CHEMICAL ENGINEERING

DUT
DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKNIMI YEZOBUCHWEPHESHE

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

2025 HAND BOOK

HANDBOOK FOR 2025

FACULTY of ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT of CHEMICAL ENGINEERING

DEPARTMENTAL VISION AND MISSION

VISION

Recognised for excellence in chemical engineering scholarship

MISSION

Developing professionals who are knowledgeable and adaptable in a changing engineering environment.

VALUES

Professionalism

(We strive to be effective, efficient, disciplined, fair and honest to stakeholders)

Excellence

(We strive to comply with professional bodies, adaptable, accountable to develop innovative, creative, and entrepreneurial generations, deliver teaching and learning, research, and community engagement in the diversity societies or environment)

Tomorrows Engineering Today

What is a University of Technology?

A University of Technology is characterized by being research informed rather than research driven where the focus is on strategic and applied research that can be translated into professional practice. It has a multidisciplinary approach to finding solutions while taking into account social impact of technology. Furthermore, research output is commercialized thus providing a source of income for the institution. Learning programmes, in which the emphasis on technological capability is as important as cognitive skills, are developed around graduate profiles as defined by industry and the professions.

Contents

IMPORTANT NOTICE

The departmental rules in this handbook must be read in conjunction with the Durban University of Technology's General Rules contained in the current General Handbook for Students.

NOTE TO ALL REGISTERED STUDENTS

Your registration is in accordance with all current rules of the Institution. If, for whatever reason, you do not register consecutively for every year/semester of your programme, your existing registration contract with the Institution will cease. Your re-registration anytime thereafter will be at the discretion of the Institution and, if permitted, will be in accordance with the rules applicable at that time.

CONTACT DETAILS

All departmental queries to:

Secretary:	Ms LP Radebe
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Location of Department:	Steve Biko Campus Level 1

All Faculty queries to:

Faculty officer:	Mrs N Singh
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Location of Faculty office:	Steve Biko Campus - S4 Level 3
Acting Executive Dean:	Prof S Rathilal
Tel No:	031 373 2762
Location of Executive Dean's office:	Steve Biko Campus - S6 Level 5

STAFFING	Name and Qualification
Chemical Engineering **Acting Head of Department**:	Dr P.T Ngema, PhD (Chem Eng) (UKZN); MSc (Chem Eng) (UKZN); MTech (Chem Eng) (DUT); BTech (Chem Eng)(DUT), Advance DIP in Business Administration (DUT); ECSA – Candidate Engineering Technologist)
Full Professors:	Prof S Rathilal, PhD (Eng) (UKZN); MScEng (Chem) (UDW); BScEng (Chem) (UDW).
Senior Lecturers:	Dr MG Ntuka, PhD (Chem Eng) (UKZN)
	Ms S Vallabh, MTech (Chem Eng) (MLST); BScEng (Chem) (NU).
Lecturers:	Mr G K Reddy, MScEng (UDW); NHD (Chem Eng) (MLST)
	Ms C P Dlamini, BTech: Eng Chem. (DUT); MEng (Chem Eng)(DUT)
	Ms S Gumede, MEng (Chem Eng)(DUT); BTech (Chem Eng) (DUT)
	Dr IG Mkhize, PhD (Chem Eng) (NWU); MTech (Chem Eng) (CPUT); BTech (Chem Eng) (CPUT); ECSA (Candidate Engineering Technologist)
	Ms Portial Thembelihle Lubisi, BTech:Eng Chem. (DUT); MEng (ChemEng)(DUT)
nGap Lecturer	Ms N Nkosi, MTech (UJ), ECSA (Candidate Engineering Technologist)
GOOT Lecturers	Mrs N Sibiya-Dlomo, MEng (Chem Eng)(DUT); BTech (Chem Eng) (DUT)
	Mr N Tshikosi, MEng (Chem Eng)(TUT); BTech (Chem Eng) (DUT)

Senior Technician: Mr R T Christy, NHD (Chem Eng) (MLST); BCom (Unisa); MTech (DUT)

Technicians: Mr V Moodley, MTech (Mech) (DUT); BScEng (Chem), (UDW)

Mr J. M Mohammed, PrTech, BTech (Chem Eng) (DUT)

Mr M Mbili, BTech: Eng (Chem) (DUT), BTech (Pulp and Paper) (DUT)

Mrs S Pillay, BTech: Chem Eng (DUT); MBA (Mancosa)

Pulp and Paper Technology

Head of Programme and Associate Professor:
Prof Theo de Koker, PhD (US)

Lecturers: Mr. N. A. HOTO, MSc Wood Science (Stellenbosch)

Mr. Nampe Majoe, MTech (Chem Eng)(UNISA); BTech (Chem Eng) (DUT)

PROGRAMME RULES (ALL PROGRAMMES)

ECE 1.1 REGISTRATION

In addition to the General Rules pertaining to Registration (e.g. G1-G10) a student whose fees are being paid by a sponsor shall provide a letter of authority from such sponsor to this effect.

ECE 1.2 LATE REGISTRATION

1.2.1 No registration for any subject will be allowed later than one week after the commencement of lectures, without prior written permission from the Head of Department.

1.2.2 No student will be permitted to add or delete subjects later than one week after the commencement of lectures.

ECE 1.3 WORK DONE DURING THE SEMESTER/YEAR

1. Unless otherwise stated the semester mark will make up 40% of the overall mark and will be based on the results of tests, assignments and practicals where appropriate. A sub-minimum of 40% must be obtained for the semester mark in order to qualify to write the examination. The method of calculation of the year/semester mark for each subject, for the purpose of issuing a certificate, is indicated in the learner guide for each subject. For year/semester marks consisting of a theory and a practical component, a sub-minimum of 40% applies to the practical component, unless stated otherwise in the learner guide
2. In addition to the general requirements for a year/semester mark, the definition of the term" attended satisfactorily" shall include:

a) 80% attendance at all lectures and tutorials scheduled for each subject and satisfactory completion of tutorial work;

b) 100% attendance at all scheduled practical classes.

3. The definition of "satisfactory reason" shall include the presentation of a medical certificate stating that the person was not fit to attend the lecture, tutorial or tests on the day in question.
4.

ECE 1.4 CONDUCT OF STUDENTS IN THE LABORATORY

Rules of conduct pertaining to a specific laboratory, as instituted and amended from time to time by the heads of the department, shall apply to all students using the laboratory. These rules shall be made available to the students at the beginning of each semester.

ECE 1.5 EXAMINATIONS

1. The examinations in each instructional programme where applicable will consist of theory and/or practical and/or oral examinations as indicated in the study guide.
Unless otherwise indicated in the relevant syllabus all theory ex- examinations will be of 3-hour duration and the marks obtained will constitute 60% of the overall mark for the subject.
For subjects which consist of two or more modules, it is necessary to pass all modules individually in order to obtain the subject credit. The normal semester mark and examination requirements apply to each module. The modules may be written during different examination sessions.

