiconductors	2.5
056378	Statistical Thermodynamics in Chemical Eng.	2.0	054406	Final Project 1	3.0
104215	Complex Functions	2.5	054407	Final Project 2	3.0
054369	Polymer Engineering Lab	2.5	054412	Biochemical Engineering	3.5
054461	Process Control Lab	2.5	054414	Process Design and Control	4.0
056379	Membrane Process Lab	2.0	056120	Electron Microscopy	2.0
014917	Principles of Quality Eng.	2.5	056166	Surface Phenomena and Colloids	2.0
035142	Energy Technology	2.5	056383	Complex Fluids	2.0
036038	Transport at Interfaces	3.0	056388	Intro. Molecular Simulations	2.0
044103	Electrical Engineering 1	3.5	056391	Nano-based Sensors	2.0
			196008	Hydrodynamic Stability	3.0

Micro and Nanotechnology Stream

Cat. No.	Course	Credit	Cat. No.	Course	Credit
<u>Required courses: one of the following</u>			054132	Mini Project	1.0
094480	Intro. to Probability and Statistics	3.5	054406	Final Project 1	3.0
014003	Statistics	3.0	054407	Final Project 2	3.0
<u>Required courses: three of the following</u>			054380	Micro Systems Chem. Eng.	2.5
314533	Intro. Material Eng. 1M	3.5	054451	Math. Models in Chem. Eng.	2.5
124408	Quantum Chemistry OR	3.5	054465	Composite Mat. Chem. Eng.	2.5
044109	Electrical Engineering 1 OR	3.5	056120	Electron Microscopy	2.0
034022	Introduction to Mechatronics	2.5	056140	Colloidal Systems	2.0
114210	Optics	3.5	056142	Membrane Processes	2.5
044239	Processes in Microelectronics	3.5	056114	Adsorption and Catalysis	2.0
054369	Polymer Engineering Lab	2.5	056166	Surface Phenomena and Colloids	2.0
054461	Process Control Lab	2.5	056383	Complex Fluids	2.0
056379	Membrane Process Lab	2.0	056390	Molecular Materials	2.0
014917	Principles of Quality Eng.	2.5	056391	Nano-based Sensors	2.0
035142	Energy Technology	2.5	056372	Production and Characterization of Powders	2.0
044109	Intro. to Electrical Eng.	3.5	056378	Statistical Thermodynamics	2.0
044239	Processes in Microelectronics	3.5	104214	Fourier Series and Integral Transformations	2.5
036060	Multiscale Modeling of Mat.	3.0	124412	Electromagnetism and Spectroscopy of Materials	5.0
044127	Principles of Semiconductors	3.5	124509	Principles of Spectroscopy	2.0
044129	Physics of Semiconductors	3.0	127418	Chemistry of Semiconductors	2.0
054371	Environmental Risk and Safety in the Chem. Industry	2.5	314309	Production and Processing of Material	2.5
054350	Polymers 1	2.5	314311	Ceramic and Reflecting Materials	2.5
054351	Polymers 2	2.5	054373	Intro. to Solid State Chem.	2.5
315038	Materials for Electromechanical Systems	2.0	054375	Semiconductors	3.5
315042	Introduction to Nanoscience and Nanotechnology	2.0	317627	Contacts and Metals for Semiconductor Devices	2.0

Biochemical Engineering Stream

Cat. No.	Course	Credit	Cat. No.	Course	Credit
<u>Required courses: one of the following</u>			044103	Electrical Engineering 1	2.5
094480	Into. to Probability and Statistics	3.5	035142	Energy Technology	2.5
014003	Statistics	3.0	017022	Bioprocesses in Environmental Eng.	2.5
<u>Required courses: one of the following</u>			017016	Soil in Environmental System	2.0
054412	Biochemical Engineering	3.5	017009	Applications of Brackish and Recovered Water	2.5
054308	Separation Processes 2 for Biochemical Engineering	3.5	054132	Mini Project	1.0
054369	Polymer Engineering Lab	2.5	054406	Final Project 1	3.0
054461	Process Control Lab	2.5	054407	Final Project 2	3.0
056379	Membrane Process Lab	2.0	054451	Math. Models in Chem. Eng.	2.5
014968	Ecology for Engineers	2.5	054454	Liquid – Solid Separations	2.5
014917	Principles of Quality Eng.	2.5	054454	Industrial Wastes	2.5
016327	Biological Treatment of Harmful Organic Materials	2.0	056142	Membrane Processes	2.5
014319	Water Chemistry Lab	1.0	056391	Nano-based Sensors	2.0
014320	Water Chemistry	2.5	127109	Environmental Chemistry	2.5
054413	Polymers in Biotechnology	2.5	056387	Introduction to Biophysics	2.0
056112	Bioreactors	2.0	056390	Molecular Materials	2.0
056120	Electron Microscopy	2.0	054350	Polymers 1	2.5
056166	Interfacial and Colloidal Phenomena	2.0	054351	Polymers 2	2.5
056383	Complex Fluids	2.0	064509	Fundamentals of Biotechnology	3.5
056388	Introduction to Molecular Simulations	2.0	064611	Environmental Toxicology	2.0
064322	Food Chemistry	3.0	066327	Physical Methods for Biomol. Characterization	2.0
064419	General Microbiology	3.0	124301	Structure Determination By Physical Methods	2.5
054371	Environmental Risk and Safety in the Chem. Industry	2.5	134113	Metabolic Pathways	3.5
054372	Catalytic and Biocatalytic Purification	2.5	276413	Basic Immunology	4.0
064523	Introduction to Molecular Biotechnology	2.5	336525	Molecular Engineering	2.0
277006	Intro. to Sensing Systems	3.0	336528	Controlled Drug Release	2.5
336401	Biomaterials	2.0	336529	Biological Substitutes and Tissue Engineering	2.5
336512	Biochem. Eng. Process Lab	2.0			
336517	Cell Bioengineering	2.5			

General Stream

Cat. No.	Course	Credit	Cat. No.	Course	Credit
<u>Required courses: one of the following</u>			054367	Research Project 1	2.5
094480	Into. to Probability and Statistics	3.5	054368	Research Project 2	2.5
014003	Statistics	3.0	334001	Introduction to Med. Eng. 1	2.0
<u>Elective courses: any course that appears in the lists of one of the other streams, and in addition:</u>			094591	Introduction to Economics	3.5
054251	Summer Work in Industry 1	1.0			
054364	Summer Work in Industry 2	1.0			