2023 HANDBOOK

DUT
DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

CHEMICAL ENGINEERING

HANDBOOK FOR 2023

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 K Ntuli
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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
Executive Dean:	Prof FJ Nemavhola
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)
	Dr T P Mahlangu, DEng (Chem Eng) (TUT) ; MTech (Chem Eng) (UNISA); BTech (Chem Eng) (TUT)
	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)
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) astudent 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 oneweek 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 theover-all 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 ex- amination. The method of calculation of the year/semester mark for each subject, for the purpose of issuing a certificate is indicated in thelearner guide for each subject. For year/semester marks consisting ofa 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, thedefinition of the term" attended satisfactorily" shall include:

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

b) 100% attendance at all scheduled practical classes.

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

ECE 1.4 CONDUCT OF STUDENT IN LABORATORY

Rules of conduct pertaining to a specific laboratory, as instituted and amended from time to time by the heads of 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 with the relevant syllabus all theory ex- aminations 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 topass 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 such a 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 1.10 EXPERIENTIAL LEARNING

The National Diploma programme requires the student/candidate to undergo a period of experiential learning as part of the course. All prescribed compulsory subjects (instructional offerings) and the prescribed experiential component must be passed in order to obtain sufficient credits to qualifyfor the qualification.

Although the Durban University of Technology undertakes to assist the student/candidate in obtaining suitable experiential learning placement, theonus is on the student/candidate to find a suitable "employer". The employer must be accredited by the Institution for the purposes of experientiallearning. An experiential learning agreement creates a separate contract between the "employer" and the student/candidate.

The student must fulfill all the requirements as laid out in the experiential learning manual. The experiential learning manual will be made available to students on registration for experiential learning.

Experiential Learning must be completed within 18 months from the date of first registration. If a student has not completed experiential learning within this prescribed period, the student may approach the Head of Department to request an extension on reasonable grounds; otherwise they will be excluded from the programme.

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 per-mitted to re-register in 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 maximum period of registered study.

The above includes periods of study and exemptions granted for subjects passedat any other educational institution towards the same or equivalent qualification.A student who is prevented from re-registering in terms of Rule ECE.1.12 may appeal to the Faculty Board Executive provided there is proof of ex-tenuating 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 days

of having been notified by the Head of Department that he/she is not permitted to re-register.

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

PROGRAMMES OFFERED IN CHEMICAL ENGINEERING

Programmes are offered in chemical engineering which upon successfulcompletion 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**
B. Tech : Chemical Engineering	**72127**

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 Technology, Master of Engineering and Doctor of Engineering. These qualifications in Engineering Technology are designed to meet the needs of thecountry 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 SouthAfrican 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. 1 BACHELOR OF TECHNOLOGY ENGINEERING: CHEMICAL QUALIFICATION CODE (3308005)

A learner achieving this qualification will be competent in applying and integrating theoretical knowledge, engineering principles, proven techniques, practical experience, and appropriate skills to the solution of well-defined and ill-defined problems in the field of Chemical Engineering, by operating within the relevant standards and codes. The learner will be capable of in- dependent decision-making taking into account the relevant technical, social, economic, and environmental factors.

ECE. 1.1 ADMISSION REQUIREMENTS

Please note that due to National legislation, signed into effect by the Minister of Higher Education in the Government Gazette no. 40123 of 6th July 2016, the last

permitted enrolment for any non-HEQSF aligned programme will be the 31st December 2019. This means that you will not be able to enrol in a Bachelor of Technology (BTech) degree at DUT, or at any other institution in South Africa after thisdate.

1. National Diploma: Chemical Engineering
(3208022/3208038/3208054)

OR

2. National Diploma: Chemical Engineering (3208593) PLUS
credits in the following subjects:
Process Control III
Chem. Proc. Des. Principles III Chemical Plant III: Mod II
Thermodynamics: ChemEng III Chemical Engineering
Tech III: 302

OR

3. National Higher Diploma: Chemical Engineering (3508464)

OR

4. Conferment of Status

Persons not meeting the above requirements may make an application to the department, which will determine further requirements that are necessary.

