VUT
Vaal University of Technology

Learner Guide

Faculty:	**Engineering and Technology**
Department:	**Chemical Engineering**
Course:	**National Diploma**
Title:	**Chemical Engineering Practical 1 (EHEXP1) & 2 (EHEXP2)**
Compiled By:	**John Kabuba Tshilenge**
Year:	**2019**

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1. Introduction

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

Work integrated 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.

Work integrated learning may be done at one of the following stages:

1. The first period of work integrated learning, Part 1, should preferably follow after S3 of uninterrupted theoretical training at the University. This will give the student sufficient theoretical knowledge to benefit from the training, especially as they progress through the more advanced subject matter of S4 courses.

2. Work integrated learning can also be done after completion of the total theoretical part of the Diploma, after S4.

To ensure the effectiveness of the work integrated 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 integrated 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 integrated 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 integrated learning from the Head of Department: Chemical Engineering.

For further enquiries please contact:

Dr. J. Kabuba (Senior Lecturer-WIL Coordinator: Chemical Engineering)
Tel: 016 950 9887
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2. Registration

It is **compulsory** for all chemical engineering students to formally register for work integrated learning at the University. The registration must take place not later than **one** month after starting the work integrated learning in the industry. Students will, however, not be registered without proof of suitable employment letter. This procedure applies to both training periods of part 1 and part 2.

Registration for Work integrated 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 integrated 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 Integrated Learning (WIL), 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 S3 modules before they can register for WIL.
- WIL students should NOT be allowed to register both P1 and P2 simultaneously.

- It's the student's responsibility to confirm the registration.
- Validation/Accreditation of WIL Employers will be done by the WIL Coordinator.
- Placement will be done by the Co-operative Education Department.

2.5 Fees

The WIL registration fee is payable per WIL module. The WIL registration fee increase annually. For the latest fee, please contact Student Admission& Registration or Co-operative Education. The fee can be paid at the VUT Finance department or it can be paid into the VUT bank account.

Note that the additional student card fees. Student levies and the WIL registration fee will be billed to the students account.

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 integrated 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 (P1 or P2) 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 integrated 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 integrated 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 integrated 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 for P2 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 integrated 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 and 2 for P1 and P2 respectively:**

Table 1: Tasks for work integrated learning P1

Which of these tasks is the student involved in, according to the nature of the in-service training placement.

Tasks for P1	Completed	Unavailable	Exit Level Outcomes
EHEXP1A Module 1			
Safety, Health and Environmental Responsibility Training			**1, 6, 7, 10**
• General Process Safety Elements (Recognition, Prevention, Mitigation, Response)			
• Occupational Health and Safety			
Process Engineering Technical Aspect			**1, 2, 7**
• Process Description			
• Process Flow Scheme (PFD)			
• Elementary Material and Energy balances			
• Piping, Instrumentation and Process Control Philosophy			
• Process Utilities			
Process Plant Operation (Industrial, Pilot or Bench Scale)			**1, 2, 7**
• Process operation, Standard operating Procedures, Process Limits, Cause and Effect Troubleshooting Logic			

• Process Monitoring, Sampling, Data Logging and Reporting			
Process Chemical Analysis			**2, 3, 4, 5, 9**
• Sample Preparation and Analysis Routines			
• Results Interpretation and Reporting			
Systems found in factory environment: • Organization structures • Maintenance systems			

Note: Student must complete all S3 subjects to be eligible for P1 training

Table 2: Tasks for work integrated learning P2

Tasks for P2	**Completed**	**Unavailable**	**Exit Level Outcomes**
EHEXP2A Module 2			
Project Allocation			**1, 2, 7**
• Aim/ objective of the project			
• Allocation of resources			
• Estimated time of completion			
• Time scheduling			
• Technical report writing			
Process Plant Operation			**2, 3, 4, 5, 9**
• Determination of power requirements for pumps, mixers and similar equipment			
• Design analysis			
• Chemical/Metallurgical work in research and development			
• Hazop studies			
• Optimisation 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			**2, 3, 4, 5, 9**
• Sample Preparation, Analysis Routines, Results Interpretation and Reporting			
Business Administration and Management			**8**
• Human resources (Shift Supervision and Management)			

• Economics and Financial Analysis and Management (Financial Projects, ROI Calculations)			

Note: student must have at least 2 outstanding S4 subjects to be eligible for P2 training

8. Exit Level Outcomes

Exit Level Outcome 1: Apply engineering principles to systematically diagnose and solve well-defined engineering problems.