ECE 1.6 SUPPLEMENTARY EXAMINATIONS

1. No supplementary examinations will be set for practical subjects and failure in sucha subject will necessitate re-attendance of the entire practical programme for that subject.

A supplementary examination will be granted to a candidate who obtains at least 45% as a final mark. These candidates will be permitted to write the supplementary exam at the next available examination session.

ECE 1.7 AWARDING OF DIPLOMAS / DEGREES

Diplomas/degrees are not automatically awarded to students who have satisfied all of the requirements for each instructional programme. The onus is on the student to apply to the Institution for the award of the diploma/degree. In terms of Rule G18 a student must, when applicable, apply on the prescribed form to the Faculty Office at the Durban University of Technology for such diploma/degree.
In cases where in-service training is a requirement for the award of a diploma, students are required to register with the Department (Experiential Learning Coordinator) at the start of their experiential learning.

ECE 1.8 SICKNESS OR ABSENCE DURING TESTS OR PRACTICALS

Absence from tests or practicals will not be condoned. At the discretion of the Head of Department, arrangements can be made for aegrotat tests to be written. Written application must be made to the Head of Departmenton the prescribed form within five days of the test or practical scheduled date.

ECE 1.9 VALIDITY OF COURSE MARKS FOR RE-SIT EXAMINATIONS

Semester marks obtained for any subject are only valid for the examination in the semester in which the student is registered.

ECE 1.11 STUDENT SELECTION

The number of first-year enrolments is regulated. Student selection is based on academic merit.

ECE.1.12 EXCLUSION FROM PROGRAMMES

This rule must be read in conjunction with Rule G17 in the DUT Rule book. Where a student fails to obtain a credit in a specific instructional offering after two year/semesters of study in such offering, he/she shall not be permitted to re-registerin the relevant programme at the Institution without the permission of the Senate, on the recommendation of the Head of Department subject to such additional requirements as may be imposed. In addition, the following assessments will apply:

First Assessment A student must have passed 50% of the subjects comprising the instructional programme after the minimum period of registered study.

Second Assessment A student must have passed all the subjects comprising the instructional programme after a maximum period of registered study. The above includes periods of study and exemptions granted for subjects passed at any other

educational institution towards the same or equivalent qualification. A student who isprevented from re-registering in terms of Rule ECE.1.12

may appeal to the Faculty Board Executive provided there is proof of extenuating circumstances that prevented that student from completing the required number of subjects in the time allowed. A student must take such an appeal, in writing, to the Dean of the Faculty within five (5) working day of having been notified by the Head of Departmentthat he/she is not permitted to re-register.

If the appeal is successful, the Faculty Board Executive may set such specific conditions for re-registering as it deems fit.

PROGRAMMES OFFERED IN CHEMICAL ENGINEERING

Programmes are offered in chemical engineering which upon successful completion leads to the award of the following qualifications:

Qualification	SAQA NLRD Number
Bachelor of Engineering Technology in Chemical Engineering	98955
Bachelor of Engineering Technology Honours in Chemical Engineering	115521
Master of Engineering	96827
Doctor of Engineering	96812

Purpose of the Chemical Engineering Programmes

The Engineering profession contributes to the technological, socio-economic, built environment and environmental infrastructure of the country, facilitating socio-economic growth and sustainability. The Department of Chemical Engineering contributes to this development by providing learning opportunities by offering the following qualifications in chemical engineering: Bachelor of Engineering Technology, Bachelor of Engineering Technology Honours, Master of Engineering and Doctor of Engineering. These qualifications in Engineering Technology are designed to meet the needs of the country in respect of engineering competence.

These qualifications are the starting points of career paths, and are still generic enough to allow maximum mobility, within this diverse industry. Skills, knowledge, values and attitudes reflected in these qualifications are building blocks for the development of engineering competence.

These qualifications are intended to:

- Promote the development of engineering knowledge and skills that are required to serve public and private needs.
- Release the potential of people.
- Provide opportunities for people to move up the value chain.
- Provide learners with life-long learning and articulation opportunities in the engineering profession.

All the chemical engineering courses offered are registered with The South African Qualification Authority (SAQA), and accredited by the Engineering Council of South Africa (ECSA).

In addition, the department offers the following qualifications in the specialized field of Pulp and Paper Technology: Diploma and Advanced Diploma. These qualifications have been registered with the South African Qualification Authority (SAQA) and are supported by the Paper Manufacturers Association of South Africa (PAMSA).

STRUCTURE OF CHEMICAL ENGINEERING PROGRAMME

ECE. 2.0 BACHELOR OF ENGINEERING TECHNOLOGY IN CHEMICAL ENGINEERING: Code: BNCME1; SAQA ID: 98955; NQF Level 7; SAQA Credits = 420

This is a 420-credit qualification which is primarily professionally oriented. The learning programme consists of a coherent assembly of knowledge areas associated with chemical engineering practice, these include: mathematics, natural sciences, engineering sciences, design and synthesis, computing and IT, and relevant complementary studies. This assembly of knowledge areas provides a viable platform for further studies and lifelong learning and will produce graduates who can function in today's fast-changing, dynamic and evolving industrial marketplace.

Their broad training in natural and mathematical sciences, coupled with a strong foundation in chemical engineering principles, will produce graduates who are highly numerate and have skills in problem-solving, teamwork, communication and Information Technology. This qualification is designed to providethe graduate with the knowledge and attributes to work in a diverse spectrum of industries including the chemical, petrochemical, pulp and paper, polymer, mining, water and wastewater treatment, energy, food, and pharmaceutical industries. The key attributes of the graduates of this qualification are:

- The ability to apply established and newly developed engineering technology to solve *broadly- defined* problems and develop components, systems, services and processes.
- They provide leadership in the application of technology in safety, health, engineering and commercially effective operations and have well-developed interpersonal skills.
- They work independently and responsibly, applying judgement to decisions arising in the application of technology and health and safety considerations to problems and associated risks.
- A specialized understanding of engineering sciences with a deep under-lying knowledge of specific technologies together with financial, commercial, legal, social and economic, health, safety and environmental matters.

This qualification provides the educational base for the registration as a candidate Professional Engineering Technologist with the Engineering Council of South Africa (ECSA) and is recognized internationally through the Sydney Accord.

