VAAL UNIVERSITY OF TECHNOLOGY

*Inspiring thought. Shaping talent.*

# LEARNER GUIDE

| | |
|---|---|
| **Faculty** | Engineering and Technology |
| **Department** | Industrial Engineering, Operations Management and Mechanical Engineering |
| **Course** | DI0830 |
| **Title** | Diploma in Industrial Engineering |
| **Compiled By** | Mr GS Nhlabathi |
| **Year** | 2021 |
| **NQF Level** | 6 |
| **Credits** | 60 |

## CONTENT

# 1. WELCOME

The Industrial Engineering and Operations Management Department welcomes you to the practical training component of your curriculum (**Refer to Appendix A**). After studying what is required of you from a theoretical perspective, this is an opportunity for you to now apply what you have learned thus far to the work environment. The department wishes you all the best in completing this aspect of the curriculum.

# 2. CONTACT PERSONS

| Title Surname | Office number | Telephone number | Email Address |
|---|---|---|---|
| Mr Gift Sizwe Nhlabathi (WIL Coordinator) | R-205 | 016 950 6803 | giftn@vut.ac.za |
| Ms Lieketseng Nakedi (Administrator) | RE-206 | 016 950 9287 | lieketsengn@vut.ac.za |
| Prof Thomas Tengen (Head of Department) | RE-205 | 016-950-9287 | thomas@vut.ac.za |

# 3. PREREQUISITES / LEARNING ASSUMED TO BE IN PLACE

Prerequisites for this subject is:

- The student must pass all credits from S1 to S4 and at least 90% credits from S5. This only applies when the student has found placement by his/herself in the industry.
- Should the student complete 100% of the programme's theoretical content, it will be the responsibility of VUT via the Co-Operative Department to find placement on behalf of the student at a company.
- Students should have met all the graduate attributes listed in section 6 of this document to meet the ECSA requirement.
- Students should have access to and be competent in the use of the following computer software:
    - Microsoft Word
    - Microsoft Excel
    - Microsoft PowerPoint

# 4. THE RATIONALE FOR THIS MODULE

## 4.1 What is Industrial Engineering?

Modern Industrial Engineering is concerned with integrating resources and processes into cohesive strategies, structures, and systems for the effective and efficient production of quality goods and services in any undertaking.

Industrial Engineering draws upon specialised knowledge and skills in the mathematical, physical, behavioural, economic and management sciences and discusses engineering analysis and design principles and methods to find optimal and practical solutions. They contribute to the success and prosperity of an industrial undertaking, thereby making a fundamental contribution to creating wealth.

## 4.2 What do Industrial Engineers do?

There are several things industrial engineers do in their work which include making processes more efficient, making products easier to manufacture, being consistent in their quality, and increasing productivity. An Industrial engineer specialises in designing new systems and improving current systems for the optimal use of resources (including labour) for the financial benefit of any organisation.

The industrial engineer must ensure that the project's design elements are compatible and that the capital, plant, labour, and raw material are optimally employed. Consequently, the project is feasible and economically viable.

You, as an industrial engineer, will, therefore, coordinate a variety of disciplines, and your work and experience will extend across the entire spectrum of the enterprise's activities.

As an industrial engineer, you will be expected to specialise in investigating, improving, designing, and implementing integrated systems comprising capital, plant, labour, and raw materials. Your objective will be to establish optimum utilisation of all the production factors. You will utilise the principles and techniques of engineering, industrial economics, and management to design the systems to obtain the desired physical and economic results.

## 4.3 Related Institutional Documentation

Relevant Institutional policies and rules are Work Integrated Learning Policies, Procedures, and Guidelines (WIL New Qualification – Vaal University of Technology (vut.ac.za))

# 5. PURPOSE OF THE QUALIFICATION (DIPLOMA IN INDUSTRIAL ENGINEERING)

The primary purpose of this vocationally-oriented diploma is to develop focused knowledge and skills, and experience in a work-related context. The diploma equips graduates with the knowledge base, theory, skills, and methodology of one or more engineering disciplines as a foundation for further training and experience towards becoming a competent engineering technician. This foundation is achieved through a thorough grounding in mathematics and natural sciences specific to the field, engineering sciences, engineering design, and applying established methods. Engineering knowledge is complemented by methods for understanding the impacts of engineering solutions on people and the environment.

Note: This standard is designed to meet the educational requirement towards registration as a Candidate or Professional Engineering Technician with the Engineering Council of South Africa and acceptance as a candidate to write the examinations for Certificated Engineers.

# 6. WHAT IS WORK-INTEGRATED LEARNING (WIL)?

Some qualifications are being designed to incorporate periods of required work that integrate with classroom study. This is called Work Integrated Learning. Where work Integrated Learning (WIL) is a structured part of the qualification, the volume of learning allocated to WIL should be appropriate to the purpose of the qualification. WIL contributes 60 credits towards the programme or qualification.

WIL is also directed at the attainment of professional or occupational learning outcomes. WIL is not exclusively experiential learning but includes a curriculum-driven continuum of learning and is therefore designed and executed at the NQF levels of the qualification. Examples would include combinations and integrated aspects of theoretical learning, problem-based learning, project-based learning and experiential learning.

# 7. STUDENT CONDUCT

The table below presents important information for you on the policy and procedures for plagiarism, grievance and appeals, sick test, class attendance, and your rights and responsibilities as a student. We urge you to read, remember and heed these pointers, as they will empower you to become the successful student that you strive to be.

| Criteria | Policy and procedure |
|---|---|
| **Class attendance, punctuality and participation** | As a smart, responsible student, ensure that you are punctual for classes. As you know, time is limited and must, therefore, be managed optimally. It is important that you attend and participate in ALL lectures for this module. We encourage you to engage in group discussions, debates and we appreciate your action learning, insight, and opinions. |
| **Rights and responsibilities** | As a VUT student, YOU have rights such as to be taught according to the module Learning Outcomes (LOs); assessed as per the Assessment Criteria (ACs); fair, valid, and reliable teaching, learning and assessment. As a VUT student, YOU also have responsibilities. The responsibility of learning and providing evidence of that learning rests with YOU. |
| **Plagiarism and self-plagiarism** | The consequences of plagiarism are very serious. When needed, the VUT disciplinary processes will be followed. Plagiarism is any form of literature fraud. Dishonesty and plagiarism are not tolerated and will be punished. Plagiarism means the following (Maurer, Kappe, & Zaka, 2006, p.1050-1051):<br>• Presenting someone else's words as one's own original work<br>• The duplication of someone's work without appropriate recognition of the source<br>• Quoting without quotation marks<br>• Giving incorrect facts of a cited source<br>• Copying of a sentence replacing words with synonyms without citing the original source<br>• When the majority of the discussion comes from one source, whether cited or not |

| Criteria | Policy and procedure |
|---|---|
| | • Self-plagiarism of one's own writings that have appeared previously in the public domain.<br>It is important to acknowledge any thoughts, ideas and information that are not your own. It is also important to use a standard form of referencing to provide all relevant information that will help any person who may be interested to read further about the information. As a result, you need to keep an accurate record of where you collect your data. You will be required to cite your source(s), especially when referring to an item within your text. You are also required to indicate the reference where the citation can be found at the end of your work (in a "List of References" section at the end of your assignment). It is important for you to enquire and adhere to the requirements set by the university regarding the consequences of plagiarism. |
| **Grievance and appeals** | As a student, you must be able to follow procedures, solve problems and manage conflict. The department's grievance procedure should be followed in case of any dissatisfaction, grievance or appeal of results.<br>Step 1: If you experience any problems in this module, contact your lecturer.<br>Step 2: If a satisfactory agreement is not reached, then you may consult with the course/qualification coordinator.<br>Step 3: If a satisfactory agreement is not reached, then you may consult with the Head of Department responsible for the module.<br>Step 4: If you are still dissatisfied, then contact the Executive Dean of the Faculty. |
| **Assignment deadlines** | Assignment deadlines and test dates are given well in advance. No extension will be allowed. In the case of health issues, follow the appropriate university. |

# 8. GRADUATE ATTRIBUTES

The Engineering Council of South Africa (ECSA) is a statutory body established in terms of the Engineering Profession Act (EPA), 46 of 2000. ECSA's primary role is the regulation of the engineering profession in terms of this Act. Its core functions are the accreditation of engineering programmes, registration of persons as professionals in specified categories, and the regulation of the practice of registered persons.