ECE. 1.2 SUMMARY OF PROGRAMME: BTECH: CHEMICAL ENGINEERING - BTCMEI

COURSE STRUCTURE

Subject Offering	Code	Semester	Assessment Method	NQF Level	Pre-requisite	Co-requisite
Chem Eng Tech IV (3 Modules)	CENT402	1				
Chem Eng Tech 401 (Fluid Flow IV)	CETE401	1	Examination	7		
Chem Eng Tech 402 (Heat & Mass IV)	CHTE401		Examination	7		
Chem Eng Tech 403 (Unit Operations IV)	CTEC401	1	Examination	7		
Mathematics: Chem Eng III	MCEN301	1	Examination	7		
Reactor Technology IV	RTEC401	1	Examination	7		
*Project IV: Chem Eng	PRCE401	1	Continuous Assessment	7		
Chem Proc Design IV (2 modules)	CPDE401					
*Chem Proc Design 402	CEPD401	1	Continuous Assessment	7		Chem Eng Tech 402 Chem Eng Tech 403 Reactor Technology IV
Chem Proc Design 401	CHPD401	2	Continuous Assessment	7		

~~Process Control IV~~	~~PCCR402~~	~~2~~	~~Examination~~	~~7~~	~~Mathematics: Chem Eng III~~	
~~Production Eng.: Chem Eng~~	~~PECI401~~	~~2~~	~~Examination~~	~~7~~		

*Project IV: Chemical Engineering and Chemical Process Design 402 are annual subjects.

Important information for current BTech students:
Due to phase out of non HEQSF aligned programmes by the Department ofHigher Education, the last registration for 1st time entering students into the B. Tech Chemical Engineering was in 2019.

Notwithstanding all the current rules (both General rules and Departmental rules) that regulate this degree, the last semester in which any student may register for each of the subjects is listed as follows:

Subject Name	Last Possible Semester of Registration
Chem Eng Tech IV (3 Modules)	January 2022
Chem Eng Tech 401 (Fluid Flow IV)	January 2022
Chem Eng Tech 402 (Heat & Mass IV)	January 2022
Chem Eng Tech 403 (Unit Operations IV)	January 2022
Mathematics: Chem Eng III	January 2022
Reactor Technology IV	January 2022
*Project IV: Chem Eng	January 2022
Chem Proc Design IV (2 modules)	January 2022
*Chem Proc Design 402	January 2022
Chem Proc Design 401	January 2022
Process Control IV	January 2022
Production Eng.: Chem Eng	January 2022

ECE.2.0 BACHELOR OF ENGINEERING TECHNOLOGY IN CHEMICAL ENGINEERING SAQA ID: 98955

This is a 420-credit qualification which is primarily professionally oriented. The learning programme consists of a coherent assembly of knowledge areasassociated 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 pro- vides a viable platform for further studies and lifelong learning, and will pro- duce 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

that are highly numerate and have skills in problem solving, team working, communication and Information Technology. This qualification is designed to provide the graduate with knowledge and attributes to work in a diverse spectrum of industries including the chemical, petrochemical, pulp and paper,polymer, mining, water and waste water treatment, energy, food, and pharmaceutical industries. The key attributes of the graduates of this qualificationare:

- 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 Councilof 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						
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		
Year 2 Semester 1						
Engineering Chemistry 2A	ENCM201	3	12	6	Engineering Chemistry 1A Engineering Chemistry 1B	
Computer Applications 2A	CMAP201	3	12	6	Computer Applications 1A	
Process Fluid Flow	PFFL101	3		6	Chemical Engineering Fundamentals 1B	
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 Design 1 Chemical Engineering Fundamentals 1B	Process Fluid Flow
Chemical Engineering Laboratory 1A	CELA101	3	8	6	Chemical Engineering Fundamentals 1B	Process Fluid Flow
Year 2 Semester 2						
Applied Thermodynamics	APTH101	4	12	6	Chemical Engineering Fundamentals 1B	

Transfer Processes	TRFP101	4	12	6	Chemical Engineering Fundamentals 1B	

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 Design 1 Chemical Engineering Fundamentals 1B	Applied Thermodynamics Transfer Processes
Chemical Engineering Laboratory 1B	CELB101	4	8	6	Chemical Engineering Fundamentals 1B	Applied Thermodynamics Transfer Processes
French for Sciences and Technology 1	Frst101	4				
Mandarin for Sciences and Technology 1	MNST101	4				
Year 3 Semester 1						
Project Management	PMNM101	5	8	7		
Reaction Engineering	RCNE101	5	12	7	Chemical Engineering Fundamentals 1B Engineering Mathematics 1B	
Unit Operations	UNOP101	5	12	7	Chemical Engineering Fundamentals 1B	
Multistage Operations	MSOP101	5	12	7	Chemical Engineering Fundamentals 1B	
Chemical Engineering Design 3A	CEDA301	5	16	7	Chemical Engineering Design 2A Chemical Engineering Design 2B Transfer Processes Fluid Flow	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						
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 Engineering Mathematics 2A	
Chemical Engineering Design 3B	3CEDB301	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

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.

