B. Eng. (Hons.) Chemical Engineering (Minor: Energy Engineering) – E403

1. Introduction

Chemical engineering is a broad based discipline that extends to numerous areas of technology and development. Chemical engineers are responsible for the conception and design of processes for the physico-chemical transformation of raw materials into desired products; it generally begins with laboratory experimentations followed by process and technology development up to implementation of alternative commercial full scale production systems. Modern chemical engineering generally encompasses new elements such as sustainable design, safety, optimal resource use and the environment.

Chemical engineering requires a complete and quantitative understanding of both the engineering and scientific principles underlying technological processes that enables appropriate plant design and practical problem solving in industries. The first three years of this 4-year degree programme provides an in-depth knowledge and understanding of the design, development and operation of chemical processes and plants together with their proper management and optimum resource use; it focuses on specific chemical engineering modules like chemical thermodynamics, heat and mass transfer, transport phenomena, unit operations, chemical process design, reaction engineering and process safety. In the fourth year, it subsequently provides the learners with the opportunity to apply the knowledge acquired so far in designing a complete commercial chemical processing plant, and to concurrently specialize in energy engineering by acquiring knowledge in specific modules like energy engineering/management and renewable energy technologies, and by opting or linking the bachelor degree project to this area.

This programme thus combines the wide range of core chemical engineering modules including those focusing on multidisciplinary knowledge with complementary specialization electives; it includes the essential academic structure to provide the undergraduates with an excellent foundation for careers in the chemical and/or energy engineering industry. It typically prepares them to meet the challenges in the chemical processing industries such as the sugarcane industry involved in the production of sugar, bioethanol, electricity and other by-products; food and allied industries; textile industry; soap, detergents and paint industries; fertilizer production plants, amongst many others. The specialization option extends opportunities in the energy area, in particular energy management and renewable energy technologies.

2. Objectives

The main educational objectives of the programme are as follows:

- To master the principles of basic scientific and engineering sciences that underlie modern chemical engineering;
- To inculcate and develop analytical skills pertaining to chemical and energy engineering;
- To demonstrate a complete understanding for designing integrated chemical processing systems together with its critical elements of sustainability, safety and optimum resource use;
- To apply critical and creative thinking in solving chemical engineering problem;
- To appreciate and link the broader context of environmental, social, safety and economic issues that affect decision making in chemical engineering;

- To communicate effectively, work in multidisciplinary teams and with observance of professional ethics;
- To recognize and commit to the importance of continued self-improvement and the ability to engage in lifelong learning; and
- To understand the implications of chemical processing on energy use and management and apply the use of renewable energy technologies in chemical process industries to promote low carbon development and green productivity.

3. General Entry Requirements

As per General Entry Requirements for admission to the University for Undergraduate Degrees.

4. Programme Requirements

Credit in Chemistry and Physics at SC/'O' Level.
GCE 'A' Level Passes in Mathematics and Chemistry or Physics.

5. Minimum Requirements for Degree Award

For the award of the degree, the following should be met:

a) Completion of 150 credits as per the programme plan;
b) Attendance to at least 12 seminars organized by the department during the course of the programme (i.e. attendance to at least 3 seminars per year); and
c) Satisfactory completion of vacation training and industrial training.

To complete the programme of studies, students are required to perform satisfactorily in the following 10 Exit Level Outcomes (ELOs) which are linked to the modules offered in the programme.

ELO 1: Problem solving
ELO 2: Application of scientific and engineering knowledge
ELO 3: Engineering design
ELO 4: Investigations, experiments and data analysis
ELO 5: Engineering methods, skills and tools, including Information Technology
ELO 6: Professional and technical communication
ELO 7: Impact of engineering activity
ELO 8: Individual, team and multidisciplinary working
ELO 9: Independent learning ability
ELO 10: Engineering Professionalism

Students will be allowed to proceed to Level 3 subject to having a minimum CPA of 45.0% at the end of Level 2.

6. Programme Duration

	Normal (Years)	Maximum (Years)
Degree	4	7
Diploma	2	3

7. Credits per Year

Minimum 5, Maximum 48 subject to Regulation 6 above.

8. Pre-Requisite (PR)/Pre-Requirement (PQ) Modules

A student will be allowed to follow module y of which module x is a pre-requisite (PR) provided the student has passed module x (i.e. obtained at least Grade D in the Pre-requisite module).

A student will be allowed to follow module Y of which module X is a pre-requirement (PQ) provided that the student has registered, attended and sat for examinations of module X, irrespective of the grade obtained.

9. Assessment

The assessment mode for each module will be based on one or a combination of the following:

- Final examination.
- Continuous assessment (class tests, assignments, practicals and oral presentations).
- Report assessment (for Design Project, Final Year Project, Vacation Training and Industrial Training).
- Attendance to seminars.