Consequently, the ECSA is the only body in South Africa that is authorised to register engineering professionals and bestow the use of engineering titles, such as Pr Eng, Pr Tech Eng, Pr Techni Eng, Pr Cert Eng, on persons who have met the requisite professional registration criteria. (https://www.ecsa.co.za )

The Engineering Council of South Africa, in their document E-02-PN, Rev 3 (Qualification Standard for Diploma in Engineering: NQF level 6), prescribes eleven Graduate Attributes (GAs) that learners should be able to demonstrate competence in by the time they have finished their qualification. Graduate Attributes are clear, concise statements of the qualities, skills and understandings that learners should develop during their time with the institution. These attributes include and go beyond the disciplinary expertise or technical knowledge that has traditionally formed the core of most university courses.

Graduate Attributes defined below are stated generically and will be assessed in the Industrial engineering discipline contexts. The Department of Industrial Engineering and Operations Management shall, in its quality assurance process, demonstrate that an effective integrated assessment strategy is used. Identified components of assessment must address the summative assessment of graduate attributes. Evidence should be derived from significant work or multiple instances of limited scale work.

Below is a short summary of the 12 Graduate Attributes that will be developed and assessed in different subjects during your studies for this qualification. To view the full description, please refer to the qualification standard at E-02-PN Qualification Standard for Diploma in Engineering NQF Level 6 20.pdf (ecsa.co.za)

| GRADUATE ATTRIBUTE | | LEARNING OUTCOME |
|---|---|---|
| GA1 | Problem-solving | Identify, formulate, analyse and solve well-defined engineering problems |
| GA2 | Application of scientific and engineering knowledge | Apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering speciality to solve well-defined engineering problems. |
| GA3 | Engineering Design | Perform procedural design and synthesis of components, systems, engineering works, products or processes. |
| GA4 | Investigations, experiments and data analysis | Demonstrate competence to design and conduct investigations and experiments. |
| GA5 | Engineering methods, skills, and tools, including information technology | Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology. |
| GA6 | Professional and technical communication | Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large. |
| GA7 | Sustainability and Impact of Engineering Activity | Demonstrate a critical awareness of the sustainability and impact of engineering activity on the social, industrial and physical environment. |
| GA8 | Individual, team and multidisciplinary working | Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments. |
| GA9 | Independent learning ability | Demonstrate competence to engage in independent learning through well-developed learning skills. |
| GA10 | Engineering Professionalism | Demonstrate a critical awareness of the need to act professionally and ethically and to exercise judgment, and take responsibility within own limits of competence. |
| GA11 | Engineering Management | Demonstrate knowledge and understanding of engineering management principles and economic decision-making. |
| GA12 | Workplace Practices | Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved. |

## 9. GRADUATE ATTRIBUTES ASSESSED IN THIS MODULE

The following Graduate Attribute will be assessed in the module:

| GRADUATE ATTRIBUTE | | EVIDENCE |
|---|---|---|
| **GA12** | **Workplace Practices**<br>Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.<br><br>**Range Statement:**<br>Tasks to demonstrate this outcome should be designed to connect academic learning with workplace practice and may be performed in one or more of the following types of work-integrated learning<br>i. Work-directed theoretical learning.<br>ii. Problem-based learning.<br>iii. Project-based learning.<br>iv. Work-based learning and<br>v. Simulated learning. | WIL Report |

## 10. KNOWLEDGE AREAS BREAKDOWN

The National Diploma in Industrial Area has a total of 392 credits. Of those credits, 60 is allocated to Work Integrated Learning.

| KNOWLEDGE AREA | CREDITS |
|---|---|
| Mathematical Sciences | |
| Natural Sciences | |
| Engineering Sciences | |
| Design and Synthesis | |
| Computing and Information Technology | |
| Complementary Studies | |
| Work-integrated Learning | 60 |
| **TOTAL CREDITS FOR SUBJECT** | **60** |

## 11. OUTCOMES: WORK-INTEGRATED LEARNING

At the end of the student's respective training period, the student must, through a portfolio of evidence, show progress to the achievement of the outcomes outlined below

1) Have an understanding of and be able to practice basic occupational health and safety within the work environment;
2) Have an understanding of and should be able to demonstrate their ability to use basic hand tools and measurement devices, i.e. a measuring tape, stopwatch etc.;
3) Plan and execute basic studies that would incorporate principles learnt during the five semesters of academic study. This would include but is not limited to the following areas within the industrial engineering discipline;
    a) Process and/or product design;
    b) Jig and tool design;
    c) Work measurement and ergonomic studies;
    d) Materials handling, facilities and workplace design;
    e) The system, procedure and policy development and design;
    f) Cost analysis and quality control/assurance;
4) 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.
5) 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.
6) Project-based learning: that brings together intellectual enquiry, real-world problems and student engagement in meaningful work.
7) Workplace-based learning, where students are placed in professional practice or simulated environments within a training programme.
8) Simulated learning. Demonstrate an ability to be able to carry out an oral/written presentation to management at various levels.

Note: **Appendix B** is the form used for the evaluation of exposure to Industrial Engineering areas, techniques and tools during the WIL period.

# 12. PURPOSE AND OVERVIEW OF THE LEARNER GUIDE

The purpose of this learner guide is to illustrate to the learner, and their employer what the department's expectations are whilst the learner is completing the work-integrated learning (WIL) component of their curriculum. The learner guide also contains a brief explanation of the department's learning outcomes, assessment criteria, and assessment strategies. After reading the guide, it is advised that if the learner/employer is still uncertain of any aspect or requirement of the WIL component, they should contact the department or coordinator for further assistance.

# 13. WIL PROCEDURES FOR THE LEARNER

## 13.1 Registration and submission of portfolios

The programme requires the student/candidates to undergo a work-integrated learning period (not less than six (6) months) as part of the course. The student has to pass all prescribed (compulsory and elective) modules and the prescribed work-integrated learning component to obtain sufficient credits to qualify for the qualification.

The university must accredit the employer for offering work-integrated learning. A work-integrated learning agreement creates a separate contract between the "employer" and the student/candidates.

Students are advised to contact the Department of Co-operative Education to submit their CVs. If the student finds employment on their own, they must contact the Co-operative Department and confirm if that company is accredited with VUT. The student must maintain a portfolio outlining the experience gained through the work-integrated learning component.

## 13.2 Procedure that will need to be followed by the learner.

All industrial engineering students must 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 (employment letter from the employer).

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**

**OR**

**Send email to wilregistration@vut.ac.za**

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

Registration fees for work-integrated learning must be paid with registration. Detail on course fees can be obtained from the Co-operative Education office or on the VUT website https://www.vut.ac.za/wil-new-qualification/#1563272542627-890b039f-0ccf

**Note**: *The following documents are compulsory for WIL registration:*

- *Registration form.*
- *Appointment / Confirmation letter from company.*
- *Proof of payment.*
- *Certified copy of ID.*
- *Proof of residence.*
- *Certified copy of Gr 12 certificate.*
- *International students must also submit the checklist.*

### 13.2.1 Registration cycles

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

### 13.2.2 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.

### 13.2.3 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.

### 13.2.4 Prerequisites

- The student must pass all modules from S1 to S4 and at least 90% credits from S5. This only applies when the student has found placement by themselves in the industry.
- Work-integrated learning can also be done after completion of the total theoretical part of the diploma after S5.
- It's the student's responsibility to confirm the registration.
- The WIL Coordinator will do validation/Accreditation of WIL Employers.
- The Co-operative Education Department will do the placement.