ECE 2.1 Minimum Admission Requirements

In addition to the minimum admission requirements, rule G7, the following are required for admission into the Bachelor of Engineering Technology in Chemical Engineering:

Compulsory Subjects	NSC	SC		NCV Level 4
	Rating	HG	SG	
English	4	C	B	60%
Mathematics	4	C	B	70%
Physical Science	4	C	B	70%
Life Orientation				60%
+ 2 other vocational subject				60%

In addition to the subject requirements above, applicants with an NSC will be ranked according to the sum of their marks for mathematics and Physical Science, subject to a minimum combined score 100.

NB: Meeting the minimum admission requirements does not guarantee selection.

National Senior Certificate Requirements:

1. The subject NSC Mathematical Literacy will not be accepted as a substitute for the subject NSC Mathematics.

2. The exit certificate of the candidate must qualify the candidate for degree study at an institution of higher learning.

National Certificate Vocational Level 4:

The 3 vocational subjects must be relevant to the field of chemical engineering, one of which must be Physical Science or equivalent.

3. A student has to obtain a combined subminimum of 100 for Mathematics and Physical Science in addition to the entrance requirements above.

NB: Applicants may also present a cognate NQF level 6 Diploma for entry into Bachelor of Engineering Technology programme.

ECE 2.2 PROGRAMME STRUCTURE

Modules	Code	Semester	Credits	NQF Level	Pre-requisites	Co-requisites
Year 1 Semester 1						
Engineering Mathematics 1A	EMTA101	1	12	5		
Engineering Chemistry 1A	ENCA101	1	12	5		
Cornerstone 101	CSTN101	1	12	5		
Engineering Physics 1A	EPHA101	1	12	5		
Chemical Engineering Fundamentals 1A	CEFA101	1	12	5		
Computer Applications 1A	CMAP101	2	12	5		
Year 1 Semester 2			72			
Engineering Mathematics 1B	EMTB101	2	12	5		
Engineering Physics 1B	EPHB101	2	12	5		
Engineering Chemistry 1B	ENCB101	2	12	5		

Chemical Engineering Fundamentals 1B	CEFB101	2	12	5		
Chemical Engineering Design 1	CEDS101	2	12	5		
Technical Literacy	TCHL101	1	8	5		
TOTAL			68			
Year 2 Semester 1						
Engineering Chemistry 2A	ENCM201	3	12	6	Engineering Chemistry 1A Engineering Chemistry 1B	
Computer Applications 2A	CMAP201	3	12	6		
Process Fluid Flow	PFFL101	3	12	6		
Engineering Mathematics 2A	EMTH201	3	12	6	Engineering Mathematics 1A Engineering Mathematics 1B	
Applied Statistics	APPS101	4	8	6		
Chemical Engineering Design 2A	CEDA201	3	12	6		
Chemical Engineering Laboratory 1A	CELA101	3	8	6		
Year 2 Semester 2			76			
Applied Thermodynamics	APTH101	4	12	6		
Transfer Processes	TRFP101	4	12	6		
Principles of Management	PCPM101	3	8	6		
Process Safety and Occupational Health	PSOH101	4	12	6		
Chemical Engineering Design 2B	CEDB201	4	12	6		
Chemical Engineering Laboratory 1B	CELB101	4	8	6		
French for Sciences and Technology 1	Frst101	4				
Mandarin for Sciences and Technology 1	MNST101	4				
TOTAL			64			
Year 3 Semester 1						
Project Management	PMNM101	5	8	7		
Reaction Engineering	RCNE101	5	12	7	Engineering Mathematics 1B	
Unit Operations	UNOP101	5	12	7		
Multistage Operations	MSOP101	5	12	7		
Chemical Engineering Design 3A	CEDA301	5	16	7	Chemical Engineering Design 2A Chemical Engineering Design 2B Transfer Processes FluidFlow	Unit Operations Multistage Operations Reaction Engineering
Chemical Engineering Laboratory 2A	CELA201	5	8	7	Chemical Engineering Laboratory 1A Chemical Engineering Laboratory 1B	Unit Operations Multistage Operations Reaction Engineering
French for Sciences and Technology 2	FRST201	5				
Mandarin for Sciences and Technology 2	MNST201	5				
Year 3 Semester 2			68			
Particle Technology	PTCT101	6	12	7	Chemical Engineering Fundamentals 1B	
Environmental Engineering	ENVN101	6	12	7	Chemical Engineering Fundamentals 1B Process Safety and Occupational Health	

Chemical Thermodynamics	CTHM101	6	12	7	Chemical Engineering Fundamentals 1B	
Process Control	PCSC101	6	12	7	Chemical Engineering Fundamentals 1B	
Chemical Engineering Design 3B	CEDB301	6	16	7	Chemical Engineering Design 2A Chemical Engineering Design 2B Transfer Processes Fluid Flow Chemical Engineering Design 3A	Process Control Chemical Thermodynamics Particle Technology
Chemical Engineering Laboratory 2B	CELB201	6	8	7	Chemical Engineering Laboratory 1	Process Control Chemical Thermodynamics Particle Technology
TOTAL			72			

In modules where Graduate attributes are assessed, the student must meet both the academic and the graduate attribute requirements, as specified in the relevant study guide, in order to pass the subject. The student has to show competences in the following latest ECSA standard E-02-PT – 2023 - Graduate Attribute for BEngTech

Graduate Attribute 1: Problem solving

Identify, formulate, research literature and analyse broadly defined engineering problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialisation.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialisation to defined and applied engineering procedures, processes, systems or methodologies.

Graduate Attribute 3: Engineering design

Design solutions for broadly-defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs.

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of broadly defined engineering problems; locate, search and select relevant data from codes, databases and literature, and design and conduct experiments to provide valid conclusions.

Graduate Attribute 5: Use of engineering tools

Demonstrate competence to select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to broadly defined engineering problems.

Graduate Attribute 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on broadly defined engineering activities, both orally and in writing, with the engineering community and society at large, taking into account cultural, language and learning differences.

Graduate Attribute 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

Graduate Attribute 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Graduate Attribute 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

Graduate Attribute 10: Engineering Professionalism

Understand and commit to professional ethics and norms of engineering technology practice, including compliance with national and international laws.

Graduate Attribute 11: Project management and finance

Demonstrate knowledge and understanding of engineering management principles.

ECE 2.4 Slow progress

In order to progress from one study level to the next, a student would need to accumulate a minimum number of credits as indicated with the table below. Students achieving below the threshold would be considered as making unsatisfactory academic progress and would be excluded.

END OF YEAR	MINIMUM CREDITS
1	84 at NQF level 5
2	168 credits: 140 credits at NQF level 5 plus 28 credits at NQF level 6
3	252 credits: 140 credits at NQF level 5 and 112 credits at NQF level 6
4	336 credits: 140 credits at NQF level 5 plus 140 credits at NQF level 6 plus 56 credits at NQF level 7

ECE 2.5 Promotion to a Higher Level

In addition to the prerequisites, co-requisites, requirements of the individual

modules, and the minimum credit accumulation as specified in the table above, the student:

a. Must register a failed module in the following year.

b. Can register for 3rd year modules only if all 1st year modules are passed.