The detailed assessment mode and delivery for each module will be provided in the Module Specification Sheet (MSS) for the respective module. Assessment will be based on written examination 3-hour duration for modules carrying 4-6 credits and 2-hour duration for module carrying below 3 credits and on continuous assessment done during the year. The continuous assessment (except for design and final year projects) will count for 30-40% of the overall percentage mark of the module(s).

10. Exit Points

Minimum Requirements for Diploma Award Students who have a CPA of less than 45.0% at the end of Level 2 shall be required to repeat the entire academic year or exit with a Diploma in Chemical Engineering provided the following conditions are met:

MODULES UNDERTAKEN	CREDITS
Modules from Levels 1 & 2	60
Diploma Project	6
TOTAL	66

Students are allowed to repeat only once over the entire duration of the Programme of Studies.

A student may also opt for a Diploma in Chemical Engineering provided s/he satisfies the above requirements.

The Diploma Project would be 8 weeks duration.

11. Programme Plan

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LEVEL 1				**Prequisites/Prequirements**
Code	**Module Name**	**L+P/T/SL**	**Credits**	
CHE 1007Y(1)	Chemistry & Basic Chemical Engineering	2+2	6	
CHE 1008Y(1)	Thermodynamics	2+2	6	
CHE 1009Y(1)	Fluid Mechanics	2+2	6	
CHE 1010Y(1)	Science and Mechanics of Materials	2+2	6	
CHE 1012Y(1)	Engineering Computations	2+2	6	
CHE 1013Y(1)	Mathematics for Chemical Engineers	2+2	6	
CHE 1014Y(1)	Professional Communication Skills	1+1	3	
CHE 1015Y CHE	Industry Seminar 1		0	
1000	Vacation Training		0	
LEVEL 2				**Prequisites/Prequirements**
Code	**Module Name**	**L+P/T/SL**	**Credits**	
CHE 2007Y(3)	Heat & Mass Transfer	2+2	6	CHE 1008Y(1) (PQ)
CHE 2008Y(3)	Instrumentation & Chemical Process Control	2+2	6	CHE 1013Y(1) (PQ)
CHE 2009Y(3)	Applied Chemical Thermodynamics	2+2	6	CHE 1008Y(1) (PQ)
CHE 2010Y(3)	Chemical Engineering Law & Economics	2+2	6	
CHE 2012Y(3)	Statistics & Numerical Methods	2+2	6	CHE 1013Y(1) (PQ)
CHE 2013Y(3)	Engineering Sustainability	2+2	6	
CHE 2014Y(3)	Research Methodology	1+1	3	
CHE 2015Y	Industry Seminar 2		0	
LEVEL 3				**Prequisites/Prequirements**
Code	**Module Name**	**L+P/T/SL**	**Credits**	
CHE 3012Y(5)	Unit Operations	2+2	6	CHE 2007Y(3) (PR)
CHE 3013Y(5)	Chemical Process Design & System Analysis	2+2	6	CHE 2008Y(1) (PR)
CHE 3014Y(5)	Process Safety & Risk Management	2+2	6	
CHE 3015Y(5)	Reaction Engineering	2+2	6	CHE 2009Y(3) (PR)
CHE 3016Y(5)	Chemical Process Technologies	2+2	6	CHE 2007Y(3) (PR)
CHE 3017Y(5)	Fluid Dynamics & Transport Phenomena	2+2	6	CHE 1009Y(1) (PR)
CHE 3018Y	Industry Seminar 3		0	
CHE 3020	Industrial Training (12 weeks)	-	0	
ELECTIVE MODULE				
CHE 3019Y(5)	Quality Systems & Standards	2+2	6	
LEVEL 4				**Prequisites/Prequirements**
Code	**Module Name**	**L+P/T/SL**	**Credits**	
CHE 4010Y(5)	Degree Project		10	CHE 2014Y(3) (PR)
CHE 4011Y(5)	Design Project	1+14	8	CHE 3012Y(5) (PR)&, CHE 3013Y(5) (PR)
CHE 4012Y	Industry Seminar 4		0	
ENGG 4101	Sociology for Engineers	2+1	2.5	
ELECTIVE MODULES				
CHE 4013Y(5)	Petrochemical Engineering	2+2	6	CHE 3012Y(5) (PR)
CHE 4017Y(5)	Energy Engineering	2+2	6	CHE 2009Y(3) (PR)
CHE 4018Y(5)	Renewable Energy Technologies	2+2	6	CHE 2013Y(3) (PR)
CHE 4019Y(5)	Energy Management	2+2	6	CHE 2009Y(3) (PR)

Note:

1) At least 3 elective modules have to be taken in Level 4.
2) Specialisation modules are CHE 2013Y Engineering Sustainability, CHE 4017Y Energy Engineering, CHE 4018Y Renewable Energy Technologies and CHE 4019Y Energy Management.