### 13.2.5 Fees

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

| Students Paying for themselves: | Companies paying for students: |
|---|---|
| *ABSA* | *ABSA* |
| *Branch Code 334237* | *Branch Code 334237* |
| *Account Number 4068126832* | *Account number 530861945* |
| *Reference: Student number* | *Reference: Student number* |

**Note:** *The additional student card fees, student levies and the WIL registration fee will be billed to the student's account.*

1) The student must furnish proof of employment from the company where they are doing their training. Suppose the student has enrolled into learner ship or a specialised training programme offered by the company or a SETA accredited institution. In that case, the

student needs to verify that the content being taught or experience gathered is in line with Industrial Engineering. The student should contact the department before enrolling on such a programme.

2) It is recommended that the student submit a draft project report, completed following the guidelines given by the department, within three months from the date of commencement for their training.
3) The first draft of the final training portfolio (hardcopy) must be submitted by the student 2 (two) weeks before the end of their training.
4) The student must ensure that they receive a letter from the department confirming receipt of the portfolio.
5) The portfolio would then be assessed according to the assessment criteria outlined by the department, and the student would be informed of the necessary corrections that would be required (If any). This process would take 3 (three) weeks to complete. If no longer, the student will be informed by the department when they could expect feedback on their portfolios.
6) The student has a period of 2 (two) weeks to complete the necessary changes and resubmit the final portfolio. The student is also required to submit the draft copy where the department made the changes and recommendations.
7) After that, the portfolio would be re-assessed by the department, and if approved, the student would be duly informed.
8) If there is any deviation from the above procedure without written correspondence, it must be submitted to the HOD for approval.
9) If the student defaults in keeping to the above procedure without written consent from the department, they would be required to re-register that part of their training module WIL.

**Note**: *Students with outstanding fees are still eligible to register for their WIL modules. Arrangements need to be made with the Finance Department regarding the outstanding fees, and the Department WIL coordinator/HOD needs to be informed. Once a student has completed all the subjects and work-integrated learning components, the student must apply for graduation by completing the application for graduation form. The diploma shall be awarded only on successful completion of all the subjects and the work-integrated learning component.*

## 13.3 Changing Employers/Sections/Departments

When a student changes their employer or relocates to another branch within the organisation, the learner must:

1) Notify the university in writing by completing the relevant form within one working week of the change occurring;
2) Ensure that he/she abides by the necessary conditions of his/her employment contract (i.e. resign as per the conditions outlined in the employment contract). Complaints by employers regarding student conduct in this regard would not be treated lightly as it could affect future placement opportunities for students in the system;
3) Ensure that the previous employer/manager has signed the WIL report pertaining to that particular period of employment; and
4) Comply with the item (2) of the registration procedure (Section 11.1.)

**Note:** *Failure to comply with the above may result in the learner not appearing correctly on the department's database and, therefore, would not be visited by the Supervisor. Students to please note that any complaints from employers would be thoroughly investigated and could result in disciplinary action against the student. Students are to be fully aware that whilst engaged in WIL, they still represent the university and have to abide by the codes of conduct.*

# 14. WIL PROCEDURES AND GUIDELINES FOR THE EMPLOYER

## 14.1 Introduction

The relationship between VUT and the employer is a value-adding partnership where each partner strives to add value to the economy by contributing positively to the growth of learners. This value-adding process should produce productive and skilled learners that can contribute positively to the economy at large.

## 14.2 Responsibility of the employer

1) Ensure that the learners have registered with the university for their WIL components
2) To ensure that the learner complies with the guidelines for their WIL components as specified in this learner guide

3) To offer the learner the appropriate form of training and guidance to develop the learners' skills and competence in Industrial Engineering.
4) To mentor and supervise the learners' progression at the workplace to meet the outcomes as specified in this learner guide.
5) To evaluate the learner's performance in the workplace and provide meaningful feedback to the learner and university to improve the learner's competence in the field of Industrial Engineering.

## 14.3 Information and Guidance for Employers/Supervisors/Mentors

When a training program is offered to the students, it is at the discretion of the employer, with limited interventions by the Department of Industrial Engineering, that the employer is requested to bear the following points in mind:

- By employing the student for WIL (In-service training/experiential learning), the employer commits itself to this institution's co-operative education programme.
- As the nature and type of training that the learners are going to receive will vary depending on company resources, the employers urged to verify the training program with the Department of Industrial Engineering to ensure that the learner receives the appropriate form of training as required by the curriculum.
- Although this may not be possible, the employer is urged to ensure that the respective mentor/supervisor is qualified in the same field as that of the learner. Should this not be the case, then the mentor/supervisor is urged to contact the department should they have any queries regarding the nature of the training the learner should be undertaking.
- For a learner registering for WIL, who has not had any previous exposure to the working environment, it is recommended that the employer introduce an initial/induction module into their training program to orientate the learner to the working environment. Areas that can be covered could include an overview of codes of conduct that need to adhere to relationships with fellow workers, supervisors, health and safety, etc.
- It is also recommended that, in the WIL part of the training program, supervisors/mentors have regular meetings with the learner to discuss work is done and any problems that the learner may be experiencing at the workplace. The frequency of these meetings can be reduced as the learner becomes more accustomed to the work environment.
- It is important that all staff that would be in contact with these students be advised as to the student of the learner as they would also have a role in guiding the learner.

- Mentors/supervisors should note that the degree of difficulty of the task allocated should gradually progress from being clear well defined WIL to being unstructured and unformulated WIL,
- Employers are encouraged to enrol learners for courses and seminars. This training should ensure that the learner is better equipped to function effectively and productively in the workplace.

# 15. ASSESSMENT CRITERIA

## 15.1 Assessment Strategies

In order to assess the achievement of outcomes outlined in section 1.7, the following assessment strategies have been adopted.

- The department will undertake a workplace Accreditation of the company preferably before the actual placement of the student;
- The learner will submit a detailed documented portfolio (for academic evaluation) of his work experience and how it relates to the field of Industrial Engineering. This would be assessed through the means of an assessment rubric. **(Refer to Appendix C);** and
- A representative from the Department of Industrial Engineering will visit the student at least once per registration to oversee the appropriateness of the training being received by the learner, adherence to the learner guidelines, and monitor the learner's progress.

## 15.2 Moderation of WIL

All work submitted by students registered for WIL will be externally moderated in keeping with the current externally moderating exit-level subjects. The Department of Industrial Engineering will appoint a suitable moderator.

# 16. THE WIL TRAINING PORTFOLIO

At the end of the specified registration period, the learner is required to submit to the department (within the month after the end of the in-service (period) a detailed portfolio of evidence. The suggested structure of the portfolio is given in section 6.1. Learners are to note that this is a suggested structure, and deviation will be allowed with permission from the department. The work

submitted by the learner must be a true reflection of their own contribution to the work undertaken during the period of training.

## 16.1 Suggested Structure of the WIL Training Portfolio

The Work Integrated Learning portfolio should consist of the following sections:

- The cover page;
- The table of content;
- The portfolio declaration page (**Appendix E**);
- Learners Evaluation of WIL and the workplace (**Appendix F)** evaluation;
- Appendices (additional information related to the project reports, copies of certificates or confirmation of attendance to workshops, training seminars etc.) if applicable.