ECE. 3 BACHELOR OF ENGINEERING TECHNOLOGY HONOURS IN CHEMICAL ENGINEERING: Code: BEHCE1; SAQA ID: 115521; NQF Level 8; SAQA Credits = 144

This qualification is primarily oriented to meet the needs of practicing Engineers ready for the industry. The knowledge emphasises general principles and application of technology transfer. The qualification provides students with a sound additional knowledge base in the discipline of chemical engineering and the ability to apply their knowledge and skills to particular career or professional contexts, while equipping them to undertake more specialised and intensive learning. This learning programme has a strong professional and career focus and holders of this qualification are normally prepared to enter a specific niche in the chemical and allied industries.

Specifically the purpose of the learning programme is to strengthen the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent engineering practitioner in the discipline of chemical engineering. This qualification provides:

1. Development on acquired knowledge towards careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development.
2. The additional educational base contributing towards the registration as a Professional Engineer with the Engineering Council of South Africa (ECSA).
3. Entry to NQF level 9 Masters Programmes and the ability to then proceed to Doctoral Programmes.

ECE 3.1 Minimum Admission Requirements

- The number of students enrolled each year will be determined by the University and the Departmental enrolment policies. In addition to the minimum University admission requirements, the following criteria must be met by students wishing to study this programme:

- The minimum entry requirement is the Bachelor of Engineering Technology in Chemical Engineering and Advanced Diploma in Chemical Engineering.

- Applicants who did not complete the Bachelor of Engineering Technology in Chemical Engineering at this University may apply for Conferment of Status as stated

in Rule G10A. (Note: These applicants may need to complete additional undergraduate courses to gain admission.)

Module Name	Subject code	Study Period	Credits	C/E	Pre-requisite	Exam
Semester 1						
Reaction Engineering	RENG101	1	12	C	Nil	Yes
Separation Technology	STEC101	1	12	C	Nil	Yes
Chemical Engineering Process Design 4A	CEPD101	1	16	C	Nil	No
Chemical Engineering Project 4A	CEPR401	1	16	C	Nil	No
Process and Project Management	PPMN101	1	8	C	Nil	Yes
Petroleum Refining Technology	PERT101	1	8	E	Nil	Yes
TOTAL Credits			72			
Semester 2						
Process Optimisation and Computational Analysis	POCA101	1	12	C	Nil	Yes
Process Control4	PRCO401	1	12	C	Nil	Yes
Chemical engineering Process Design 4B	CEPD402	1	16	C		No
Chemical Engineering Project 4B	CEPR402	1	16	C		No
Bioprocess Engineering	BIOP101	1	8	E	Nil	Yes
Green	GREN101	1	8	E	Nil	No
TOTAL Credits			72			

ECE 3.2 Unsatisfactory Academic Progress

Refer to Rule G17

All modules have Graduate Attributes to be assessed, the student must meet both the academicand the graduate attribute requirements, as specified in the relevant study guide, in order topass the subject. The student has to show competencies in the following latest ECSA standard E-09-PT – 2023 - Graduate Attribute for BEngTech Honours

Graduate Attribute 1: Problem-solving

Identify, formulate, research literature and analyse complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialisation to develop solutions to complex problems.

Graduate Attribute 3: Engineering design

Design creative solutions for complex problems and design systems, components or processes to meet identified needs.

Graduate Attribute 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

Graduate Attribute 5: Use of engineering tools

Demonstrate competence to create, select and apply, and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex problems.

Graduate Attribute 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on complex engineering activities, both orally and in writing, with the engineering community and society at large, taking into account cultural, language and learning differences.

Graduate Attribute 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

Graduate Attribute 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

Graduate Attribute 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

Graduate Attribute 10: Engineering Professionalism

Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws.

Graduate Attribute 11: Project management and finance

Demonstrate knowledge and understanding of engineering management principles and economic decision-making.

ECE. 4 MASTER OF ENGINEERING: Code: MNCHM1; SAQA ID: 96827; NQF Level 9; SAQA Credits = 180

ECE. 4.1 COURSE OBJECTIVE

This qualification is intended for persons who will make a contribution, through research, to understanding the application and evaluation of existing knowledge in a specialized area of technology. They will also demonstrate a high level of overall knowledge in that area, ranging from fundamental concepts to advanced theoretical or applied knowledge. This will include the ability to make an informed decision on the choice of method for tackling a given problem, the communication of ideas and results of scientific investigation and the use of scientific literature.

ECE 4.2 ENTRANCE QUALIFICATION

Students are required to have completed an appropriate honours degree or equivalent in Chemical Engineering. Graduates with an appropriate engineering degree in any discipline within the engineering profession plus related experience in the field of Chemical Engineering can apply for the qualification using rule G10 – Conferment of Status.

ECE 4.3 COURSE STRUCTURE

The duration of this course is equivalent to a minimum of 1-year. The project must involve either developmental or applied research. Examining willbe done by a panel of examiners appointed by the University.

ECE 5 DOCTOR OF ENGINEERING: Code: DNCHM1; SAQA ID: 96812; NQF Level 10, SAQA Credits = 180

ECE 5.1 COURSE OBJECTIVES

This qualification is intended for persons who will make a significant and original contribution to knowledge in a specialised area of technology. Theywill have a high level of overall knowledge in that specialised area ranging from fundamental concepts to advanced theoretical or applied knowledge.A student must provide proof of original and creative thinking and problem solving, and make a real contribution to the knowledge field. The dissertation must comply with the normal general technical requirements and ruleswith regard to scope, quality and layout.

ECE 5.2 ENTRANCE QUALIFICATION

Students are required to have completed a Master's degree in Chemical Engineering. Graduates with an appropriate degree in engineering plus an appropriate Master's degree relevant to the field of Chemical Engineering can apply for the qualification using rule G10 – Conferment of Status.

ECE 5.3 COURSE STRUCTURE

The duration is equivalent to a minimum of two (2) years study.
Examining will be done by a panel of examiners appointed by the University.

PROGRAMMES OFFERED IN PULP AND PAPER

Programmes are offered in Pulp and Paper which upon successful completion lead to the award of the following qualifications:

Qualification	SAQA NLRD ID
Advanced Diploma in Pulp and Paper Technology	102017
Diploma in Pulp and Paper Technology	111384

ECE.8 ADVANCED DIPLOMA IN PULP AND PAPER TECHNOLOGY: Code: ADPPT1; SAQA ID: 102017; NQF Level 7; SAQA Credits = 120

The programme offered in this Department, which upon successful completion, will lead to the following qualification

Qualification:	SAQA NLRD Number
Advanced Diploma in Pulp and Paper Technology	102017
Diploma in Pulp and Paper Technology	111384

Purpose of the Programme and General Information

The Advanced Diploma in Pulp and Paper Technology will provide graduates in general science or engineering with intensive, focused and applied knowledge and skills required to function effectively in the pulp, paper and allied industries. In addition, the Advanced Diploma will provide career development and progression possibilities for senior operating staff holding the Diploma in Pulp and Paper Technology.

