



VUT

Vaal University of Technology

Learner Guide

Faculty:

Engineering and Technology

Department:

Chemical Engineering

Course:

Diploma

Title:

Chemical Engineering Practical
(EHEXL1A)

Compiled By:

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Year:

2020



1966 - 2016

Your world to a better future

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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:

Dr. J. Kabuba (Senior Lecturer and WIL Coordinator: Chemical Engineering)

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

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.

1.1 Registration cycles

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

1.2 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.

1.3 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.

1.4 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.

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 B must be completed and signed by the supervisor.
- VIII. A minimum of **20 pages** for semester report and **15 pages** for progress report is required.

All REPORTS (Progress, Semester and Project) to be submitted should **be ring-bounded** otherwise it will not be accepted for marking.

The reports are 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: P2 report MUST be submitted to N108 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 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.

Note: 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	Exit Level Outcomes
Safety, Health and Environmental Responsibility Training			1, 2, 5, 9
<ul style="list-style-type: none"> • General Process Safety Elements (Recognition, Prevention, Mitigation, Response) 			
<ul style="list-style-type: none"> • Occupational Health and Safety 			
Company Background			
Project Allocation			1, 2, 5, 9
<ul style="list-style-type: none"> • Introduction 			
<ul style="list-style-type: none"> • Literature review 			
<ul style="list-style-type: none"> • Methodology 			
<ul style="list-style-type: none"> • Results and discussion 			
<ul style="list-style-type: none"> • Conclusion 			
<ul style="list-style-type: none"> • References 			
Process Plant Operation			1, 2, 5, 9
<ul style="list-style-type: none"> • Determination of power requirements for pumps, mixers and similar equipment 			
<ul style="list-style-type: none"> • Design analysis 			
<ul style="list-style-type: none"> • Chemical/Metallurgical work in research and development 			
<ul style="list-style-type: none"> • Hazop studies 			
<ul style="list-style-type: none"> • Optimization of processes 			
<ul style="list-style-type: none"> • Control of feed or product loss 			
<ul style="list-style-type: none"> • Methods of detecting feed or product loss 			
<ul style="list-style-type: none"> • Toxicity arising from effluents 			
<ul style="list-style-type: none"> • Details Material and Energy balances and Process utilities 			
<ul style="list-style-type: none"> • Quality audits/ quality assurance 			
Process Chemical Analysis			1, 2, 5, 9
<ul style="list-style-type: none"> • Sample Preparation, Analysis Routines, Results Interpretation and Reporting 			
Business Administration and Management			8
<ul style="list-style-type: none"> • Human resources (Shift Supervision and Management) 			
<ul style="list-style-type: none"> • 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 <i>well-defined</i> 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 <i>well-defined</i> 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.

Module Credits

L	TL	ML	T	Tt	Mt	P	Tp	Mp	X	Tx	Mx	A	Ta	E	Me	Credit
0	1	1	0	1	1	260	1	1	0	1	1	16	1	0	1	14

L	Lectures Sessions	TL	Lecture Duration	ML	Work per Lecture period
T	Tutorials Sessions	Tt	Tutorial Duration	Mt	Work per tutorial period
P	Practical Sessions	Tp	Practical Duration	Mp	Work per practical period
X	Other contact Sessions	Tx	Other Duration	Mx	Work other period
A	Assessment	Ta	1 Hour	E	Work outside (Me = 1)

Module Knowledge Profile

Mathematical Sciences	Natural Sciences	Engineering Sciences	Engineering Design	Computing and IT	Complementary Studies	Work Integrated learning
						14

Appendix A. Project Report Guidelines



VAAL UNIVERSITY OF TECHNOLOGY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CHEMICAL ENGINEERING

WORK BASED LEARNING (WBL)

COMPANY LOGO

TITLE of Project/Progress Report / Final Report

STUDENT SURNAME AND INITIALS :
STUDENT NUMBER :
MENTOR NAME :
SUPERVISOR NAMES :
COMPANY NAME :
CELL PHONE NUMBER :
EMAIL ADDRESS :
SUBMISSION DATE :
EXPERIENTIAL TRAINING (Progress/Final):

Reports must be typed on one side of A4 paper only, 1.5 spacing 12-point font size, one inch margins on all sides.

