VAAL UNIVERSITY OF TECHNOLOGY

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1966-2026

LEARNER GUIDE

Faculty	ENGINEERING AND TECHNOLOGY
Department	CHEMICAL AND METALLURGICAL ENGINEERING
Course	DIPLOMA: CHEMICAL ENGINEERING
Title	CHEMICAL ENGINEERING PRACTICAL (EHEXL1A)
Compiled By	PROF. JOHN KABUBA TSHILENGE
Year	2026
NQF Level	6
Credits	60

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1. Introduction

In order to qualify for the Diploma: Engineering: Chemical, a minimum six-month period of suitable work based learning (WBL) in addition to the prescribed theoretical University training must be successfully completed.

Work based learning refers to that component of co-operative education that can only be conducted by the employer in the work place. This training provides the student with an opportunity to apply and develop the academic knowledge he/she received at the university to relevant problem situations in industry and exposure to typical organizational culture, human relations and working conditions.

With suitable guidance and supervision, the student is taught the responsibility to work independently and to develop an awareness of the ethics and requirements of industry.

To ensure the effectiveness of the work based learning, employer and University must co-operate as partners. The student will enroll for the subject Chemical Engineering Practice at the University. The employer will act as an examiner and must award a mark for the work based learning. To pass the student must obtain 50%, and to pass with distinction 75%. The University acts as a moderator for the subject.

The student must have a mentor, who will certify that the student has completed the work required satisfactorily.

During work based learning, the student must submit three-monthly progress reports that contain sufficient information so that the training received can be evaluated. These reports must be approved by the student's mentor before being submitted to the Department of Chemical Engineering, Vaal University of Technology.

On completion of the training period, the student must submit all relevant reports.

Students may obtain the requirements for work based learning from the Head of Department: Chemical Engineering.

For further enquiries please contact:

Prof. John Kabuba Tshilenge (WIL Coordinator: Chemical Eng.)
Tel: 016 950 9887
Fax: 016 950 9796
E-mail: johnka@vut.ac.za

2. Registration

It is **compulsory** for all chemical engineering students to formally register for work based learning at the University. The registration must take place not later than **one** month after starting the work based learning in the industry. Students will, however, not be registered without proof of suitable employment letter.

Registration for Work based learning can be done at the following address:

Vaal University of Technology Vaal University of Technology
Co-operative Education/WIL Office (N108)
Tel: 016 950 9496/9372/9161
Fax: 016 950 9817

Note: Although registration takes place continuously through the year, these offices will be closed during public and university holidays.

Registration fees for work based learning must be paid with registration. The course fees may be obtained from the Co-operative Education office.

2.1 Registration cycles

VUT has an annual (Jan – Dec) academic calendar set in line with the census dates; end of March and end of September.

2.2 Cycle -1

Students that register before the end of March will have their results released in June, justifying the minimum period required for Work Based Learning (WBL), six (6) months; these students can only graduate in September.

2.3 Cycle – 2

Students that register before the end of September will have their results released in December to make the March graduation ceremony the next academic year.

2.4 Prerequisites

- Students need to have completed all S5 modules before they can register for WBL.
- It's the student's responsibility to confirm the registration.
- Validation/Accreditation of WBL Employers will be done by the WBL Coordinator.

Placement will be done by the Co-operative Education Department.

3. Logbook

3.1 Purpose

The purpose of the logbook is to provide a time sequenced and dated record your industrial training period, which will serve as an authentic record for proof and audit purposes.

3.2 Reasons for keeping a logbook

- Keeping and maintaining a logbook is a requirement by the Department of Chemical Engineering and also forms part of the auditing processes for qualification accreditation by the Engineering Council of South Africa (ECSA)
- The logbook forms an integral part of your assessment by the Department and the hosting industrial partner.
- It also provides authentic evidence that you receive training, as outlined in the organisation's programme, in accordance with the requirements of the programme.

3.3. Logbook structure

The official logbook for the Chemical Practice is presented at the Department. No other formats of the logbook will be accepted, however the

logbooks of the workplace company can be submitted as optional additional evidence.

- All information as requested must be furnished.
- It is the learner's responsibility to comply with the above request.

3.4 Record of Activities

It is required that the learner records all workplace experience, in the manner as prescribed below.

A. The starting and completion dates of each activity must be captured.

B. Each activity must be recorded as indicated in the layout below with a brief summary.

    - Write a brief summary to explain each activity.

C. Evidence of each activity must be attached in a form of a detailed report.

    - A report of the activity must be attached
    - Other supporting evidence associated with the activity such as sample analysis log-sheets, production log-sheets, plant operation log-sheets, and workplace Logbooks. sample analysis log-sheets, production log-sheets, plant operation log-sheets, and workplace Logbooks.