The Advanced Diploma in Pulp and Paper Technology is offered part-time only, with lectures at pulp and paper industry facilities country-wide. Preference will be given to applicants who are already employed in the industry, and are able to undertake a Process Optimisation Project in the industry.

ECE 8.1 MINIMUM ADMISSION REQUIREMENTS

The admission requirements for this programme are stipulated in Rule G21C(1).

Selection Criteria

- The minimum entry requirement is the Diploma in Pulp and Paper Technology or Diploma in Chemical Engineering, or any Science/Engineering NQF6 qualifications.
- Preference will be given to applicants who are already employed in the industry, and are able to undertake a Process Optimisation Project in the industry.
- Applicants not employed in the industry will be considered where the Department has the required resources to ensure that they are able to under- take a Process Optimisation Project at the Institution.

ECE 8.2 UNSATISFACTORY ACADEMIC PROGRESS

A student will be refused re-registration if he/she is unable to complete the qualification within the maximum allowed period of study as stipulated in Rule G17.

ECE 8.3 PROGRAMME STRUCTURE

MODULE	SEMESTER	ASSESSMENT	NQF LEVEL	SAQA CREDITS	PRE - REQUISITES
Fibre preparation A	1	Examination	7	16	Nil
Fibre preparation B	2	Examination	7	16	Nil
Paper manufacture A	1	Examination	7	16	Nil
Paper manufacture B	2	Examination	7	16	Nil
Operations research and statistics	3	Examination	7	8	Nil
Environmental engineering	3	Examination	7	8	Nil

Process optimization project A	3	Continuous assessment	7	8	Nil
Operations and financial management	4	Examination	7	8	Nil
Process optimization project B	4	Continuous assessment	7	16	Process optimization project A
Pulp and paper products and applications	4	Examination	7	8	Nil
TOTAL				120	

ECE 9 DIPLOMA IN PULP AND PAPER TECHNOLOGY: Code: DIPPT1; SAQA ID: 111384; NQF Level 6; SAQA Credits = 360

ECE 9.1 MINIMUM ADMISSION REQUIREMENTS

In addition to Rule G7(1) and G7(2)(b)(ii), the following achievement ratings apply for admission into the Diploma in Pulp and Paper Technology:

Compulsory Subjects	NSC	SC		NCV
	Rating	HG	SG	
Mathematics	4	D	B	3 (Competent: 60-69%)
Physical Science	4	D	B	3 (Competent: 60-69%)
English	3	E	C	3 (Competent: 50-69%)

Mathematics Literacy is excluded as an admission requirement.

ECE 9.2 PROGRAMME STRUCTURE

- Referring to the table below, all modules are compulsory.
- This is a full-time qualification

Subject	Semester	NQF Level	Credits	C/E*	Pre-Req.	Co Req	Exam**
Mathematics A	1	5	12	C			No
Chemistry A	1	5	12	C			Yes
Cornerstone 101 (general module)	1	5	12	C			No
Physics A	1	5	8	C			Yes
Pulp and Paper Engineering Fundamentals A	1	5	12	C			Yes
Technical Literacy	1	5	8	C			No
Mathematics B	2	5	12	C	Mathematics A		No
Physics B	2	5	8	C			Yes
Chemistry B	2	5	12	C	Chemistry A		Yes
Pulp and Paper Science 1	2	5	12	C	Chemistry A		Yes
Pulp and Paper Engineering Fundamentals B	2	5	12	C	Mathematics A; Chemistry A;		Yes
Computer Applications	3	5	12	C			No
Chemistry C	3	6	12	C	Chemistry A		Yes
Physics C	3	6	8	C			Yes
Pulp and Paper Technology A	3	6	12	C	Pulp and Paper Science 1		Yes
Pulp and Paper Laboratory A	3	6	8	C	Pulp and Paper Science 1	Pulp and Paper Technology A	No
Unit Operations A	3	6	12	C			Yes
Pulp and Paper Technology B	4	6	12	C	Pulp and Paper Science 1		Yes

Pulp and Paper Laboratory B	4	6	8	C	Pulp and Paper Science 1	Pulp and Paper Technology B	No
Transfer Processes	4	6	12	C			Yes
Unit Operations B	4	6	12	C			Yes
Thermodynamics	4	6	12	C			Yes
Pulp and paper technology C	5	6	12	C	Pulp and Paper Science 1		Yes
Pulp and Paper Laboratory C	5	6	8	C	Pulp and Paper Science 1	Pulp and Pape	No
Principles of management A	5	7	8	C			Yes
Process Instrumentation and Control	5	6	12	C	Pulp and Paper Engineering Fundamentals B		Yes
Project Management	5	7	8	C			Yes
Pulp and paper manufacturing	6	6	72	C	Pulp and Paper Technology A, B and C. Pulp and Paper Laboratory A, B and C		No
TOTAL Credits			360				

ECE 9.3 DURATION OF PROGRAMME

ECE 9.4 SPECIFIC RULES FOR PULP AND PAPER PROGRAMMES

The duration of study is stipulated in Rule G21B

ECE 9.5 PROMOTION TO A HIGHER LEVEL/PROGRESSION

Rule G16 applies

ECE 9.6 EXCLUSION RULES

Rule G17 applies

ECE 10 SYLLABI FOR DEPARTMENTAL PROGRAMMES

Note: Below is a brief description of the subjects for the qualifications offered in the department. Detailed information for all these subjects is to be found in the Study Guidelines that are issued to students at the beginning of each course. The study guidelines will include information regarding: credit value, duration (lectures, practicals and tutorials), assessment methods, outcomes and content.

BACHELOR OF ENGINEERING TECHNOLOGY IN CHEMICAL ENGINEERING

Engineering Mathematics 1A (EMTA101): Numbers and Algebra, Areas and Volumes, Trigonometry, Graphs, Complex Numbers, Calculus-differentiation, Calculus-Integration.