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

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.

- 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
French for Sciences and Technology 3	FSCT301	1	8	E	Nil	No
Mandarin for Sciences and Technology 3	MSCT301	1	8	E	Nil	No
Petroleum Refining Technology	PERT101	1	8	E	Nil	Yes
Minerals Processing	MIPR101	1	8	E	Nil	Yes
Semester 2						
Process Optimisation and	POCA101	1	12	C	Nil	Yes

Computational Analysis						
Process Control4	PRCO401	1	12	C	Nil	Yes
Chemical engineering Process Design 4B	CEPD402	1	16	C	Chemical Engineering Process Design 4A	No
Chemical Engineering Project 4B	CEPR402	1	16	C	Chemical Engineering Project 4A	No
Bioprocess Engineering	BIOP101	1	8	E	Nil	Yes
Green Engineering	GREN101	1	8	E	Nil	Yes
French for Sciences and Technology 4	FSCT401	1	8	E	French for Sciences and Technology 3	No
Mandarin for Sciences and Technology 4	MSCT401	1	8	E	Mandarin for Sciences and Technology 3	No

ECE 3.2 Unsatisfactory Academic Progress

Refer to Rule G17

ECE. 4 MASTER OF ENGINEERING(96827)

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 (96812)

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

ECE 6 NATIONAL DIPLOMA IN PULP AND PAPER TECHNOLOGY (NDPPT2)

QUALIFICATION CODE (3208112)

A learner achieving this qualification will be competent in applying theoretical knowledge, engineering principles, proven techniques, practical experience, and appropriate skills to the solution of well-defined problems inthe field of pulp and paper technology. This qualification is designed to prepare students for positions as operational staff in the pulp and paper industry.

ECE 6.1 ENTRANCE REQUIREMENTS

In addition to the Institution's General Minimum Admission Rule, the applicant must meet the following minimum requirements:
Mathematics - rating code 4 (Adequate achievement), and Physical Science
- rating code 4 (Adequate achievement)
Students who did not write the Mathematics Paper 3 (Geometry Paper) will be required to attend an additional Mathematics I sub-module which will be run concurrently with the normal Mathematics I course. The onus is on thestudents to prove that they wrote the Mathematics Paper 3 otherwise theywill be required to attend the additional Mathematics I sub-module.
Alternatively, a matriculation certificate, with at least a D symbol (Higher Grade) or B symbol (Standard Grade) in Physical Science and Mathematics. A pass in the subjects Technical Drawing and/or Computer Studies will bean added recommendation.
Applicants who do not have the required matric symbols/ratings in Mathematics or Physical Science, but have passed Mathematics 1, Chemistry 1 and/or Physics 1 at an accredited tertiary educational institution will also beconsidered for entry into the program.
In addition to the above requirements, bursary students will have to meet additional criteria prescribed by their sponsor company, which may include interviews, psychometric assessments, and work-based skills tests. Favourable results of such assessments can also mitigate for lower matric symbols/ratings, subject to the minimum institutional requirements.
A person who wants to embark on a career in the pulp and paper industrymust have a basic knowledge of Chemistry, Physics, Mathematics and a logical mind. An aptitude for solving practical process problems in a team environment is essential.

NC (V) SYSTEM

In addition to the relevant General Rules pertaining to the Registration (e.g.

Rules G3), learners must, as a minimum, have obtained the following NC (V) subjects results:

Subject	**Result**
English (First Additional)	3 (Competent: 50-69%)
Mathematics	3 (Competent: 60-69%)
Physical Science	3 (Competent: 60-69%)

Note that the subject Mathematical literacy will not be accepted as a substitute for the subject Mathematics. Students who did not write the Mathematics Paper 3 (Geometry Paper) will be required to attend an additional Mathematics I sub-module which will be run concurrently with the normal Mathematics I course. The onus is on the students to prove that they wrote the Mathematics Paper 3 otherwise they will be required to attend the additional Mathematics I sub-module.