D. The name of the responsible mentor must be completed with the relevant signature and date.

4. Progress, Semester and Project Reports

Engineering Council of South Africa (ECSA) requires that students submit regular progress reports that should reflect their learning experiences towards their particular anticipated careers. As a resolution to this requirement, and to facilitate mutual co-operation between all stakeholders (Faculty, Employers and Students), the work based learning committee of

the faculty requires three-monthly progress reports for both training periods. The following procedure should be followed:

I. The student is responsible for the writing of the report. The report must be written in the first person.

II. The report should cover all learning experiences to the date of submission of the report, including investigations, studies and/or exercises done/partaken by the student.

III. Reports must contain a short description of the training received and not a lengthy description of processes and equipment.

IV. It is also important that the student specifically reflects in his/her report the extent to which the program is contributing to his/her particular development progress.

V. It is expected that students must submit their report after two weeks of the completion of training.

VI. The progress report must be signed before it is submitted.

VII. The Evaluation form in Appendix C must be completed and signed by the supervisor otherwise it will not be accepted for marking.

VIII. A minimum of **20 pages** for semester report and **15 pages** for progress report is required.

All REPORTS (Progress, Semester and Project) can be submitted online to the **WIL Coordinator** at johnka@vut.ac.za.

The hard copy of the report should **be ring-bounded** and submitted at the Co-operative Education offices (N108) or may be mailed to:

Vaal University of Technology
Co-operative Education
Attention: Mrs. L Dreyer
Private Bag X021
VANDERBIJLPARK, 1900

After you submit your report, you will receive a receipt as proof that the report has been submitted.

After capturing the report on the system, the report will be sent to the department for evaluation/assessment.

After WIL is completed and when there is no outstanding subjects, students can apply for graduation at the Examination department.

5. Monitoring of Students during work integrated learning

- Engineering Council of South Africa (ECSA) requires that students be continuously monitored throughout their work based learning period. A staff member/s from the Faculty of Engineering should visit students and their supervisors at least once per semester.
- The relevant University staff will notify the employers in advance of monitoring visits so that proper arrangements can be made for the student and his supervisor to be available for interviews.
- Students and their supervisors are encouraged to discuss any problems/questions/suggestions regarding work based learning /university education/administration procedures during such visits or advised to contact the responsible Head of Department with matters of importance and urgency.
- The student must always have all relevant documentation, including completed project reports and assignments, available at monitoring interviews for evaluation purposes.

6. Evaluation of work integrated learning – Application for a Diploma

After completion of the student's training period, the employer has to certify that he/she has passed the training successfully.

If the employer realises that the student does not meet the minimum requirements for the National Diploma and his/her achievements are still not up to standard, the period of work based learning could be extended or terminated.

6.1 Diploma application

- Students can apply at the Examinations Department for graduation
- Documents to be submitted upon application:
    a. Certified copy of ID or Passport
    b. Original covering letter from company
    c. Form from Examinations Department
- The closing dates for April graduation is 31 January and for September graduation 31 July of each year.

Note: Final report MUST be submitted BEFORE applying for graduation!

If all documents are not included for the Diploma application, the application will be rejected.

Your graduation forms will not be processed unless you have met the six months minimum requirement counting from the date you have registered for the training with VUT Co-operative Education office.

If any problem regarding the application arises, the University will contact the student.

- The Head of Departments will direct the completed documents to the Examination Office for processing.
- The examination office will process the documents for evaluation and approval by the respective Heads of Department.
- It will take about two months after the application for a diploma has been received, before the student will receive a letter confirming the

approval/failure of his/her application. Students/employers are therefore advised to submit their applications as early as possible (i.e. not later than the end of January for the Autumn Diploma Ceremony and the end of July for the Spring Diploma Ceremony) to eliminate any inconvenience.

Students and employers must be patient and not phone the University regarding this matter.

<u>Note</u>: The feedback on reports submitted will be sent via email by the WIL Coordinator.

7. Work based learning requirements

The training program should be career orientated and designed to integrate the academic training with the practical skills required in industry. Employers should design the training program within the flexibility of their own requirements, facilities and equipment.

Technicians are that group of people whose education and training allows them to be of immediate support to the engineering profession in general and to provide the information on which management discussions and consequent decisions are based and executed. The student therefore

requires training and education that will enable him/her to understand the work for which he/she will be responsible in that particular career.

The training should involve the practical application of engineering principles and should include a diversity of activities as possible. **The student must complete 80% of the following Tasks as shown in Tables 1.**

Table 1: Tasks for work based learning

Tasks	Completed	Unavailable	GA's
Safety, Health and Environmental Responsibility Training			**11**
• General Process Safety Elements (Recognition, Prevention, Mitigation, Response)			
• Occupational Health and Safety			
Company Background			
Project Allocation			**1, 2, 5, 11**
• Introduction			
• Literature review			
• Methodology			
• Results and discussion			
• Conclusion			
• References			
Process Plant Operation			**1, 2, 5, 11**
• Determination of power requirements for pumps, mixers and similar equipment			
• Design analysis			
• Chemical/Metallurgical work in research and development			
• Hazop studies			
• Optimization of processes			
• Control of feed or product loss			
• Methods of detecting feed or product loss			
• Toxicity arising from effluents			
• Details Material and Energy balances and Process utilities			
• Quality audits/ quality assurance			
Process Chemical Analysis			**1, 2, 5, 11**
• Sample Preparation, Analysis Routines, Results Interpretation and Reporting			
Business Administration and Management			**11**
• Human resources (Shift Supervision and Management)			
• Economics and Financial Analysis and Management (Financial Projects, ROI Calculations)			