Engineering Chemistry 1A: Atomic structure and periodic table, introduction to elements, compounds and atomic structure. Types of bonding ; Ionic and covalent bonding. Nomenclature of ionic and covalent compounds Ionisation energy, electronegativity and electron affinity reactions and stoichiometry, moles, percent composition, empirical formulae, limiting reactant and percentage yield. Concentration units and solution chemistry, neutralisation reactions. Types of reactions – synthesis, decomposition, single replacement, double replacement using solubility chart), and redox. Properties of s and p block elements. Hydrogen, groups 1, 2, 13 (Al,B), 14 (C,Si),15 (N,P), 16 (O,S), 17 (F, Cl, Br, I) Introduction to organic chemistry

Cornerstone (CSTN101): Introduction to cornerstone and the common set of values, Introduction to Journeys, Historical Events, Diversity, Social Groups and the Bill of Rights, Social Identities, structure and Agency, Issues of gender, HIV/AIDS and Society.

Engineering Physics 1A: Units, Physical Quantities, Vectors, Equilibrium of a particle, Newton's Second Law, Gravitation, Work and Energy, Impulse and Momentum, Torque, Elasticity, Periodic Motion

Chemical Engineering Fundamentals 1A: Basic Chemical Engineering Concepts Units and dimensions, Introduction to material and energy balances, Chemical industry in KZN and SA, Problem Solving

Technical Literacy: The differences between language usage in academic, technical and common environments, Referencing, spreadsheets, pictorial representation of data, Word processing, Experimental methods scientific methods, Planning and documenting experiments Technical Report writing, Standards (ISO, SABS, etc.)

Engineering Mathematics 1B (EMTB101): Differentiation, Integration, Linear Algebra, Statistics and Probability
Engineering Physics 1B Thermodynamics, Mechanical Waves, Vibrating Bodies, Acoustic Phenomena, Coulomb's Law, Current, Resistance and Capacitance **Engineering Chemistry 1B:** Chemical Bonding, Chemical Reactions in Aqueous and Non-Aqueous Solutions, Gases, Liquids, Electrochemistry, Chemical equilibrium, Colligative properties of solutions, Reaction kinetics, Colloids

Chemical Engineering Fundamentals 1B: Material and energy balances for single and multiple unit processes, with and without chemical reactions, including recycle, bypass and purge streams, and Simultaneous material and energy balances for systems

Chemical Engineering Design 1: Sustainable Development, Engineering Graphics, Professional Practice, Ethics, Workshop practice, Application of Computers to Chemical Engineering Design, Design Project 1

Computer Applications 1A: Theory of computers, Microsoft Office Word, Excel

Engineering Chemistry 2A: Alkanes and Cycloalkanes, Radical Reactions, Ionic Reaction, Alkenes and Alkynes, Alcohols and Ethers, Alcohols and Carbonyl, Aromatic Compounds, Electrophilic Aromatic Substitution, Aldehydes and Ketones, Carboxylic Acids and their derivatives

Computer Applications 2A: Advanced Excel, Chemical Engineering application software, programming with VBA and Matlab.

Process Fluid Flow: Fluid statics and dynamics principles, Incompressible Newtonian and Non-Newtonian flow in pipes and channels, Pumps, Mixing, Flow of compressible flow in pipes

Engineering Mathematics 2A: Advanced Calculus, Differential Equations

Principles of Management: Working environment, principles of general management, Human resource management, Impact of employment relations and labour legislation on an organisation, Managing people and teams, Law of contracts, Managing technology and innovation

Chemical Engineering Design 2A: Plant Design Aspects, Design Project 2, Application of Computers to Chemical Engineering Design

Chemical Engineering Laboratory 1A: Chemical Engineering Laboratory Practice, various

practical in fluid flow and heat transfer

Applied Thermodynamics: First Law and Second Law of Thermodynamics, The Working Fluid, The Heat Engine cycle, Nozzles, and Roto-dynamic Machinery, Positive Displacement Machines, Refrigeration and Heat pumps

Transfer Processes: Conduction and Convection, Thermal Radiation, Double-Pipe and Shell-and-Tube Heat Exchangers, Steady State Molecular Diffusion, Convective Mass Transfer, Mass Transfer Across An Interface

Applied Statistics: Discrete Random Variables And Probability, Continuous Random Variables And Probability Distributions, Joint Probability Distributions And Random Samples, The Analysis Of Variance., Multifactor Analysis Of Variance, Simple Lin-ear Regression And Correlation, Nonlinear And Multiple Regression.

Process Safety and Occupational Health: Occupational Health and Safety Legislation relevant to the chemical industry, Chemical Plant Safety, Handling, transport and storage of bulk chemicals, Hazard and Risk assessment, Fault Tree Analysis, Audits, Incidents and Emergency Planning

Chemical Engineering Design 2B: Design of heat and mass transfer equipment Application of Computers to Chemical Engineering Design

Chemical Engineering Laboratory 1B: Various practicals in thermodynamics, mass transfer and process control

French for Sciences and Technology 1: Pragmatic, linguistic and cultural components

Mandarin for Sciences and Technology 1: Pragmatic, linguistic and cultural components

French for Sciences and Technology 2: Pragmatic, linguistic and cultural components

Mandarin for Sciences and Technology 2: Pragmatic, linguistic and cultural components

Project Management: Modern project planning methods, tools, analyses and computer applications, Oral and written communication of project planning, project implementation, Support of the operational systems.

Reaction Engineering: Mole Balances, Conversion and Reactor Sizing, Rate Law and Stoichiometry, Isothermal Reactor Design, Collection and Analysis of Rate Data, Multiple Reactions, Non-elementary Reaction Kinetics

Unit Operations: Psychrometry, Drying, Single and Multi-effect Evaporation, Leaching, Adsorption

Multistage Operations: Phase Equilibria, Distillation of binary and multi-component mixtures, Gas absorption, Liquid-Liquid Extraction

Chemical Engineering Design 3A: Thermal performance calculations using LMTDand NTU concepts, Detailed Equipment Design: Shell and tube Heat exchangers, Extended Heat Transfer

Surfaces, Plate-and-frame heat exchangers, Mass transfer Equipment design.