ECE. 6.2 COURSE STRUCTURE

Minimum experiential time - 1 years
Minimum formal time - 2 years

SUMMARY OF PROGRAMME: ND: Pulp and Paper Technology

Subject Offering	Code	Semes-ter	Assessment Method	NQF Level	Pre-requisite	Co-requisite
Chemistry I	CHEM102	1	Examination	5		
Mathematics I	MATH101	1	Continuous as-sessment	5		
Physics I	PYSC105	1	Examination	5		
Communication Skills I	COSK101	1	Continuous as-sessment	5		
Computer Skills I	COMS101	1	Continuous as-sessment	5		
Intro to Pulp & Paper Making	IPPM101	1	Examination	5		
Quality Assurance and Statistics	QAST101	2	Examination	5	Mathematics I	
Intro to Pulp & Paper Making	IPPM101	2	Examination	5		
Physical Chemistry II	PHCH201	2	Examination	5	Chemistry I	
Pulp and Paper Technology I	PPPT101	2	Examination	5		
Chem Eng Technology II	CENT201	2	Examination	5	Chemistry I	
Engineering Physics II	EPHY201	2	Examination	5	Physics I	
Pulp and Paper Chemistry II	PPPC201	2	Examination	5	Chemistry I	
Chem Eng Tech III (2 Modules)	CENT304	3				
Chem Eng Tech 301 (Transfer Processes III)	CENT314	3	Examination	6	Chem Eng Tech II	
Chem Eng Tech 302 (Unit Operation III)	CENT324	3	Examination	6	Chem Eng Tech II	
Pulp and Paper Technology II	PPPT201	3	Examination	6	Pulp & Paper Technology I	
Pulp and Paper Chemistry III	PPPC301	3	Examination	6	Physical Chemistry II	Pulp and paper Technology II
Thermodynamics: Applied III	TDYA301	3	Examination	6	Chem Eng Tech II	
Pulp & Paper Technology III	PPPT301	4	Examination	6	Pulp & Paper Technology	

					II	
~~Chemical Plant III (2 Modules)~~	~~CHPL304~~	~~4~~				
~~Chemical Plant 301~~	~~CHPL314~~	~~4~~	~~Examination~~	~~6~~		
~~Chemical Plant 302~~	~~CHPL324~~	~~4~~	~~Examination~~	~~6~~		
Management Skills I	MASK101	4	Examination	5		
~~Process Control III (Only for students registered under NDPPT2)~~	~~PCCR301~~	~~4~~	~~Examination~~	~~6~~		
~~Pulp and Paper Practice I~~	~~PPPR101~~	~~5~~	~~Continuous assessment~~	~~6~~		
~~Pulp and Paper Practice II~~	~~PPPR201~~	~~5~~	~~Continuous assessment~~	~~6~~		
~~Pulp and Paper Practice III~~	~~PPPR301~~	~~6~~	~~Continuous assessment~~	~~6~~		

ECE. 6.3 PROMOTION TO HIGHER LEVEL

I. In order to gain promotion from Semester I to Semester II, students must pass Chemistry I and either Mathematics I OR Physics I, and atleast one other Level I course.

II. In order to gain promotion from Semester II to Semester III or IV, students must pass Chemical Engineering Technology II and at least two other Level II courses.

ECE. 6.4 Important information for current and prospective students (effective as of January 2018):

The National Diploma: Pulp and Paper Technology phased out starting in 2018 to allow for the introduction of the new Diploma in Pulp and Paper Technology. The last cohort of first-time entering students admitted to this National Diplomaqualification was in January 2018. Notwithstanding all the current rules (both General rules and Departmental Rules) that regulate this diploma, the last semester inwhich <u>any</u> student may register for each of the subjects is listed as follows:

Subject Name	Last Possible Semester of Registration
Chemistry I	January 2020
Mathematics I	January 2020
Physics I	January 2020
Communication skills I	January 2020
Computer skills I	January 2020
Intro to pulp and paper making	January 2020
Quality assurance & statistics	July 2020
Physical chemistry 2	July 2020
Pulp & paper technology I	July 2020
Chem Eng technology 2	July 2020
Engineering physics 2	July 2020
Pulp & paper chemistry 2	July 2020

Chem Eng technology 301 – transfer processes	January 2021
Chem Eng technology 302 – unit	January 2021
Pulp & paper technology 2	January 2021
Pulp & paper chemistry 3	January 2021
Applied Thermodynamics 3	January 2021
Pulp & paper technology 3	July 2021
Chemical plant 301	July 2021
Chemical plant 302	July 2021
Management skills 1	July 2021
Process control 3	July 2021
Pulp & paper practice 1	January 2023
Pulp & paper practice 2	January 2023
Pulp & paper practice 3	January 2023

No student may register for Pulp and Paper Practice 1, 2 or 3 unless they have completed the following prerequisites.