## 16.2 Project report guidelines

- The projects must be of a nature that represents the engineering work undertaken by the learner illustrating the learner's ability to meet the outcomes as specified in section 1.7. relevant to the period of training registered WIL;
- Each report submitted should reflect the extent of the learner's contribution to the engineering process, such as conceptualisation, design, analysis, manufacturing, implementation etc.; and
- The report must be set out in a way that clearly shows how engineering knowledge was applied to the problem at hand. The following is a suggested guideline as to the structure of each report with the learner choosing the appropriate headings as applicable (**Refer to Appendix D** for a more detailed breakdown):
    - Objective / Scope;
    - Team members;
    - Duration;
    - Methodology;
    - Analysis;
    - Conclusion / Recommendation / Summary.

# 17. APPLICATION FOR GRADUATION

- 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 are 31 January and for September graduation 31 July of each year.
- The Head of Departments will direct the completed documents to the Examination Office for processing.

  **Note:** *The feedback on reports submitted will be sent via email by the WIL Coordinator***.**
- The examination office will process the documents for evaluation and approval by the respective Head of the 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 their 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 final report MUST be submitted to N108 BEFORE applying for graduation!*

**If all documents are not included with/before the Diploma application, the application will be rejected. Your graduation forms will not be processed unless you have met the six-month requirement counting from the date you have registered for the training with the VUT Co-operative Education office. If any problem regarding the application arises, the university will contact the student.**

# APPENDIX A: CURRICULUM OF DIP IE

**FACULTY OF ENGINEERING AND TECHNOLOGY (1100)**

**DEPARTMENT OF INDUSTRIAL ENGINEERING AND OPERATIONS MANAGEMENT (1150)**

**PROGRAMME: DIPLOMA IN INDUSTRIAL ENGINEERING (DE0830/DI0830)**

**SAQA Qualification ID: 110935**

| POS | Subject Code | Subject Name | Compulsory /Elective | Credits | Prerequisites |
|---|---|---|---|---|---|
| POS A | HKCOX1A | Applied Communication Skills 1.1 | C | 8 | |
| POS A | AAECH1A | Engineering Chemistry I | C | 10 | |
| POS A | AMMAT1A | Mathematics I | C | 10 | |
| POS A | APHYS1A | Physics I | C | 10 | |
| POS A | ASICT1A | ICT Skills I | C | 10 | |
| POS A | EEESK1A | Engineering Skills I | C | 5 | |
| POS A | EESIN1A | Social Intelligence I | C | 3 | |
| | | | | | ***56*** |
| POS B | HKCOY1A | Applied Communication Skills 1.2 | C | 8 | |
| POS B | AAECH2A | Engineering Chemistry II | C | 10 | AAECH1A |
| POS B | EBCOA2A | Computing Applications II | C | 7 | |
| POS B | AMMAT2A | Mathematics II | C | 10 | AMMAT1A |
| POS B | APHYT2A | Physics II (Theory) | C | 5 | APHYS1A |
| POS B | APHYP2A | Physics II (Practical) | C | 5 | APHYS1A |
| POS B | EMEDR1A | Engineering Drawing I | C | 10 | |
| POS B | EBMRE2A | Manufacturing Relations II | C | 10 | |
| POS B | EBSPA1A | Safety Principles and Law I | C | 5 | |
| | | | | | ***70*** |
| POS C | HKCOX2A | Applied Communication Skills 2.1 | C | 8 | HKCOX1A HKCOY1A |
| POS C | EMMEC1A | Mechanics I | C | 10 | |
| POS C | EBEWS1A | Engineering Work Study I | C | 10 | |
| POS C | EBPEN1A | Production Engineering I | C | 10 | |
| POS C | EBQTE1A | Qualitative Techniques I | C | 10 | |

| POS | Subject Code | Subject Name | Compulsory /Elective | Credits | Prerequisites |
|---|---|---|---|---|---|
| POS C | EMMEN1A | Mechanical Manufacturing Engineering I | C | 10 | |
| POS C | EPEEN1A | Electrical Engineering I | C | 10 | |
| POS C | AMMAT3A | Mathematics III | C | 10 | AMMAT2A |
| | | | | | ***78*** |
| POS D | HKCOY2A | Applied Communication Skills 2.2 | C | 8 | HKCOX1A<br>HKCOY1A |
| POS D | BACOS2A | Costing II | C | 10 | |
| POS D | EBEWS2A | Engineering Work Study II | C | 10 | EBEWS1A |
| POS D | EBFLA2A | Facility Layout and Material Handling | C | 10 | |
| POS D | EBPEN2A | Production Engineering II | C | 10 | EBPEN1A |
| POS D | EBQAS2A | Quality Assurance II | C | 10 | EBQTE1A |
| POS D | EMMEN2A | Mechanical Manufacturing Engineering II | C | 10 | EMMEN1A |
| ***Select Any 1 of the following electives:*** | | | | 10 | |
| POS D | EBCAD1A | Computer-Aided Draughting I (Not active) | E | | |
| POS D | EMMAE1A | Maintenance I | E | | |
| POS D | EMMOM2A | Mechanics of Machines II | E | | EMMEC1A |
| POS D | EMSOM2A | Strength of Materials II | E | | EMMEC1A |
| POS D | EPEEN2A | Electrical Engineering II | E | | EPEEN1A |
| POS D | EMMED2A | Mechanical Engineering Design 2 | E | | |
| | | | | | ***78*** |
| POS E | EBAUT3A | Automation III | C | 10 | EMMEN1A |
| POS E | EBEWS3A | Engineering Work Study III | C | 10 | |
| POS E | EBIAC3A | Industrial Accounting III | C | 10 | BACOS2A |
| POS E | EBILE3A | Industrial Leadership III | C | 10 | EBMRE2A |
| POS E | EBORE3A | Operational Research III | C | 10 | EBQAS2A |
| | | | | | ***50*** |
| POS F | EBWIL1A | Work Integrated Learning (Industrial) | C | 60 | |
| | | | | | **60** |
| | | | | | **TOTAL CREDITS: 392** |

PROGRESSION RULES (Dip IE):

1) To move to POS B, the student should have obtained:
    - At least 15 credits in POS A.

2) To move to POS C, the student should have obtained:
    - At least 15 credits in POS B.
    - Register for outstanding POS A Modules first
    - Can only register for a maximum of 80 Credits in total

3) To move to POS D, the student should have obtained:
    - At least 20 credits in POS C.
    - Possed all POS A modules
    - Register for outstanding POS A Modules first
    - Can only register for a maximum of 80 Credits in total

4) To move to POS E, the student should have obtained:
    - At least ten credits in POS D.
    - Possed all POS A and POS B modules
    - Register for outstanding POS C Modules first
    - Can only register for a maximum of 80 Credits in total

5) To move to POS F, the student should have obtained:
    - 90% of theoretical modules must have been completed

6) Only subjects for which the prerequisite has been passed can be enrolled.

# APPENDIX B: EVALUATION OF EXPOSURE FORM

VAAL UNIVERSITY OF TECHNOLOGY
*Inspiring thought. Shaping talent.*

**DIPLOMA IN INDUSTRIAL ENGINEERING**
**WORK INTEGRATED LEARNING**
**EVALUATION OF EXPOSURE**

| Student Number | Student Name | Company Name |
|---|---|---|
| | | |

Industrial engineering technicians work in a variety of industries and businesses. It is more than manufacturing – it also encompasses service industries, with many IE technicians employed in entertainment industries, shipping and logistics businesses, healthcare organizations, Information Technology, and financial services. IE students can do their work-integrated learning at any of these industries and therefore, no specific tools, techniques and learning areas can be prescribed for WIL. This document shows which of the many different tools, techniques and learning areas the student was exposed to during their work-integrated learning. No diploma application will be approved if the student had not been exposed to six (6) months of applicable in-service training.