Chemical Engineering Laboratory 2A: Various practicals in particle technology, reaction engineering and unit operations

Particle Technology: Characterization of particles, Size reduction, Storage and transport of solids, Solid-liquid separation processes

Environmental Engineering: Environmental and Safety Legislation, Sustainable Development, Fundamentals of Toxicology, Water, Air and Land pollution, Environmental Impact Assessment, Waste Minimization and Cleaner Production, Life Cycle Analysis, BACT

Chemical Thermodynamics: Properties of Pure Fluid, Heat Effects, Thermodynamic Properties of Real Fluids, Properties of Mixtures

Process Control: Process Instrumentation, Process and Instrumentation Diagrams, Control theory, Controller tuning and stability, Control strategies, Alarms, interlocks and safety trips, HAZOP

Chemical Engineering Design 3B: Preliminary plant Design, Storage and fluid handling, Pinch Technology, Reactor design

Chemical Engineering Laboratory 2B: Investigative technical project in a particular field in chemical engineering

BACHELOR OF ENGINEERING TECHNOLOGY HONOURS IN CHEMICAL EN-GINEERING

Reaction Engineering: Steady State Non-isothermal Reactor Design: Algorithm for non-isothermal CSTR, PFR and PBR. Size adiabatic and non-adiabatic CSTR, PFR and PBR. Reactor staging to obtain high conversions. Catalysis and Catalytic Reactors: Derive rate law and catalytic mechanism. Size isothermal reactors for reactions with Langmuir-Hinschelwood kinetics. Different types of catalyst deactivation. Size and performance calculations on heterogeneous systems. Mass Transfer diffusional effects in heterogeneous systems: Accounting for mass transfer resistances in heterogeneous systems: internal and external, shrinking core model, etc. Analysis of Non-Ideal Reactors: RTD analysis and non-ideal reactor models

Separation Technology: Distillation: Review of binary distillation theory and systems: batch, continuous, single and multiple feed and side streams, Multi-component Distillation: System configuration, Degrees of freedom and variable specification, Limiting reflux and contacting requirements, Splits of non-key components, Estimates of stage requirements, Structure of computational procedures, Stage-to-stage calculations, Simultaneous solutions to system equations Separation of non-ideal mixtures (Azeotropic, extractive and reactive distillation) Introduction to Computer-aided Design and Analysis Steady-state simulations – use and context, Multicomponent examples – ideal and non-ideal mixtures and complex column specifications, Residue curve map generation and analysis Gas Absorption: Rate expressions and mass transfer coefficients for packed columns Transfer units and height equivalent to a theoretical stage or plate (HETS or HETP) Liquid-Liquid extraction: Solvent Selection and design of LLE systems Crystallization Ion-exchange Reverse osmosis

Chemical Engineering Process Design 4A: Process Synthesis, Process Feasibility, Safety and Loss Prevention, Material Balance, Energy Balance, Process Flow-sheeting, Instrumentation and Control, Equipment Selection and Design (reaction modelling and reactor design, separation unit and heat transfer), Process Economics, Process Optimization, and Process Simulations The design assignment will require the student to: · Identify and analyses specific project objectives, and plan and formulate the criteria for an acceptable design solution. · Access, acquire and evaluate the relevant knowledge, information and resources · Generate and analyse alternative solutions by applying appropriate engineering knowledge. · Select the optimal solution based on technical, operational and economic criteria, and evaluate the impact and benefits of the proposed design. · Communicate the design logic and information in the appropriate format.

Chemical Engineering Project 4A: An investigative project (plant investigation, product development, process evaluation, process development) is undertaken by the student. The scope of the project must include the following: · Formulate the project. ·Describe and justify the theoretical framework and methodology to address the project.

· Conduct and manage the project. · Analyse the information gained / results of the project. · Draw conclusions / Make recommendations based on the project. · Produce a report of the completed work

Process and Project Management: Planning: Vision and mission statement, Setting objectives and targets, Forecasting, Resource planning, Devise short-term and long-term strategy, Time schedules (Gantt chart) Control: Meeting targets, Work ethic and discipline, Labour relations (negotiation), Managing quality, Service delivery, Performance management, Record-keeping and recording, Report-writing Project Management: Project stakeholders, Tasks of project manager, Conflict management, Work breakdown structure, Project time management People management: Authority, power and responsibility, Leadership style, Managing relationships, Teamwork, Stress management, Professional ethics and practice Financial Management: Accounting and financial basics, Profit and loss, Operational budgeting and cost estimation, Time value of money, Capital budgeting and financial viability evaluation (IRR, NPV) Entrepreneurship: Characteristics of an entrepreneur, The business plan, Sources of finance, Legal and tax requirements

Process Optimisation and Computational Analysis: Introduction: definitions; terminology; mathematical representation; formulation of objective function; static versus dynamic optimization; unimodality; convexity and concavity; characterization of stationary points; contour plots; equality and inequality constraints; problems encountered in optimization; review of matrices and matrix algebra Analytical techniques: classical optimization theory; necessary and sufficient conditions; Hessian matrix; determinant and eigenvalue analyses of Hessian matrix Unconstrained one-dimensional optimization numerical methods; interval of uncertainty; Line-Search Without Using Derivatives: region-elimination methods; sequential search; Dichotomous search; Golden-Section search; Fibonacci search; polynomial approximation methods, Line-Search Using Derivatives: bisecting search; Newton, Quasi-Newton, and Secant methods. Unconstrained multivariable optimization: se of line search in multidimensional search; Multidimensional Search Without Using Derivatives: cyclic coordinate method; method of Hooke-Jeeves; method of Rosen brock; flexible polyhedron (simplex) search; Multidimensional Search Using Derivatives: steepest descent; Newton, Quasi-Newton, Marquardt-Levenberg, and Broyden methods; Methods Using Conjugate Directions: method of Fletcher and Reeves Con- strained multivariable optimization: Linear Programming (LP):

graphical solution; slack and artificial variables; simplex method; sensitivity analysis; duality in LP; Penalty Function Techniques; Lagrange Multiplier Method; Kuhn-Tucker conditions Optimization of staged and discrete processes: Dynamic Programming; Integer (IP) and Mixed Integer Programming (MIP: MILP, MINLP) Parameter estimation: Linear/Nonlinear Regression

Process Control 4: Introduction to Process Control: Control Objectives and BenefitsBasic introduction and recapping of previous knowledge. Mathematical Modelling Principles: The modelling procedure, modelling examples, linearization, numerical solutions of ODE's, the non-isothermal chemical reactor. The Laplace transform, I/O models and transfer functions, block diagrams Modelling and Analysis for Process Control Dynamic Behavior of Typical Process Systems: Basic system elements, series structures of simple systems, parallel structures of simple systems, recycle structures, staged processes, multiple input – multiple output systems The Feedback loop. Control performance measures, approaches to process control Desired features of feedback control, block diagram of

the feedback loop, proportional mode, integral mode, derivative mode, the PID controller, analytical expression for a closed loop response PID Controller Tuning for Dynamic Performance: Defining the tuning problem, determining good tuning constant values, correlations for tuning constants, Fine-tuning the controller tuning constants Stability Analysis and Controller Tuning: The concept of stability, stability of linear systems, stability analysis of linear & linearized systems, stability analysis of control systems: Principles, the Bode method, Ziegler Nichols closed loop PLCs: Basic introduction and programming of PLC's

Chemical Engineering Process Design 4B: Process Synthesis, Process Feasibility, Safety and Loss Prevention, Material Balance, Energy Balance, Process Flow-sheeting, Instrumentation and Control, Equipment Selection and Design (reaction modelling and reactor design, separation unit and heat transfer), Process Economics, Process Optimisation, and Process Simulations The design assignment will require the student to: · Identify and analyse specific project objectives and plan and formulate the criteria for an acceptable design solution. · Access, acquire and evaluate the relevant knowledge, information and resources · Generate and analyse alternative solutions by applying appropriate engineering knowledge. · Select the optimal solution based on technical, operational and economic criteria, and evaluate the impact and benefits of the proposed design. · Communicate the design logic and information in the appropriate format.