Pulp & Paper Practice 1 (P1)

Pre-requisites: Complete ALL Diploma subjects BEFORE commencing Pulp & paper practice 1

Pulp & Paper Practice 2 (P2)

Pre-requisites: Complete Pulp & paper practice 1.

Pulp & Paper Practice 3 (P3)

Pre-requisites: Complete Pulp & paper practice 2.

The dates stated in this rule are subject to change depending on the effective approval date for the new HEQF aligned programmes.

ECE 7 BACHELOR OF TECHNOLOGY: PULP AND PAPER TECHNOLOGY

ECE 7.1 ENTRANCE REQUIREMENTS

In order to register for the BTech: Pulp and Paper, a candidate must haveone of the following:

(a) A University of Technology (formally Technikon) National Diploma in Engineering or Science, or

(b) A University degree in Engineering or Science, or

(c) (i) An N6 Diploma in Pulp or Paper, or

(ii) An N6 in an Engineering field plus N4 Pulp or Paper, plus Fluid Mechanics III and Thermodynamics III from a University of Technology (this will require that the candidate will have to have

completed Mechanics I, Thermodynamics II and Fluid Mechanics
II. At UNISA credit for Mechanics I will be granted to candidateswho have passed Engineering Science N4 and Mechanotechnics N5 with at least 50%; credit for Fluid Mechanics II will be grantedto candidates who have passed Fluid Mechanics N5 and N6 withat least 50%; credit for Thermodynamics II will be granted to candidates who have passed Power Machines N5 and N6 with at least 50%; for credits from other institutions contact the institution concerned), or

(d) A Government Certificate of Competency.

Prospective students with qualifications in other disciplines must pre- sent their qualifications and work experience, together with a letter from their employer motivating their registration on the BTech: Pulp and Paper.

ECE 7.2 COURSE STRUCTURE

The BTech: Pulp & Paper comprises both a theoretical and research component and is offered part-time only at pulp and paper industry facilities country-wide. Normally, only students who are already employed in the industry will be permitted to register. The minimum time for completion ofthe program is two years.

The theoretical component is presented in the form of fourteen modules. The modules are clustered into Subjects, as follows:

Subject Offering

SUMMARY OF PROGRAMME: B Tech: Pulp and Paper Technology - BTPPTI

Subject Offering	Code	Semester	Assessment	Method NQF Level	Pre-req-uisite	Co-req-uisite
Paper Industry, Fibres & Pulping IV (5 Modules)	PIFP401	1	Examination	7		
Unit Operations of Paper Making IV (6 Modules)	UOPM401	1	Examination	7		
Environmental Factors & Corrosion Control IV (Module 10)	EFCC401	2	Examination	7		
Paper Production, Proper-ties and End Uses IV (Mod-ule 13)	PPRE401	2	Examination	7		
Paper Industry: Quality As-surance IV (Module 14)	QAPI401	2	Examination	7		
Paper Industry Research Project	PIRP401	2	Continuous Assessment	7		

PIFP401- Paper Industry, Fibres & Pulping IV, comprising:

Module 1 industry, resources & fundamentals.

Module 3 pulping.

Module 5 pulping.

Module 8 fibre processing.

~~UOPM401- Unit Operations of Paper Making IV, comprising:~~

Module 2 - Stock Preparation
Module 4 - Wet End Operations
Module 6 - Wet End Chemistry
Module 9 - Pressing
Module 11 - Drying
Module 12 - Finishing Operations

The subjects Paper Industry, Fibres and Pulping (PIFP401) and Unit Operations of Papermaking (UOPM401) will be offered in the first year of the program, and the remaining subjects viz. EFCC401, PPRE401, QAPI401 and PIRP401 will be offered in the second year.

ECE 7.5 ASSESSMENT

a) The subjects PIFP401 and UOPM401 shall be assessed by completion of a variety of individual and group assignments, case studies, presentations, tests and a final examination as detailed in the relevant StudyGuide.

The final mark will be calculated as follows:
Course mark: Assignments 40 %,
Tests (2 hrs, minimum of 2) 20%,Total course mark60%
Final examination 40%

b) The subjects EFCC401, PPRE401, QAPI401 will be assessed by completion of individual and group assignments, case studies or presentations, and a final examination as detailed in the relevant Study Guide.