**The student has been exposed to the practical application of the following learning areas during his/her work integrated learning period (A minimum of six (6) required):**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Health and Safety | | First Aid | | Workshop Processes | | | |
| Forecasting | | Capacity Planning | | Scheduling | | | |
| Inventory Management | | Logistics and Distribution | | Quality Management | | | |
| Project Planning & Control | | Productivity Improvement | | Design | | | |
| Facility Layout | | Work Measurement | | Method Studies | | | |
| Decision Analysis | | Ergonomics | | Automation | | | |
| Material Handling | | Human Factors | | Maintenance | | | |

**The following techniques were applied during the work integrating learning period (A minimum of 4 required):**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Forecasting | | Scheduling | | MRP and MPS | | | |
| JIT and Inventory | | Economic Analysis | | Critical Examination | | | |
| Value Analysis | | Creative Thinking | | Time Study | | | |
| Facility Layout | | Activity Sampling | | Process Charting | | | |
| Feasibility Studies | | Computer-Aided Design | | Work Environment Design | | | |
| Reliability Studies | | Overall Equip. Effectiveness | | Equipment monitoring unit | | | |

**The following tools were used during the application of the abovementioned techniques (A minimum of six (6) required):**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Stopwatches | | Pre-designed Documents | | Document Boards | | | |
| Scientific Calculators | | Microsoft Word | | Microsoft Excel | | | |
| Microsoft Project (basic) | | Microsoft PowerPoint | | Microsoft Visio | | | |
| MODAPTS | | Quantitative Analysis | | Qualitative Analysis | | | |

Please note the following comments:

| Markers Signature | Initials and Surname | Date |
|---|---|---|
| | | |

1

# APPENDIX C: MARKING RUBRIC FOR WIL

**WORK INTERATED LEARNING (INDUSTRIAL) 1 - EBWIL1A**

**MARKING RUBRIC - GRADUATE ATTRIBUTE 12 (WORKPLACE PRACTICES)**

| INDICATORS | LEVEL OF ACHIEVEMENT | | | | MARKS POSSIBLE | MARKS OBTAINED |
|---|---|---|---|---|---|---|
| | Level 4 | Level 3 | Level 2 | Level 1 | | |
| | Outstanding | Competent | Developing | Inadequate | | |
| **Industrial Engineering Knowledge**<br>Familiarity with Industrial Engineering knowlede or Learning Area | **15-20**<br>Has strong mastery of knowledge and learning areas of assigned task, and can source for more information to addres the task. | **10-14**<br>Understand knowledge and learning areas on assigned tasks. | **5-9**<br>Demonstrates some understanding of knowledge areas on assigned tasks. | **0-4**<br>Demonstrate minimal understanding of knowledge areas in most of the assigned tasks. | 20 | |
| **Industrial Engineering Teohniques**<br>Ability to apply Industrial Engineering Techniques | **15-20**<br>Can identify usefull techniques and has strong understanding of how techniques are applied at the work place. | **10-14**<br>Apply identified techniques with ease. | **5-9**<br>Moderate understanding on how to apply identified Industrial Engineering techniques at workplace | **0-4**<br>Find it difficult to apply identified techniques at workplace | 20 | |
| **Industrial Engineering Tools**<br>Ability to handle and use Industrial Engineering tools. | **15-20**<br>Ability to effectively handle and use Industrial Engineering tools. | **10-14**<br>Adequatly able to handle and use industrial engineering tools | **5-9**<br>Can satisfactorily manage to use some Industrial Engineering tools. | **0-4**<br>Have difficulty in using most Industrial Engineering tools | 20 | |
| **WIL Tasks / Activities**<br>Statement on own tasks and those of team members. | **8-10**<br>Have excelent knowledge and strong understanding of individual and team's tasks. | **5-7**<br>Can positively follow the task actions and those of team members to execute the given task. | **3-4**<br>Understanding some set of activities and its own team. | **0-2**<br>Student hardly understand the set of activities given or a task. | 10 | |
| **WIL Report - Appearance and Content**<br>Cover page; Table of Content; Theoretical modules covered in the learning plan; Reader friendlyness of document; Depth of discussion of elements within the learning plan; Formatting and layout. | **8-10**<br>Can apply with ease report writing skills on documentation and the report is user friendly to the reader. The learning plan is adequately discussed and is skillfully enhanced with diagrams, graphs, photos and the use of colour. | **5-7**<br>Understand report writing principles and report is user friendly to the reader. The learning plan is discussed and enhanced with diagrams, graphs, photos, and the use of colour. | **3-4**<br>Can follow some of the report writing logic and iqyout and document is somewhat easy to the read. Some use of diagrams, graphs, photos, and the use of colour to enhance discussions of the learning plan. | **0-2**<br>Struggle to adhere to report layout and lack in-depth discussion of the learning plan. | 10 | |
| **WIL Report - Report Writing**<br>Adherence to report writing guidelines. Spelling and grammar is up to standard. | **5**<br>Report is very neat, easy to read and flow chronologically. Spelling and Grammar is excellent. | **3-4**<br>Report is easy to read and the spelling and grammar is adequate. | **2**<br>Report does not flow fluently and contain some errors. Some obvious spelling and grammar mistakes. | **0-1**<br>Report is not reader friendly and has many spelling and grammar mistakes | 5 | |
| **WIL Report - Enhancement**<br>Charts, diagrams, figures, graps and photos used to enhance the report and assist with the discussions and understanding. | **5**<br>Student knows how to clearly present and interpret charts, figures and graphs into simple language. | **3-4**<br>Student is able to explain diagram, charts, graphs and figures in accordance to the learning area. | **2**<br>Moderately understand how to explain charts, diagrams, figures and graphs related to the learning area. | **0-1**<br>Struggle to interpret charts, figures, diagrams and graphs related to the learning area. | 5 | |
| **Finances**<br>Projections of production activities, costs, income, overheads, calculations, spreadsheets, formulas etc. Project cost and savings calculations. | **8-10**<br>Strongly know how to project costs involved in a project and strongly knows how to read spreadsheets, explain formulae, explain technical financial concepts into simple terms | **5-7**<br>Student can project project costs, understand the financial concepts and explain spreadsheets. | **3-4**<br>Student has some understanding of financial languate and can narrate some concepts. | **0-2**<br>Find it difficult to explain most of finances and how they came about it. | 10 | |
| **FINAL MARK %:** | | | | | 100 | 0 |
| **GRADUATE ATTRIBUTE LEVEL:** | Level 4 (75% to 100%) | Level 3 (50% to 74%) | Level 2 (25% to 49%) | Level 1 (0% to 24%) | | |

# APPENDIX D: PROJECT REPORT STRUCTURE

## WIL Project Report Structure

(Note: The learner is required to choose the headings that are appropriate for their report)

### 1. Scope

A brief background surrounding the initiation of the project

### 2. Objective

What type of project are you involved in? Any reason or reasons for doing this project? Objectives should be brief and preferably in point form. It is important to note that there should be a direct link between the objectives outlined at the start of the report and the conclusions/recommendation/summary thereafter.

### 3. Team members

Are there others involved in this project? How are they involved? The use of an organogram is preferable, and the reporting structure must be shown.

### 4. Duration

How much time did you spend on this project? You may be involved in more than one project at a time. Specify the start date, end date and the actual time that you have spent on the project. As there are ongoing projects and projects that exceed the time spent on WIL, the learner is quantified the time that they have spent contributing to the project.

### 5. Methodology

This section documents the method followed in achieving the objectives of the project. E.g.