Exit Level Outcome 2: Apply knowledge of mathematics, natural science and engineering sciences to wide practical procedures and practices to solve well-defined engineering problems.

Exit Level Outcome 3: Perform procedural design of well-defined components, systems, works, products or processes to meet desired needs within applicable standards, codes of practice and legislation.

Exit Level Outcome 4: Conduct investigations of well-defined problems through locating and searching relevant codes and catalogues, conducting standard tests, experiments and measurements.

Exit Level Outcome 5: Use appropriate techniques, resources, and modern engineering tools, including basic information technology and prediction methodologies for the solution of well-defined engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.

Exit Level Outcome 6: Communicate effectively, both orally and in writing, with engineering audiences.

Exit Level Outcome 7: Demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by defined procedures.

Exit Level Outcome 8: Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a technical team and to manage projects.

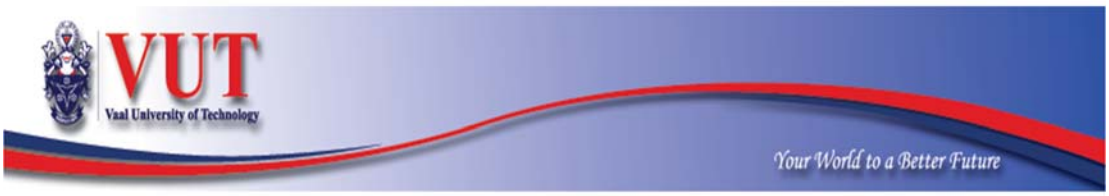
Exit Level Outcome 9: Engage in independent and life-long learning through well-developed learning skills.

Exit Level Outcome 10: Understand and commit to professional ethics, responsibilities and norms of engineering technical practice.

9. Recognition Prior Learning

- The University may consider recognition of work integrated learning of student who has worked at VUT recognised industry for a period of 10 years. The student must meet the requirements of P1 and P2 and also may supply a **portfolio of evidence** comprises of the following documents:
    - Letter from your HR stating the date of employment
    - All certificates of training acquired from work place
    - Detailed report of what has been done at work place (safety, mass and energy balance, flow diagrams etc.)
    - Letter of motivation from your supervisor/mentor certifying your achievement level and why you should be exempted from P1 and P2
    - Separate evaluation forms for P1 and P2 be signed and submitted
- The Vaal University of Technology may consider recognition of work integrated learning that has been approved by other Universities accredited by ECSA.

Appendix A. Project Report Guidelines



VAAL UNIVERSITY OF TECHNOLOGY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CHEMICAL ENGINEERING

Work Integrated Learning (WIL)

Company logo

TITLE of project/ Progress Report P1 or P2/ Final Report P1 or P2

Student Surname and Initials :

Student number :

Mentor names :

Supervisor names :

Company name :

Cell phone name :

Email address :

Submission date :

Experiential training period (P1/P2) :

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.

2. **Table of contents**

List the different sections with page references.

3. **List of tables, figures and drawings**

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. Statement of sub-problems

Some projects will be too large to be handled by a single person. Such projects should be divided into smaller projects, or sub-problems, that will be easier to comprehend and then given to other people to solve.

7. Delimitation

In the problem statement the project leader states exactly what will be done. It is also important that he/she specifies what he/she does **not** intend to do.

8. Assumptions

The factors that will be taken for granted and will not be incorporated into the solution must be clearly stated.

9. Gathering of information

The gathering of information is extremely important and is not always that obvious.