The final mark will be calculated as follows:
Course mark: Assignments 40%
Final examination60%

c) A minimum of 40% must be achieved in each type of assessment andan overall average of 50% is required to pass the subject. Students willbe given opportunities to resubmit assessments, subject to conditionslaid out in the Study Guide. In accordance with Rule G12, a minimumcourse/year/semester mark of 40% must be achieved in order to qualify to write the examination. A distinction will be granted if a mark of75% or more is achieved as the final result.

d) The subject PIRP401 is assessed by means of continuous assessment.Formative assessment will consist of a research proposal, presentations and progress reports. Final Summative assessment is by means of a written research report and an oral audio-visual presentation. These count 67% and 33% respectively. The assessment of the project PIRP401 will be completed by the end of October each year. Studentswho have failed the subject will be given the opportunity to resubmitthe relevant components for re-assessment by the end of January of the following year.

ECE 7.6 EXAMINATIONS

Examinations for the subjects PIFP401, UOPM401 and PPRE401 will be written in the year-end examination period.

Examinations for the subjects QAPI401 and EFCC401 will be written in the mid-year examination period:

Supplementary examinations for which a student may be eligible in terms of Rule G13 (3), will be written in July (for mid-year examined subjects) andin December for year-end examined subjects.

A student must obtain a final mark of at least 45% to qualify for a supplementary examination.

A student who is unable to write an examination as a result of urgent work commitments will be permitted to write a special examination, which will coincide with the supplementary examination. The student must apply in writing in advance of the main examination session, and Rules G13 (4) andG13 (3) will apply.

All examinations for this course will consist of written paper/s of at least three (3) hours total duration.

ECE 7.9 SUBSEQUENT REGISTRATIONS

7.9.1 As per Rule G17, the maximum duration of study after initial registration shall not exceed twice the minimum period of registered study.

7.9.2 A student wishing to appeal to the Faculty of Engineering, Science & the Built Environment against the application of the above rule must submit a statement explaining the reasons for the appeal to the Faculty Officer within 10 days of the student being officially notified in writing that he/she is not permitted to re-register. No appeals will beconsidered after this.

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

Qualification	SAQA NLRD ID
ND: Pulp and Paper Technology	72257
BTECH: Pulp and Paper Technology	72156
Advanced Diploma in Pulp and Paper Technology	102017
Diploma in Pulp and Paper Technology	111384

ECE.8 ADVANCED DIPLOMA IN PULP AND PAPER TECHNOLOGY SAQA REGISTRATION NO: 102017 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

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

- 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

ECE 9 DIPLOMA IN PULP AND PAPER TECHNOLOGY

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 (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; Pulp and Paper Engineering Fundamentals 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 I		Yes
Pulp and Paper Laboratory A	3	6	8	C	Pulp and Paper Science I; Pulp and Paper Engineering Fundamentals B	Pulp and Paper Technology A	No
Unit Operations A	3	6	12	C	Pulp and Paper Engineering Fundamentals B		Yes
Pulp and Paper Technology B	4	6	12	C	Pulp and Paper Science I		Yes
Pulp and Paper Laboratory B	4	6	8	C	Pulp and Paper Science I; Pulp and Paper Engineering Fundamentals B	Pulp and Paper Technology B	No
Transfer Processes	4	6	12	C	Pulp and Paper Engineering Fundamentals B		Yes
Unit Operations B	4	6	12	C	Pulp and Paper Engineering Fundamentals B		Yes
Thermodynamics	4	6	12	C	Pulp and Paper Engineering Fundamentals B		Yes
Pulp and paper technology C	5	6	12	C	Pulp and Paper Science I		Yes
Pulp and Paper Laboratory C			8		Pulp and Paper Science I; Pulp and Paper	Pulp and Pape	No

	5	6		C	Engineering Fundamentals B	r Tech nolo gy C	
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

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 qualificationsoffered in the department. Detailed information for all these subjects is to be found in the Study Guidelines that are issuedto 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.

Chemical Engineering Practice III (EXCE101 AND EXCE201)

In addition to the normal academic requirements, the following projects/assignments have to be done in an industrial environment: PFDs, PIDs, material and energy balances,Hazop studies, design/performance analysis/rating of process equipment (at least one heat transfer and one mass transfer operation), elementary design of piping systems, andconsideration of safety, health and environmental issues.

BACHELOR OF TECHNOLOGY IN CHEMICAL ENGINEERING

Heat & Mass Transfer IV (CHTE401)

Heat transfer via conduction, convection and radiation. Heat transfer with change in Phase, transport anologies, mass transfer, heat transfer from extended surfaces, Transport anologies, Mass transfer.