- The 5s
- Cause and Effect
- Manufacturing / Process Kaizen
- Process Mapping
- Time and method study

It is important to note that the structure of the methodology will form the structure of the analysis section of the project report.

### 6. Analysis

Using the methodology as a guideline for the structure under this heading, show how the problem was analysed, data collected, and quantified tables, graphs and figures shown for illustration purposes must be

labelled individually. Subsequent discussions must be relevant to the sub-headings, tables, graphs and figures. The discussions under this heading must be methodical, relevant and self-explanatory to the reader.

### 7. Summary

From your analysis, what are your findings?. Summarise your findings, make conclusions/recommendations supported by your analysis and factual findings.

### 8. Conclusions

All conclusions derived must be relevant to the discussions undertaken under the Analysis heading. Statements made must be substantiated. The learner is advised to refrain from making arbitrary statements with no relevance to the project. Conclusions must have a direct link to the stated objectives.

### 9. Recommendations

Depending on what the project objectives were, the learner can make suggestions on how to improve the process. All recommendations must be substantiated to a certain degree under the Analysis heading. Recommendations made must be within reason and applicable to the problem at hand.

### 10. Appendixes

Any supporting documentation that is too large to incorporate into the body of the document has to be included here.

# APPENDIX E: PORTFOLIO DECLARATION PAGE

This declaration page should be the first page of your report:

## WORK-INTEGRATED LEARNING (INDUSTRIAL) 1 (EBWIL1A)

## PORTFOLIO DECLARATION PAGE

**MENTOR'S DECLARATION:**

I _____ (insert mentor's full name) hereby declare that I have read through the report being submitted by _____ (insert learner's name) and agree with the contents being disclosed there-in. The contents of the portfolio are a true reflection of the work that was carried out by the learner.

_____ _____

Mentor's Signature Date

**LEARNER'S DECLARATION:**

I _____ (insert learner's full name) hereby declare that the contents disclosed in this portfolio is of my own work and I have adhered to the guidelines as given in the learner guide for Experiential Learning (WIL)

_____ _____

Student's Signature Date

## APPENDIX F: EVALUATION OF WORK INTEGRATED LEARNING

The evaluation form that your mentor at the workplace has to complete and you should submit to your WIL Coordinator with your final WIL Report for evaluation.

### EVALUATION OF WORK-INTEGRATED LEARNING

| | |
|---|---|
| **STUDENT INITIALS & SURNAME** | |

| | |
|---|---|
| **CONTACT NUMBER** | |
| **EMAIL ADDRESS** | |

| | |
|---|---|
| **STUDENT NUMBER** | |
| **CAMPUS** | |

| | | | | |
|---|---|---|---|---|
| **TRAINING PERIOD** | **FROM** | | **TO** | |

| | |
|---|---|
| **COMPANY DETAILS & PHYSICAL ADDRESS** | |
| | |
| | |
| | |

**SECTION 1: TYPE OF PLACEMENT (TO BE COMPLETED BY LEARNER OR 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 on the list.

| PLACEMENT | CHECK |
|---|---|
| Operational – Industrial Engineering Process Plant Operator / Technician | |
| Operational – Industrial Engineering Process Plant Operator / Process plant trainer. | |
| Process Plant trainee | |
| Operational – Industrial Engineering Process Plant Operator | |
| Operational – Industrial Manufacturing Process Plant Operator / Technician | |
| Operational – Industrial Process Plant Maintenance | |
| Operational – Industrial Process Plant Maintenance | |
| Operational – Pilot Plant Operator | |
| Operational – Manual Labour | |
| Laboratory – Analytical Engineer / Operator / Technical (Analysing data) | |
| 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) | |
| | |

**SECTION 2: EVALUATION OF TASKS FOR WORK-INTEGRATED LEARNING**

**(TO BE COMPLETED BY MENTOR)**

Explanation of evaluation scale:

| POOR | UNSATISFACTORY | SATISFACTORY | GOOD | EXCELLENT |
|---|---|---|---|---|
| <40% | 40% - 49% | 50% - 59% | 60% - 75% | 85% - 100% |
| FAIL | | PASS | | |

| Tasks | Time spend on a task | Mentor Evaluation (%) | Task not available at workplace | Mentor Signature |
|---|---|---|---|---|
| **Problem-solving**<br>**Learning Outcome:** Apply engineering principles to systematically diagnose and solve well-defined engineering problems. | | | | |
| **Application of scientific and engineering knowledge**<br>***Learning outcome:*** Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve *well-defined* engineering problems. | | | | |
| **Engineering Design**<br>***Learning outcome:*** Perform procedural design of components, systems, works, products or processes to meet requirements, normally within applicable standards, codes of practice and legislation. | | | | |
| **Investigations, experiments and data analysis**<br>***Learning outcome:*** Conduct investigations of *well-defined* problems through locating and searching relevant codes and catalogues, conducting standard tests, experiments and measurements | | | | |

| Tasks | Time spend on a task | Mentor Evaluation (%) | Task not available at workplace | Mentor Signature |
|---|---|---|---|---|
| **Engineering methods, skills and tools, including Information Technology**<br>***Learning outcome:*** 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. | | | | |
| **Professional and technical communication**<br>***Learning outcome:*** Communicate effectively, both orally and in writing, within an engineering context | | | | |
| **Sustainability and Impact of Engineering Activity**<br>***Learning outcome:*** Demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by defined procedures. | | | | |
| **Individual, team and multidisciplinary working**<br>***Learning outcome:*** Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work as a member and leader in a team and to manage projects. | | | | |
| **Independent learning ability**<br>***Learning outcome:*** Engage in independent and life-long learning through well-developed learning skills | | | | |
| **Engineering Professionalism**<br>***Learning outcome:*** Comprehend and apply ethical principles and commit to professional ethics, responsibilities and. Understand and commit to professional ethics, responsibilities | | | | |

**SECTION 3: EVALUATION REPORT (TO BE COMPLETED BY MENTOR/SUPERVISOR)**

Explanation of evaluation scale:

| POOR | UNSATISFACTORY | SATISFACTORY | GOOD | EXCELLENT |
|---|---|---|---|---|
| <40% | 40% - 49% | 50% - 59% | 60% - 75% | 85% - 100% |
| FAIL | | PASS | | |

| PLACEMENT | EVALUATION % | SIGNATURE |
|---|---|---|
| 1. Dexterity | | |
| 2. Knowledge of techniques, procedures and materials. | | |
| 3. Safety Awareness | | |
| 4. Willingness to learn new skills | | |
| 5. Initiative | | |
| 6. Human Relations | | |
| 7. Attitute | | |
| 8. Efficiency as employee / standard of work | | |
| 9. Neatness | | |
| 10. Proficiency | | |

**SECTION 4: TO BE COMPLETED BY MENTOR/SUPERVISOR**

| Remarks on the student's professional growth and development |
|---|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

**FINAL MARK**: ……%

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 Category** | | |
| **ECSA Reg. No.** | | **Official Stamp** |