10. Preliminary Ideas

This is the stage in which your imagination and creativity plays a major role. Try to think of a number of possibilities to the solution. Sketch your different ideas and write down the advantages and disadvantages. Don't limit yourself. Think beyond your frame of reference.

11. 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.

12. Analysis

All calculations and deliberations must be reported under this heading.

13. Implementation of the solution

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

14. Conclusion

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

15. Recommendations

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

16. 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	

WORK INTEGRATED LEARNING		
SEMESTER 1	**PRACTICE I**	
SEMESTER 2	**PRACTICE II**	

TYPE OF PLACEMENT FOR P1/P2 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	

TASKS FOR WORK INTEGRATED LEARNING P1

EHEXP1A Module 1	**Duration**	**Evaluation**	**Unavailable**	**Signature**
Safety, Health and Environmental Responsibility Training				
• General Process Safety Elements (Recognition, Prevention, Mitigation, Response)				
• Occupational Health and Safety				
Process Engineering Technical Aspect				
• Process Description				
• Process Flow Scheme (PFD)				
• Elementary Material and Energy balances				

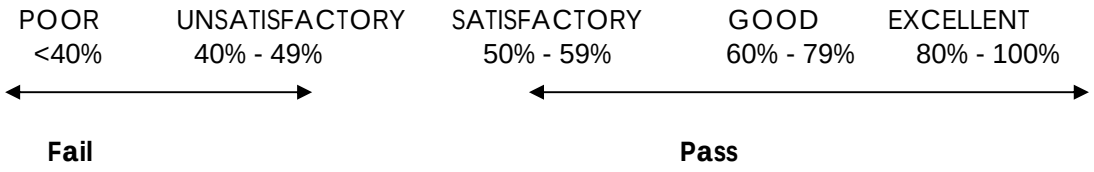
• Piping, Instrumentation and Process Control Philosophy				
• Process Utilities				
Process Plant Operation (Industrial, Pilot or Bench Scale)				
• Process operation, Standard Operating Procedures, Process Limits, Cause and Effect Troubleshooting Logic				
• Process Monitoring, Sampling, Data Logging and Reporting				
Process Chemical Analysis				
• Sample Preparation and Analysis Routines				
• Results Interpretation and Reporting				
Systems found in factory environment: • Organization structures • Maintenance systems				

TASKS FOR WORK INTEGRATED LEARNING P2

TASKS for P2	Duration	Evaluation	Unavailable	Signature
EHEXP2A Module 2				
Plant operations and troubleshooting: • Basic operating skills e.g: operating valves, starting motors, turbines, pumps. • Handling of equipment specific to the operation				
Determination of power requirements for pumps, mixers etc.				
Partaking in project work in order to understand the specific nature of projects e.g: design of Water treatment Plant				

Exposure to loss control, quality control and safety inspections.				
Advanced energy balances.				
Overall material and energy balance of plant.				
Schematic diagrams of unit operations.				
Analysis of design.				
Environmental assessment.				
Exposure to non-technical issues: • Financial management, e.g. Budgeting, Procurement Processes • Human resources • Industrial relations				

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 ……

OFFICIAL STAMP

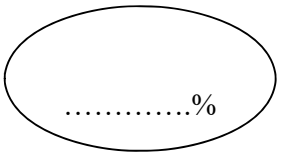
DATE ……

ECSA REGISTRATION CATEGORY ……

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

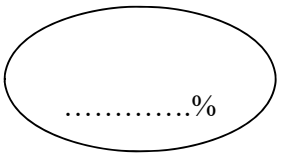
ECSA REGISTRATION NUMBER ……

EVALUATION BY MENTOR/SUPERVISOR



UNIVERSITY USE ONLY:

EVALUATION BY UNIVERSITY/MODERATOR



REMARKS: ……

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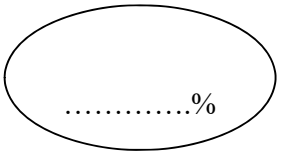
FINAL MARK:



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WIL COORDINATOR **DATE**

ECSA REGISTRATION OF WIL COORDINATOR: ……

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

ECSA REGISTRATION NUMBER ……