



**Vaal University of Technology**  
**Faculty of Engineering and Technology**  
**Department Electronic Engineering**  
**VUT**  
**Learner Guide**

**Instructional offering:** Project IV

**Code:** EEPRJ4A

**Instructional programme:** Diploma: Engineering: Electrical

**Assessment:** Continues Workplace Based Learning

**Document revision:** 23/Nov/2018 **Advisory**

**committee approved:** 23/Nov/2018

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## 1 Word of welcome

The Department of Electronic Engineering welcomes you as a student to the Faculty of Engineering and Technology at the Vaal University of Technology.

The Vision of the Department is: To be a department that leads in innovative knowledge and quality technology education. The core values of this Department are:

- Integrity
- Honesty
- Punctuality
- Professionalism
- High academic standards
- Excellence
- Trust

|                        |   |   |
|------------------------|---|---|
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## 2 Philosophy of Teaching and Learning the subject Experiential Learning II

The nature of the learning process for Project IV must include but is not limited to the following:

In the workplace the students gain knowledge and understanding in a professional and social setting.

It is expected of the student to interact with the management, mentors, technicians and peers.

The student must also interact with the broader workplace community through attentive reading of workplace policy and documentation. Each student starts from an initial base of knowledge and experience gained from the previous semester's subjects in the focusing on the broader field of electronic engineering.

All students work from this point to build a more meaningful understanding of the practical application of previous subject matter and to enhance their ability to ask questions and find answers.

The student must learn how to deal with new situations with tough problems and unknown answers.

The following steps may guide the student in the learning process:

Articulate initial knowledge

Add to what is already known to refine and enrich it with the student's own efforts

Articulate and correct misconceptions

Make connections between different concepts as applied to the workplace

Realize the limitations of their own ideas when measure against workplace solutions.

Create and test well defined problems and ideas

Be concerned with the mental processes as well as the "answer"

Reflect on the way their conceptions are changing

Ask questions (what if, why, how..?)

The ideal learning environment must include but is not limited to:

Initial activities are accessible to everyone and come from common experiences in the workplace

The environment is both accepting and critical

Students are made to feel free to propose their own ideas without premature judgment

Students learn to support their ideas while interacting with management, mentors, technicians and peers

Conversations take place in which all students feel they can contribute

Ideas are illustrated and student interest engaged through demonstrations and experiments

An environment is created that fosters self-motivation among the students within the workplace

A variety of types of learning activities are used to meet the wide range of student needs Students must develop a sense of accomplishment and satisfaction within the workplace.

The responsibilities of management, mentors, and technicians must include but is not limited to:

Help students learn the language of the discipline

Explain goals and methods

Validate knowledge brought by each student

Create interest and generate curiosity

Encourage students to work hard

Communicate standards of judgment

Help students learn how to use language precisely

Act as a resource without directly answering every question

Provide time to puzzle, wonder, and struggle when permitted.

Provide fair criticism

Encourage collaboration

Teach the student to be an active listener and learner

Question students so they realize the process of seeking explanations is critically important

The responsibilities of students must include but is not limited to:

- Make use of initial knowledge
- Think freely guided by your workplace environment
- Engage in an active social process of testing and clarifying their understanding
- Develop the ability to work effectively and intensely
- Avoid premature judgment of themselves or others
- Ask questions
- Carefully consider the ideas of others
- Learn to think independently and take responsibility for their own actions
- Value others as useful colleagues
- Evaluate their own progress in an objective manner

### 3 Qualification information

|                              |   |
|------------------------------|---|
| <b>Name &amp; Code: DoE:</b> | Diploma: Engineering: Electrical<br>DI0823 & DE0823 |
| <b>NQF level:</b>            | 6   |

#### Rationale/Purpose of the qualification

The purpose of this qualification is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing electrical engineering technician.