Fluid Flow IV (CETE401)

Properties of fluids, Incompressible Newtonian flow, Incompressible non-Newtonian flow, Pumping of liquids, Series and parallel arrangement of pumps, Compressible flow, non-Newtonian mixing, Two-phase gas liquid flow, Fluidisation and Unsteady state. Channel flow.

Unit Operations (CTEC401)

Theory and design of Binary and multi-component distillation systems. Determine minimum reflux ratio, top and bottom temperatures of multi-component systems. Introduction to residue curves. Design and optimisation of Evaporators and crystallises. Design of gas absorption systems. Continuous and unsteady state drying. All topics covered require spreadsheet solutions.

Reactor Technology IV (RTEC401)

Design and analysis of isothermal and non-isothermal batch and flow reaction systems Kinetics of catalytic systems and design of heterogeneous reaction systems. Residence time distribution in real reactors and the effect on reaction yields. Multiple reaction systems and conditions/models for optimum yields. Non-elementary and enzymatic reactions.

Chem Plant Design IV (CEPD401)

Full scale plant design on a real industrial application done over a period of one year. A finaldesign report by the student would include process selection and specification, generation of proposed process PFD and prides, material and energy balance, Hazop analysis using PC Hazop, specifications and detailed design of all major process units including detailed modelling and simulation of reaction systems and determination of optimum reaction conditions. Complete design simulation done on Chemcad and CCTherm. Aspects of project managementand economics also included.

Project IV (PRCE401)

Industrial or laboratory project done over a period of one year. This subject introducesthe student to the methodology of research and development. The work performed bythe student must include the following: defining a problem/project, literature survey, planning and execution of experimental work, analysis of data and results.

Process Control IV (PCCR402)

Introduction to advanced control configurations. Application of control configuration. Process optimisation and stability using control configurations. Software application to process modelling and simulation. Linearisation of process systems.

Process Equipment Design IV (CHPD401)

Shell and tube heat exchanger design: 1-2 exchangers, 2-4 exchangers, vaporisers, condensers. Plate and frame heat exchanger design. Hydraulic design of packed and tray columns. Pinch analysis: Thermal and water pinch.

Production Engineering in the Chemical Industry IV (PECI401)

Forecasting, Linear Programming, Advanced optimisation techniques, Decision-making, Reliability theory, Uncertainty, Project management, Quality Management.

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 toelements, 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 ofRights, 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 ConceptsUnits and dimensions, Introduction to material and energy balances, Chemical industryin 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, LinearAlgebra, 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 andNon-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 Newtonianand 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 con-tracts, 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-Pipeand 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-componentmixtures, 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: Characterisation 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 AnalysisSteady-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 Ionexchange 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 modeling and reactor design, separation unit and heat transfer), Process Economics, Process Optimisation, and Process Simulations The design assignment will require the student to: · Identifyand 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 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. · Producea 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 anentrepreneur, 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; methodof Rosenbrock; flexible polyhedron (simplex) search; Multidimensional Search Using Derivatives: steepest descent; Newton, Quasi-Newton, Marquardt-Levenberg, and Broydenmethods; 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 ofODE'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 simplesystems, 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 modeling and re- actor design, separation unit and heat transfer), Process Economics, Process Optimisation, and Process Simulations The design assignment will require the student to: · Identifyand 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. · Producea report of the completed work **French for Sciences and Technology 3:** Pragmatic components: know the missionsof an engineer and a technician, the different parts of a process, the different fields of research, 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.

Mandarin for Sciences and Technology 3: Pragmatic components: Further topics of personal interest and daily life, Simple topics related to social and cultural activities inChinese culture, the missions of an engineer and a technician, the different parts of a process, the different fields of research, institutions, argue, departments in Faculty and Engineering, Machine tools, a technical report writing. - Linguistic components: Phonology(listen to, identify and produce the basic sounds of Pinyin; Use Pinyin to learn to pronounce unfamiliar words and sentences), Character and word (Master 400 commonwords related to daily life and 150 words for engineering), Grammar(Common modal verbs and prepositions; comparative structures, etc.),Function(Apply familiar communicative functions in different situation; Understand and apply macro functions such as exposition, narration and description), Discourse (Differences and similarities in train ofthought between Chinese language and learners' mother language; Main sentence stem and connotations via modifiers and limiters) - Cultural components: Engineering/scientific profiles, jobs, types of engineering, techniques and processes, Products and inventory, laboratory and workplace, change and quantity.