1. Graduate Attributes (GA's)

This module aids to assess the following ECSA defined graduate attributes as applicable to work-place-based learning:

Graduate Attribute 1: Problem Solving

Apply engineering principles to systematically diagnose and solve *well-defined* engineering problems.

Graduate Attribute 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science and engineering sciences to applied engineering procedures, processes, systems and methodologies to solve *well-defined* engineering problems.

Range Statement: Knowledge of mathematics, natural science and engineering science is characterized by:

1. A coherent range of fundamental principles in mathematics and natural science underlying a sub-discipline or recognised practice area.
2. A coherent range of fundamental principles in engineering science and technology underlying an engineering sub-discipline or recognised practice area.
3. A codified practical knowledge in recognised practice area.
4. The use of mathematics, natural sciences and engineering sciences, supported by established mathematical formulas, codified engineering analysis, methods and procedures to solve well-defined engineering problems.

Graduate Attribute 5: Engineering methods, skills, tools, including Information technology

Use appropriate techniques, resources, and modern engineering tools including information technology for the solution of *well-defined* engineering problems, with an awareness of the limitations, restrictions, premises, assumptions and constraints.

Range Statement: A range of methods, skills and tools appropriate to the discipline of the program including:

1. Sub-discipline-specific tools processes or procedures.
2. Computer packages for computation, simulation, and information handling;
3. Computers and networks and information infrastructures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork;
4. Basic techniques from economics, management, and health, safety and environmental protection.

Graduate Attribute 11: Workplace practices

Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.

Note: The purpose of work-integrated learning is to enable the learner to connect academic learning with workplace practice.

Range Statement: Tasks to demonstrate this outcome may be performed in one or more of the following curriculum types:

1. Work-directed theoretical learning: in which theoretical forms of knowledge are introduced and sequences in ways that meet both academic criteria and are applicable and relevant to the career-specific components.
2. Problem-based learning: where students work in small self-directed groups to define, carry out and reflect on a task which is usually a real-life problem.
3. Project-based learning: that brings together intellectual enquiry, real world problems and student engagement in meaningful work.
4. Workplace learning: where students are placed in a professional practice or simulated environment within a training programme.
5. Simulated learning.

ECSA Graduate attribute	Assessment details
Graduate Attribute 1: Problem Solving Apply engineering principles to systematically diagnose and solve *well-defined* engineering problems.	
Where is outcome assessed?	In the work place.
How is this outcome assessed?	Solving of work-based problems must be demonstrated in the maintenance and administration of equipment and systems on which work is performed.
What is satisfactory performance?	Equipment on which maintenance and administration is performed must be demonstrated to be functioning correctly within the relevant system.
What is the consequence of unsatisfactory performance?	Work must be repeated until the desired results can be demonstrated.

Graduate Attribute 2: Application of scientific and engineering knowledge Apply knowledge of mathematics, natural science and engineering sciences to applied engineering procedures, processes, systems and methodologies to solve *well-defined* engineering problems.	
Where is outcome assessed?	In the work place.
How is this outcome assessed?	Application of engineering knowledge applicable to the maintenance and administration of equipment and systems must be demonstrated.

What is satisfactory performance?	The engineering knowledge and practices must be demonstrated to be appropriate to the requirements.
What is the consequence of unsatisfactory performance?	Work must be repeated until the desired results can be demonstrated.

Graduate Attribute 5: Engineering methods, skills, tools, including Information technology Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of broadly-defined engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.	
Where is outcome assessed?	In the work place.
How is this outcome assessed?	Students are required to demonstrate the use of appropriate techniques, resources, and modern engineering tools in maintenance and administration of equipment and systems that they work on.
What is satisfactory performance?	Students are required to demonstrate the use of appropriate techniques, resources and modern engineering tools in the maintenance and administration of systems that they work on.
What is the consequence of unsatisfactory performance?	Work must be repeated until the required skills and methodologies can be demonstrated.

Graduate Attribute 11: Workplace practices Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.	
Where is outcome assessed?	In the work place.
How is this outcome assessed?	Students are required to demonstrate the ability to apply appropriate theoretical knowledge and understanding to the systems and environment in which the work-place-based learning takes place.
What is satisfactory performance?	Appropriate and applicable theoretical knowledge is used to perform maintenance and administration on computer systems.
What is the consequence of unsatisfactory performance?	Work must be repeated until the appropriate application of theoretical knowledge can be demonstrated.