**SECTION 5: UNIVERSITY USE ONLY (TO BE COMPLETED BY WIL COORDINATOR)**

**EVALUATION BY MENTOR:** **…….%**

**EVALUATION BY DEPARTMENT:** **…….%**

| REMARKS: |
| --- |
| |
| |
| |
| |
| |

**FINAL MARK (MODERATED):** **…….%**

_____ _____

**WIL COORDINATOR** **DATE**

**(ECSA Reg:_____)**

_____ _____

**MODERATOR** **DATE**

**(ECSA Reg:_____)**

# APPENDIX G: GRADUATE ATTRIBUTES ASSESSED IN DIP IE

**NOTE: All assessments where a Graduate attribute is assessed is given a subminimum of 50%. A student cannot pass the module if the GA assessment linked to that module is not found competent (Competent = 50%).**

| | |
|---|---|
| **Graduate Attribute 1: Problem-solving**<br>***Learning outcome:*** Apply engineering principles to systematically diagnose and solve *well-defined* engineering problems. | |
| **●Where is outcome assessed?** | This GA is assessed in an assignment with direct relation to a workplace scenario for **EBEWS2A** (Engineering Work Study 2). |
| **●How is this outcome assessed?** | In the assignment, the student is required to do processes, charts, layouts, apply correct work measurement techniques etc., then analyse the results and come up with improvements in line with most of the learning outcomes completed in the module. |
| **●What is satisfactory performance?** | Students should demonstrate the ability to diagnose and solve well-defined engineering problems by applying practical industrial engineering knowledge underpinned by relevant theories. This may be evidenced by student ability to demonstrate that:<br>• The problem is analysed and defined, and criteria are identified for an acceptable solution;<br>• Relevant information and engineering knowledge and skills are identified and used for solving the problem.<br>• Various approaches are considered and formulated that would lead to workable solutions.<br>• Solutions are modelled and analysed.<br>• Solutions are evaluated, and the best solution is selected; and<br>• The solution is formulated and presented in an appropriate form.<br>Students should achieve a minimum of 50% when this graduate attribute is assessed. |
| **●What is the consequence of unsatisfactory performance?** | If the student fails to obtain the minimum of 50% in the assignment during the semester, he or she will be granted another chance to redo/resubmit the assignment. If the student still does not obtain 50%, then the student will have to repeat the subject. |
| **Graduate Attribute 2: Application of scientific and engineering knowledge**<br>***Learning outcome:*** Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve *well-defined* engineering problems. | |
| **●Where is outcome assessed?** | In selected tasks in the semester assignment of **EBQAS2A** module. Mainly application and use of advanced Excel and related tools to solve engineering problems. |
| **●How is this outcome assessed?** | Learners are given well-defined GA2 assignment tasks or problems to solve using practical measurements, Excel and related tools. Marks are obtained against memorandum and associated GA2 marking rubric. |

| | |
|---|---|
| **●What is satisfactory performance?** | More than 50% for the semester assignment, according to the marking rubric. |
| **●What is the consequence of unsatisfactory performance?** | If the student fails to obtain the minimum of 50% in the semester assignment during the semester, he or she will be granted another chance to redo/resubmit the assignment, but he/she can then only obtain a maximum of 50%. If the student does not obtain 50%, then the student has to repeat the subject. |
| **Graduate Attribute 3: Engineering Design**<br>***Learning outcome:*** Perform procedural design of components, systems, works, products or processes to meet requirements, normally within applicable standards, codes of practice and legislation. | |
| **●Where is outcome assessed?** | This Graduate attribute is assessed in the module Facility Layout and Material Handling 2 **(EBFLA2A)** in a documented report on assigned tasks on engineering design and tests. |
| **●How is this outcome assessed?** | If the student fails to obtain the minimum of 50% in the semester assignment during the semester, he or she will be granted another chance to redo/resubmit the assignment, but he/she can then only obtain a maximum of 50%. If the student does not obtain 50%, then the student has to repeat the subject. |
| **●What is satisfactory performance?** | The student should demonstrate the ability to engineering design procedures (the right sequences of steps) needed in the design of components, systems, works, products or processes to meet requirements, normally within applicable standards, codes of practice and legislation.<br><br>The design may have the following characteristics-:<br>• The design problem may be well formulated to satisfy user needs, applicable standards, codes of practice and legislation.<br>• The design process is planned and managed to focus on important issues and recognises and deals with constraints.<br>• Knowledge, information, and resources may be acquired and evaluated in order to apply appropriate principles and design tools to provide a workable solution.<br>• Design tasks may be performed that includes analysis and optimisation of the product, or system or process, subject to relevant premises, assumptions, and constraints.<br>• Alternatives may be evaluated for implementation, and a preferred solution is selected based on techno-economic analysis and judgement.<br>• The design logic and relevant information are communicated in a technical report.<br>• Procedures may be applied to evaluate the selected design and assessed in terms of the impact and benefits.<br>• Students should achieve above average when this graduate attribute is assessed. |

| | |
|---|---|
| **●What is the consequence of unsatisfactory performance?** | Meeting this requirement in the assessed task is compulsory.<br>The student is offered the opportunity to repeat the assessment where an attribute is tested, and if the student fails again, then the student has to repeat the module. |
| **Graduate Attribute 4: Investigations, experiments and data analysis**<br>***Learning outcome:*** Conduct investigations of *well-defined* problems through locating and searching relevant codes and catalogues, conducting standard tests, experiments and measurements. | |
| **●Where is outcome assessed?** | This graduate attribute is assessed in the module Automation 3 **(EBAUT1A)** in an assessment that is based on the related subject matter. This includes both the practical, which assesses the experimentation and data analysis aspects, as well as the assignment, which assesses the investigation aspects. |
| **●How is this outcome assessed?** | The outcome will be assessed using an assessment rubric, using prescribed criteria relevant to the graduate attribute. |
| **●What is satisfactory performance?** | Learners must achieve a mark of at least 50 % when this graduate attribute is assessed in the Practical as well as the assignment. Students must demonstrate that they are capable of investigating a given automation problem, sourcing information from literature and collating the information into a coherent automation design. Students must also demonstrate that they are able to conduct data collection and interpretation in the practical session and to report on the outcome. |
| **●What is the consequence of unsatisfactory performance?** | The learner is offered the opportunity to repeat the assignment or practical that he/she has failed, and if the learner fails again, then the learner is required to repeat the module. |
| **Graduate Attribute 5: Engineering methods, skills and tools, including Information Technology**<br>***Learning outcome:*** 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. | |
| **●Where is outcome assessed?** | The outcome is assessed in the GA5 computer assignment in the module Operations Research 3 **(EBORE3A),** which is done during the semester. Students use Excel solver or related software to solve complex linear programming/integer programming/transportation models etc. |
| **●How is this outcome assessed?** | Learners are given well-defined but complex engineering problems, such as linear programming, integer programming, transportation problems etc., to solve using Excel solver or related software. Marks are obtained against memorandum and associated GA5 marking rubric. |
| **●What is satisfactory performance?** | Learners should earn more than 50% according to the marking rubric. |
| **●What is the consequence of unsatisfactory performance?** | If the student fails to obtain the minimum of 50%, he or she will be granted another chance to redo and resubmit the assignment, but he/she can then only obtain a maximum of 50%. If the student does not obtain 50%, then the student has to repeat the subject. |

| | |
|---|---|
| **Graduate Attribute 6: Professional and technical communication**<br>***Learning outcome:*** Communicate effectively, both orally and in writing, within an engineering context. | |
| **●Where is outcome assessed?** | Formative assessment is done in a research assignment on the related subject matter of **EBIAC3A.** |
| **●How is this outcome assessed?** | Learners will be given a research assignment which might include a case study report and a presentation explaining the study to their peers. The final report and the exhibition will be assessed using a custom rubric to determine the understanding of appropriate behaviour and awareness of the importance of the principles of accounting. |
| **●What is satisfactory performance?** | The department expects learners to demonstrate the:<br>• An understanding of the nature and complexity of the accounting problems in terms of required practices, tools and techniques.<br>• Judgements in decision making, during problem-solving and design, is limited to the area of current competence and responsibility and should be ethical; and<br>• Ability to explain a problem and the solution thereof to a group of their peers in an oral presentation.<br>Learners should achieve at least 50% when this graduate attribute is assessed in the summative assessment (Assignment). |
| **●What is the consequence of unsatisfactory performance?** | If the student fails to obtain the minimum of 50%, he or she will be granted another chance to redo and resubmit the assignment, but he/she can then only obtain a maximum of 50%. If the student does not obtain 50%, then the student has to repeat the subject. |
| **Graduate Attribute 7: Impact of Engineering activity**<br>***Learning outcome:*** Demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by defined procedures. | |
| **●Where is outcome assessed?** | Formative assessment is done in an assignment on the related subject matter of **EBILE3A.** |
| **●How is this outcome assessed?** | Learners will be given a research assignment that might include a case study. The final report will be assessed using a custom rubric to determine the understanding of appropriate behaviour and awareness of the importance of the principles of management. |
| **●What is satisfactory performance?** | The department expects learners to demonstrate the:<br>• Understanding of nature and complexity of the management problem/ issues in the research assignment in terms of required practices, tools and techniques.<br>• Judgements in decision making during problem-solving and design are ethical and within acceptable boundaries of current competence; and<br>• Decision making is limited to the area of current competence and responsibility.<br>Learners should achieve at least 50% when this graduate attribute is assessed in the summative assessment (Assignment). |

