

# BACCALAUREUS TECHNOLOGIAE: ENGINEERING: CHEMICAL

Qualification code: BTCE02 - NQF Level 7

Campus where offered: Pretoria Campus (evening classes)

Last year of new intake: July 2019

Teach-out (phase-out) date: 30 June 2021

Students registered for this qualification should complete their studies according to the teach-out date prescribed for the qualification, subject to the stipulations of Regulation 3.1.11 and 3.1.13 in the Students' Rules and Regulations.

Information on phased-out programmes can be obtained from the TUT website, [www.tut.ac.za](http://www.tut.ac.za).

## CURRICULUM

Consult the 2019 Faculty Prospectus for the full contents of the qualification.

**SUBJECTS PRINTED IN BOLD ARE NOT FOR REGISTRATION PURPOSES.**

### ATTENDANCE

CODE	SUBJECT	CREDIT
PJC400T	Project: Chemical Engineering IV	(0,100)

### FIRST SEMESTER

<b>CET401T</b>	<b>Chemical Engineering Technology IV</b>	
CET40YT	Chemical Engineering Technology: Heat and Mass Transfer IV	(0,100)
CET40ZT	Chemical Engineering Technology: Unit Operations IV	(0,100)
<b>CPD401T</b>	<b>Chemical Process Design IV</b>	
CPD40XT	Chemical Process Design: Equipment Design IV	(0,100)
MTE301T	Mathematics: Chemical Engineering III	(0,100)
REA401T	Reactor Technology IV	(0,100)

### SECOND SEMESTER

<b>CET401T</b>	<b>Chemical Engineering Technology IV</b>	
CET40XT	Chemical Engineering Technology: Fluid Flow IV	(0,100)
<b>CPD401T</b>	<b>Chemical Process Design IV</b>	
CPD40YT	Chemical Process Design: Plant Design IV	(0,100)
PCI401T	Production Engineering: Chemical Industry IV	(0,100)
PCT401B	Process Control IV	(0,100)
TOTAL CREDITS FOR THE QUALIFICATION:		<b>1,000</b>



## SUBJECT INFORMATION (OVERVIEW OF SYLLABUS)

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular subject. At time of publication, the syllabus content was defined as follows:

### C

#### **CHEMICAL ENGINEERING TECHNOLOGY: FLUID FLOW IV (CET40XT) 1 X 3-HOUR PAPER** **(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Fluid properties, fluid statics, flow measurements. Conservation of mass energy and momentum: control volume approach. Flow in Pipes: (A) flow of Newtonian fluids: general characteristics of pipe flow, fully developed laminar flow, fully developed turbulent, dimensional analysis of pipe flow, open channel flow (B) flow of non-newtonian fluids: apparent viscosity, pressure drop in pipes, expansion and contraction losses. Centrifugal pumps: types of pumps, centrifugal pump theory, ideal pump, actual pump performance, power transmission, types of impellers, pump cavitation, factors that affect pump capacity, multistage centrifugal pumps, leak-proof centrifugal pumps, pump priming. Compressible flow: introduction, flow of gas through a nozzle or orifice, converging-diverging nozzles for gas flow, flow in pipes, shock waves. Fluid motion in the presence of solid particles: relative motion between a fluid and a single particle, relative motion between a fluid and a concentration of particle, fluid flow through packed bed, fluidization. Flow of multiphase mixtures: introduction, two-phase gas (vapour)-liquid flow, flow regimes and flow patterns, hold-up, pressure, momentum and energy relations and non-newtonian flow. (Total tuition time:  $\pm 60$  hours)

#### **CHEMICAL ENGINEERING TECHNOLOGY: HEAT AND MASS TRANSFER IV (CET40YT) 1 X 3-HOUR PAPER (OPEN BOOK)** **(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Introduction to conduction, convection and radiation. Steady-state one-dimensional conduction. Steady-state conduction in multiple dimensions. Condensation and boiling heat transfer. Mass transfer. (Total tuition time:  $\pm 60$  hours)

#### **CHEMICAL ENGINEERING TECHNOLOGY: UNIT OPERATIONS IV (CET40ZT) CONTINUOUS ASSESSMENT** **(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Design project, consisting of the design of a processes unit (heat exchangers, furnaces, distillation columns, etc.). Different stages in the development of a design, conceptual design, physical data collection, economic evaluation, flow diagrams and final detailed design. (Total tuition time:  $\pm 60$  hours)

#### **CHEMICAL PROCESS DESIGN: EQUIPMENT DESIGN IV (CPD40XT) 1 X 3-HOUR PAPER** **(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Development of conceptual flow sheets for chemical processes. Equipment sizing and costing. Economic evaluation of projects. Linear and non-linear models in flow-sheet design. Unit equation models. Solution of linear and non-linear equations in flow sheets. Thermodynamic options in flow sheets. Functioning of process simulator. (Total tuition time:  $\pm 60$  hours)

#### **CHEMICAL PROCESS DESIGN: PLANT DESIGN IV (CPD40YT) CONTINUOUS ASSESSMENT** **(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

The development of a conceptual flow sheet for a specific chemical process. Familiarisation with the functioning of a process simulator. Flow sheet design and simulation on the process simulator. (Total tuition time:  $\pm 60$  hours)

### M

#### **MATHEMATICS: CHEMICAL ENGINEERING III (MTE301T) 1 X 3-HOUR PAPER** **(Subject custodian: Department of Mathematics and Statistics)**

First-order differential equations. Higher-order differential equations. Basic mathematical modelling. Laplace transforms. Systems of differential equations. Numerical solutions of differential equations. Fourier Series. (Total tuition time:  $\pm 60$  hours)



**P****PROCESS CONTROL IV (PCT401B)****1 X 3-HOUR PAPER****(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Chemical process modelling, Laplace transform, dynamic analysis of processing systems, design of feedback, feed-forward and other control systems. The focus is on understanding control design principles and their implementation in the chemical processing industry. (Total tuition time: ± 60 hours)

**PRODUCTION ENGINEERING: CHEMICAL INDUSTRY IV (PCI401T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Introduction. Descriptive statistics, for example, graphic representation of data, measures of central position and measures of dispersion. Probability theory – Bayes' theorem. Probability distributions. Sampling theory. Decision theory. Statistical inference. Estimation and hypothesis testing. Linear regression and correlation. Non-parametric tests. (Total tuition time: ± 60 hours)

**PROJECT: CHEMICAL ENGINEERING IV (PJC400T)****PROJECT ASSESSMENT****(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Students must undertake an experimental examination of an approved physical or extractive metallurgical topic. It must consist of a literature study, planning and execution of experimental work, the interpretation of results and an oral, as well as a written report. (Total tuition time: ± 60 hours)

**R****REACTOR TECHNOLOGY IV (REA401T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Chemical, Metallurgical and Materials Engineering)**

Analysis of kinetic data. Theoretical foundations of chemical kinetics (reaction mechanisms, collision theory, transition state theory). Analysis of complex reactions. Design of ideal isothermal reactors. Temperature and energy effects. Non-ideal reactors/residence time considerations. Heterogeneous catalysis reactors. (Total tuition time: ± 60 hours)