Chemical Engineering Project 4B: An investigative project (plant investigation, product development, process evaluation, process development) is undertaken by the student. The scope of the project must include the following: · Formulate the project. ·Describe and justify the theoretical framework and methodology to address the project.
· Conduct and manage the project. · Analyse the information gained / results of the project. · Draw conclusions / Make recommendations based on the project. · Produce a report of the completed work **French for Sciences and Technology 3:** Pragmatic components: know the missions of an engineer and a technician, the different parts of a process, the different fields of research, and institutions, argue, write a technical report. - Linguistic components: adverbs, subjunctive, forms of the wish, the tense, present participle, expression of cause and consequence. Cultural components: Engineering/scientific profiles, jobs, types of engineering, techniques and processes.

Petroleum Refining Technology: Origin of crude oil; preliminary processing of crudeoil; desalting and dehydration separation of crude oil from associated gases; Atmospheric and Vacuum distillation of crude oil; Thermal cracking; coking; pyrolysis, catalytic cracking; catalytic reforming; hydrogenation processes; vis-breaking; Fuel properties and measurements

Minerals Processing: South African minerals Industry; ore formation; Economic and environmental concerns in minerals processing; surface chemistry of minerals; particle characterisations; comminution; gravity concentration; flocculation; coagulation; dispersion; flotation; Magnetic and electromagnetic separation.

Bioprocess Engineering: Introduction Microbiology and biochemistry; Classification and growth characteristics of microorganisms; screening and selection of micro-organisms for industrial application. Biological transformation of raw material into products; foods; fuels, chemicals and pharmaceuticals. Bioreaction kinetics; design, analysis and control of bioreactors; Bioreactors; packed bed reactors; fluidized bed reactors; airlift reactors; bubble column reactors. Fermentation processes.

Green Engineering: Introduction to Green Engineering, Theoretical framework of Green Engineering, Cleaner Production Technologies, Green engineering in practice, Life Cycle Analyses, Impact Assessment methodologies, Utilization of sustainable materials and energy

DIPLOMA IN PULP AND PAPER TECHNOLOGY

Technical Literacy: Plan, write, revise, and present technical documents.

Pulp and Paper Engineering Fundamentals A: This course is designed to give first year students an introduction to concepts, principles and practices to the field of chemical engineering.

Pulp and Paper Engineering Fundamentals B: This course introduces the student to the fundamental knowledge area of chemical engineering - material and energy balances on single and multiple-unit processes.

Principles of Management: The purpose Principles of Management is to equip the student with a basic understanding of the intricacies of Human Resource management and the Labour Relations Act.

Pulp and Paper Laboratory A, B & C: Develop problem-solving skills by experimentation through a series of short and long projects on chemical engineering unit processes.

Unit Operations A: Develop understanding of techniques and principals, design and assessment of a number of unit operations in which heat and mass transfer are involved.

Unit Operations B: Development of the fundamentals of fluid mechanics, and its application to chemical engineering operations.

Chemistry A: The principles of general and organic chemistry are explained.

Chemistry B: Apply knowledge and principles of physical chemistry applicable to chemical engineering. Gas Laws will be stated and relevant calculations performed based on these Laws.

Chemistry C: The student will be able to acquire and demonstrate scientific principles relevant to organic chemistry.

Computer applications: Provides knowledge and understanding of personal computers in terms of hardware, operating systems and networking. Expose students to commonly used software packages.

Pulp and Paper Science I: The basic scientific principles upon which the conversion of raw material to pulp and paper is based.

Pulp and Paper Technology A: Introduce the learner to the chemistry and technology of pulping, bleaching & recovery in modern pulp mills.

Pulp and Paper Technology B: Papermaking technology – all processes and sub processes are included.

Pulp and Paper Technology C

Thermodynamics: Introduce learners to the engineering applications of heat, work and their interactions.

Cornerstone 101: Induct students into the community of higher education, with values and practices that promote self-awareness, social justice and environmental sustainability.

Mathematics A: Numbers and Algebra, Areas and Volumes, Trigonometry, Graphs, Complex Numbers and Calculus.

Mathematics B: Differentiation, Integration; Linear algebra, Statistic and probability.

Physics A: Units, Physical Quantities, Vectors; Equilibrium of a particle; Newton's Second Law, Gravitation; Work and Energy; Impulse and Momentum; Torque; Elasticity and Periodic Motion.

Physics B: Thermodynamics; Mechanical Waves; Vibrating Bodies; Acoustic Phenomena; Coulomb's Law and Current, Resistance and Capacitance.

Physics C: The Magnetic Field; Inductance; Maxwell's Equations; Electromagnetic Waves; The Nature and Propagation of Light; Atomic and Molecular Structure.

Transfer Processes: Enable learners to understand and apply driving principles behind heat and mass transfer in order to solve problems relating to designing and improving the efficiency of unit operations.

ADVANCED DIPLOMA IN PULP AND PAPER TECHNOLOGY

Paper Manufacture A and B: To equip the learner with an advanced and comprehensive theoretical basis of the main unit operations that form the basis of the South African paper manufacturing industry.

Fibre Preparation A : Equip the learner with an advanced and comprehensive theoretical basis of the fibrous raw materials and pulping processes that form the basis of the South African pulp manufacturing industry.

Fibre Preparation B: Equip the learner with an advanced and comprehensive theoretical basis of the fibrous raw materials and pulping and bleaching processes that form the basis of the South African pulp manufacturing industry.

Environmental Engineering: Introduce the learner to environmental legislation, environmental assessment methodologies and environmental management systems. The students are made aware of the nature and sources of pollution produced by pulping and papermaking operations and mitigating/treatment methods are explored.

Operations and financial management: The purpose of this module is to introduce the learner to: the local and international pulp and paper market and industry; technical and project management concepts; costing and capital budgeting.

Operations Research and Statistics: The purpose of this module is to introduce the learner to quantitative optimisation techniques and to apply standard statistical data processing techniques to continuous processes typically found in the industry.

Process Optimisation Project A: Develop essential problem-solving, analysis and communication skills, as well as integrate and make relevant the technology learnt in the theoretical phase of the programme, the student is required to complete an investigative optimisation project in a pulp or paper context.

Process Optimisation Project B: Conduct an investigative study in order to solve a real process problem in a pulp or paper mill. Communicate the findings in a scientifically acceptable manner.