Each page of the report must be numbered.

Every section should start with a fresh page.

CONTENTS

1. Title page

Name of student, student number, contact number, email address, title of project, the date, name of the company training period (see Appendix A).

2. Table of contents

List the different sections with page references.

3. List of tables and figures

Tables must be provided with headings at the top and figures at the bottom.

Check to ensure the correctness of the sequence of the label numbers and the consistence of the format.

4. Identification of the problem

When starting with a project it often is the case that the problem to be solved may not be obvious and only symptoms are apparent.

At this stage, one should keep an open mind to not only see the problem but to understand its relationship with its environment.

Once a problem is identified and understood it must be formulated and written down. Objects to be met, specific requirements, unacceptable conditions and factors to be considered when the eventual solution to the problem is to be evaluated, must be known and recorded.

5. Statement of the problem

The problem should be stated in one sentence. If this is not possible, the problem is not clearly understood.

The statement consists of three basic components:

4.1 In the first part of the sentence the “what needs to be done” should be addressed.

4.2 Secondly the standard and principles, on which the solution will be based, must be stated.

4.3 Finally the goal to be achieved or “why the design/solution needs to be done/found” is answered.

6. Company background

The background of the company must be given with the site's physical address.

7. Health and safety

Health and safety policies and procedures for promoting a safe and healthy at work environment.

8. Daily Tasks (Activities)

The daily tasks must be reported.

9. Literature review

Literature review should provide a summary of previous related research on the research problem and their strength and weakness and a justification of the candidate's research.

What is known/what have been done by others? And why your research is still necessary.

10. Evaluation of ideas

Select the best ideas or combine some of the ideas to create new possibilities. Preliminary calculations and discussions with the relevant people will help to eliminate some of the ideas.

11. Analysis

All calculations and deliberations must be reported under this heading.

12. Implementation of the solution

State how the solution was implemented and supply support material such as sketches, drawings and graphs.

13. Conclusion

Give a summary of what had been achieved and to what value this project with its solution was to the company.

14. Recommendations

State all the recommendations made to the company on grounds of the solution.

15. References

State all references as far as the gathering of information is concerned and please use the Harvard Referencing.

Appendix B. Evaluation form



VAAL UNIVERSITY OF TECHNOLOGY

FACULTY OF ENGINEERING AND TECHNOLOGY

CHEMICAL ENGINEERING

EVALUATION OF WORK INTEGRATED LEARNING

STUDENT INITIALS & SURNAME	
---------------------------------------	--

CONTACT NUMBER	
EMAIL ADDRESS	

STUDENT NUMBER	
CAMPUS	

TRAINING PERIOD PER SEMESTER	FROM		TO	
-------------------------------------	-------------	--	-----------	--

COMPANY DETAILS & PHYSICAL ADDRESS	

TYPE OF PLACEMENT TO BE COMPLETED BY LEARNER AND MENTOR

Based on the student's work activities, which of these provide the best description of the nature of the In-service training placement. You may select more than one (1) option. Please use the space provided for additional options that are not in the list.

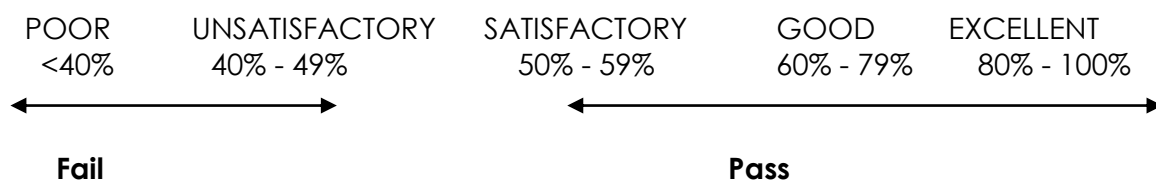
Placement Description	Selection [0 or 1]
Operational –Industrial chemical Process Plant Operator/ Technician	
Operational –Industrial Metallurgical Process Plant Operator/ Process Plant trainee	
Operational –Industrial chemical Process Plant Operator	
Operational –Industrial Manufacturing Process Plant Operator/ Technician	
Operational –Industrial Process Plant Maintenance	
Operational –Pilot Plant Operator	
Operational –Manual Labour	
Laboratory –Analytical Chemistry (Analyzing Chemical Samples)	
Engineering Design- Process Design Calculations and Activities	
Project Engineering- Project Initiation, Execution and Management	
Other- If none of the above is applicable, please give a short description	