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-organ- isms for industrial application. Biological transformation of raw material to 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

French for Sciences and Technology 4: Pragmatic components: answer to an offerand a context, identify a problem and solve it, debate about ethical issues, speak about technological progress. - Linguistic components: pronouns, past, hypothesis, direct and indirect discourse in the past, expression of intensity. - Cultural components: renewable energy, technological progress, dangers in progress, ethical issues, fields of research.

Mandarin for Sciences and Technology 4: Pragmatic components: Further topics related to personal environment and workplace, answer to an offer and a context, identify a problem and solve it, debate about ethical issues, talk about technological progress,Electrical appliances, presentation, telephone skills, business writing, invitations. - Linguistic components: Phonology (Understand in connected speech intonation patterns, tone changes, etc., within daily settings; Use appropriate pronunciation and intonation ineveryday conversation),Character and word (Master 600 common words related to daily life and 300 words for engineering), Grammar(Common modal verbs and prepositions; Progressive aspect; Particle; Negative sentences), Function (Communicate witha degree of fluency and spontaneity in daily life, school life and the workplace), Discourse (simple and more complex rhetoric devices; emotion expression in both spoken and written Chinese) - Cultural components: Renewable energy, technological progress, dangers in progress, safety in the workplace, ethical issues, fields of research.

DIPLOMA 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 problem relating to designing and improving efficiency of unit operations.

ADVANCED DIPLOMA 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 to 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.

Chemical Engineering Practice III (EXCE101 AND EXCE201)

In addition to the normal academic requirements, the following projects/assignments have to be done in an industrial environment: PFDs, PIDs, material and energy balances,Hazop studies,

design/performance analysis/rating of process equipment (at least one heat transfer and one mass transfer operation), elementary design of piping systems, andconsideration of safety, health and environmental issues.

BACHELOR OF TECHNOLOGY IN CHEMICAL ENGINEERING

Heat & Mass Transfer IV (CHTE401)

Heat transfer via conduction, convection and radiation. Heat transfer with change in Phase, transport anologies, mass transfer, heat transfer from extended surfaces, Transport anologies, Mass transfer.

Fluid Flow IV (CETE401)

Properties of fluids, Incompressible Newtonian flow, Incompressible non-Newtonian flow, Pumping of liquids, Series and parallel arrangement of pumps, Compressible flow, non-Newtonian mixing, Two-phase gas liquid flow, Fluidisation and Unsteady state. Channel flow.

Unit Operations (CTEC401)

Theory and design of Binary and multi-component distillation systems. Determine minimum reflux ratio, top and bottom temperatures of multi-component systems. Introduction to residue curves. Design and optimisation of Evaporators and crystallises. Design of gas absorption systems. Continuous and unsteady state drying. All topics covered require spreadsheet solutions.

Reactor Technology IV (RTEC401)

Design and analysis of isothermal and non-isothermal batch and flow reaction systems Kinetics of catalytic systems and design of heterogeneous reaction systems. Residence time distribution in real reactors and the effect on reaction yields. Multiple reaction systems and conditions/models for optimum yields. Non-elementary and enzymatic reactions.

Chem Plant Design IV (CEPD401)

Full scale plant design on a real industrial application done over a period of one year. A finaldesign report by the student would include process selection and specification, generation of proposed process PFD and prides, material and energy balance, Hazop analysis using PC Hazop, specifications and detailed design of all major process units including detailed modelling and simulation of reaction systems and determination of optimum reaction conditions. Com- plete design simulation done on Chemcad and CCTherm. Aspects of project managementand economics also included.

Project IV (PRCE401)

Industrial or laboratory project done over a period of one year. This subject introducesthe student to the methodology of research and development. The work performed bythe student must include the following: defining a problem/project, literature survey, planning and execution of experimental work, analysis of data and results.

Process Control IV (PCCR402)

Introduction to advanced control configurations. Application of control configuration. Process optimisation and stability using control configurations. Software application to process modelling and simulation. Linearisation of process systems.

Process Equipment Design IV (CHPD401)

Shell and tube heat exchanger design: 1-2 exchangers, 2-4 exchangers, vaporisers, con- densers. Plate and frame heat exchanger design. Hydraulic design of packed and tray columns. Pinch analysis: Thermal and water pinch.

Production Engineering in the Chemical Industry IV (PECI401)

Forecasting, Linear Programming, Advanced optimisation techniques, Decision-making, Reliability theory, Uncertainty, Project management, Quality Management.