| | |
|---|---|
| **●What is the consequence of unsatisfactory performance?** | The learner is offered the opportunity to repeat the assessment where the attribute is tested, and if the learner fails again, then the learner will have to repeat the module. |
| **Graduate Attribute 8: Individual, team and multidisciplinary working**<br>***Learning outcome:*** Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work as a member and leader in a team and to manage projects. | |
| **●Where is the outcome assessed?** | This student is assessed in an assignment on engineering management principles, as well as a Business Plan Reports for **EBEWS3A** (Engineering Work Study 3). |
| **●How is this outcome assessed?** | A student individually does the engineering management principles assignment, which is assessed to determine satisfactory performance for this competency indicator.<br>A student forms a team with fellow students to undertake a business plan project. The business is planned with set objectives, organised with identifying and assigning tasks amongst the members of the team who set leadership examples by taking charge of different aspects of the business plan. Control is achieved through remedial action to the set objectives for the business plan project. Individual aspects and the complete team project report are assessed to determine satisfactory performance for the other competency indicators. |
| **●What is satisfactory performance?** | The individual engineering management principles assignment must be at least good, with at least 50%.<br>The individual contributions by a member to the output of the team must be at least good, evidenced by a score of at least 50% in all the parts done as a leader for the team. The overall team business plan report must be at least good, evidenced with a minimum score of 50% to qualify the project as being professionally managed. |
| **●What is the consequence of unsatisfactory performance?** | If any of the above criteria are not met, then the individual engineering management principles assignment or/and the relevant portions of the business plan not having a score of at least 50% are given at least another opportunity to be redone and improved. If any of the above criteria is still not met, then the module is failed and has to be retaken. |
| **Graduate Attribute 9: Independent learning ability**<br>***Learning outcome:*** Engage in independent and life-long learning through well-developed learning skills. | |
| **●Where is outcome assessed?** | This graduate Attribute is assessed from a report on assigned tasks from the module Facility Layout and Materials Handling **(EBFLA2A)** |
| **●How is this outcome assessed?** | This graduate attribute is assessed in the form of assignments and documented investigation/research/project. |
| **●What is satisfactory performance?** | The department expects that:<br>• Learning tasks are identified, planned, and managed.<br>• The requirement for independent learning is identified/ recognised, and demonstrated.<br>• Relevant information is sourced, organised, and evaluated.<br>• Knowledge acquired outside of formal instruction is comprehended and applied.<br>• Awareness is displayed of the need to maintain continued competence through keeping abreast of up-to-date tools |

| | |
|---|---|
| | and techniques available in the workplace.<br>Students should achieve above average when this graduate attribute is assessed. |
| **●What is the consequence of unsatisfactory performance?** | If any of the above criteria are not met, then the individual engineering management principles assignment or/and the relevant portions of the business plan not having a score of at least 50% are given at least another opportunity to be redone and improved. If any of the above criteria is still not met, then the module is failed and has to be retaken. |
| **Graduate Attribute 10: Engineering Professionalism**<br>***Learning outcome:*** Understand and commit to professional ethics, responsibilities and norms of engineering technical practice. | |
| **●Where is outcome assessed?** | Formative assessment is done in a research assignment on the related subject matter of **EBSPA1A.** |
| **●How is this outcome assessed?** | Learners will be given a research assignment that might include a case study to assess the development of graduate attribute 10. The final report will be assessed using a custom rubric to determine the understanding of appropriate behaviour and awareness of the importance of the principles of personal and workplace health and safety. |
| **●What is satisfactory performance?** | The department expects learners to demonstrate:<br>• Understanding of the nature and complexity of ethical dilemmas, described in terms of required practices, legislation, and limitations of authority.<br>• The ethical implications of engineering decisions are described in terms of the impact on the environment, the business, costs and trustworthiness.<br>• Judgements in decision making during problem-solving and design are ethical and within acceptable boundaries of current competence; and<br>• Decision making is limited to the area of current competence and responsibility.<br>Learners should achieve a subminimum of 50% when this graduate attribute is assessed in the research assignment. |
| **●What is the consequence of unsatisfactory performance?** | The learner is offered the opportunity to repeat the assessment where the attribute is assessed, and if the learner scores below 50% again, then the learner have to repeat the module. |
| **Graduate Attribute 11: Engineering Management (New GA from E-02-PN Rev No. 5: 01 September 2020** E-02-PN Qualification Standard for Diploma in Engineering NQF Level 6 20.pdf (ecsa.co.za))<br>***Learning outcome:*** Demonstrate knowledge and understanding of engineering management principles and economic decision-making. | |
| **●Where is outcome assessed?** | This Graduate Attribute is assessed in the module Industrial Leadership 3 **(EBILE3A)** in a report on workplace base assigned tasks |
| **●How is this outcome assessed?** | This graduate attribute may be assessed in the form of documented investigation/research/project. |
| **●What is satisfactory performance?** | The department expects that:<br>• Workplace base tasks are identified, planned and managed;<br>• The requirement for independent learning is identified/ recognised and demonstrated; |

| | |
|---|---|
| | • Relevant information is sourced, organised and evaluated;<br>• Knowledge acquired outside of formal instruction is comprehended and applied;<br>• Awareness is displayed of the need to maintain continued competence through keeping abreast of up-to-date tools and techniques available in the workplace.<br>Students should achieve a minimum of 50% when this graduate attribute is assessed. |
| **●What is the consequence of unsatisfactory performance?** | The learner can redo the assignment where the graduate attribute is tested, and if the learner fails again, then the learner has to repeat the module. The repeated assignment will only be marked to a maximum of 50% (competent). |
| **Graduate Attribute 12: Workplace Practices (GA 11 in E-02-PN Rev No. 4: 05 November 2019)**<br>***Learning outcome:*** Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved. | |
| **●Where is outcome assessed?** | This Graduate Attribute is assessed from a report on workplace base assigned tasks in the module Work Integrated Learning 1 **(EBWIL1A).** |
| **●How is this outcome assessed?** | This graduate attribute may be assessed in the form of documented investigation/research/project. |
| **●What is satisfactory performance?** | The department expects that:<br>• Workplace base tasks are identified, planned and managed;<br>• The requirement for independent learning is identified/ recognised and demonstrated;<br>• Relevant information is sourced, organised and evaluated;<br>• Knowledge acquired outside of formal instruction is comprehended and applied;<br>• Awareness is displayed of the need to maintain continued competence through keeping abreast of up-to-date tools and techniques available in the workplace.<br>Students should achieve a minimum of 50% when this graduate attribute is assessed |
| **●What is the consequence of unsatisfactory performance?** | The learner can redo the assignment where the graduate attribute is tested, and if the learner fails again, then the learner has to repeat the module. The repeated assignment will only be marked to a maximum of 50% (competent). |