Table 1: Tasks for work based learning

Tasks	Completed	Unavailable	Exit Level Outcomes
Safety, Health and Environmental Responsibility Training			1, 2, 5, 9
<ul style="list-style-type: none"> General Process Safety Elements (Recognition, Prevention, Mitigation, Response) 			
<ul style="list-style-type: none"> Occupational Health and Safety 			
Company Background			
Project Allocation			1, 2, 5,9
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<ul style="list-style-type: none"> Conclusion 			

<ul style="list-style-type: none"> References 			
Process Plant Operation			1, 2, 5, 9
<ul style="list-style-type: none"> Determination of power requirements for pumps, mixers and similar equipment 			
<ul style="list-style-type: none"> Design analysis 			
<ul style="list-style-type: none"> Chemical/Metallurgical work in research and development 			
<ul style="list-style-type: none"> Hazop studies 			
<ul style="list-style-type: none"> Optimization of processes 			
<ul style="list-style-type: none"> Control of feed or product loss 			
<ul style="list-style-type: none"> Methods of detecting feed or product loss 			
<ul style="list-style-type: none"> Toxicity arising from effluents 			
<ul style="list-style-type: none"> Details Material and Energy balances and Process utilities 			
<ul style="list-style-type: none"> Quality audits/ quality assurance 			
Process Chemical Analysis			1, 2, 5, 9
<ul style="list-style-type: none"> Sample Preparation, Analysis Routines, Results Interpretation and Reporting 			
Business Administration and Management			8
<ul style="list-style-type: none"> Human resources (Shift Supervision and Management) 			
<ul style="list-style-type: none"> Economics and Financial Analysis and Management (Financial Projects, ROI Calculations) 			

Explanation of the evaluation scale:



EVALUATION REPORT (To be completed by mentor/supervisor)

ELEMENT	EVALUATION MARK (%) (see previous page)	SIGNATURE (mentor/supervisor)
1. Dexterity		
2. Knowledge of techniques, procedures and materials		
3. Safety awareness		
4. Willingness to learn new skills		
5. Initiative		
6. Human relations		
7. Attitude		
8. Efficiency as employee/standard of work		
9. Neatness		
10. Proficiency		

FINAL MARK:

.....%

TO BE COMPLETED BY THE MENTOR

REMARKS ON THE STUDENT'S PROFESSIONAL GROWTH AND DEVELOPMENT

It is hereby declared that the information contained in this document is correct and that the student has done the prescribed training for the period indicated.

NAME

DESIGNATION

QUALIFICATION

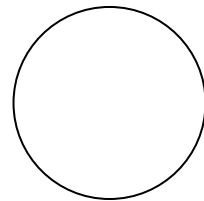
SIGNATURE

DATE

ECSA REGISTRATION CATEGORY

(Pr Eng. or Pr Tech (Eng.) or Reg Eng. Tech.)

ECSA REGISTRATION NUMBER



OFFICIAL STAMP

EVALUATION BY MENTOR/SUPERVISOR

.....%

UNIVERSITY USE ONLY:

EVALUATION BY UNIVERSITY/MODERATOR

.....%

REMARKS:
.....
.....
.....
.....

FINAL MARK:

.....%

.....

WIL COORDINATOR

.....

DATE

ECSA REGISTRATION OF WIL COORDINATOR:

(Pr Eng. or Pr Tech (Eng.) or Reg Eng. Tech.)

ECSA REGISTRATION NUMBER