Specifically, the qualification provides:

- A thorough grounding in mathematics, basic sciences, engineering sciences, engineering modelling, engineering design and the abilities to enable applications in fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced.
- Preparation for a career in electrical engineering itself and areas that potentially benefit from electrical engineering skills, for achieving technical proficiency and to make a contribution to the economy and national development.
- The educational base required for registration as a Professional Engineering Technician with ECSA.
- For graduates with an appropriate level of achievement, the ability to enter a BTech degree programme.

The electrical engineering technician completing this qualification will be competent and able to display the following learning outcomes:

- Solving well defined electrical engineering problems.
- Applying scientific and electrical engineering knowledge.
- Performing electrical engineering designs.
- Conduct investigations, experiments and collate data analysis.
- Using appropriate engineering methods, skills and tools.
- Communicating technical information in a professional manner.
- Demonstrating critical awareness of the impact of the engineering activity.
- Effectively working as an individual and in teams.
- Engaging in independent learning.
- Acting professionally and ethically at all times.
- Engaging in engineering practice via work integrated learning.

| Qualification knowledge profile        | Dip: Engineering: Electrical credits = 360 |
|--|--|
| Mathematical sciences                  | 35 minimum credits                         |
| Natural sciences                       | 28 minimum credits                         |
| Engineering sciences                   | 126 minimum credits                        |
| Engineering design                     | 28 minimum credits                         |
| Computing and IT                       | 21 minimum credits                         |
| Complementary studies / Ethical issues | 14 minimum credits                         |
| Work integrated learning               | 30 minimum credits                         |

#### 4 Module

|                      |             |         |
|----------------------|-------------|---------|
| <b>Name:</b>         | Project IV  | EEPRJ4A |
| <b>Prerequisite:</b> | 300 credits |         |

On successful completion of this subject the student will have basic knowledge, experience and understanding to:

Be able to identify an industrial problem and a possible solution

Be able to demonstrate the understanding of the basics of planning, design, testing and implementation.

Be able to conduct functionality determination of electrical, electronic or computer test equipment used in the specific field as practiced.

Be able to operate electrical, electronic or computer test equipment used in the specific field as practiced.

This unit links the work covered in the previous modules in a practical manner, for analysis and as practice.

#### Learning profile of the subject

| Assessment profile (Bloom analysis) |                          |                                     |          |           |            | Knowledge profile     |                |                      |                    |                  |  | Learning outcomes profile |   |                    |               |                        |                    |  |
|-------------------------------------|--------------------------|-------------------------------------|----------|-----------|------------|-----------------------|----------------|----------------------|--------------------|------------------|--|---------------------------|---|--------------------|---------------|------------------------|--------------------|--|
| Lower order skills                  |                          | Higher order skills                 |          |           |            | Mathematical sciences | Basic sciences | Engineering sciences | Engineering design | Computing and IT | Complementary studies / Ethical issues | Problem solving           | Application of scientific and engineering knowledge | Engineering Design | Communication | Engineering Management | Project Management | Application of Complementary Knowledge |
| Knowledge skills                    |                          | Cognitive intellectual skills       |          |           |            |                       |                |                      |                    |                  |  |                           |   |                    |               |                        |                    |  |
| Subject specific                    |                          | Generic                             |          |           |            |                       |                |                      |                    |                  |  |                           |   |                    |               |                        |                    |  |
| Knowledge Remember                  | Comprehension Understand | Application knowledge understanding | Analysis | Synthesis | Evaluation |                       |                |                      |                    |                  |  |                           |   |                    |               |                        |                    |  |
| 10%                                 | 25%                      | 35%                                 | 10%      | 5%        | 10%        | 5%                    | 5%             | 40%                  | 27%                | 20%              | 3%                                     | 45%                       | 35%   | 3%                 | 10%           | 2%                     | 2%                 | 3%                                     |
| 100%                                |                          |                                     |          |           |            | 100%                  |                |                      |                    |                  |  | 100%                      |   |                    |               |                        |                    |  |

## 5 Assessment

Assessment takes place on a continuous basis by means of a variety of methods and should include the following:

- Active participation in discussions
- Progress Report (Annexure A)
- Final Report (Annexure B)

### Summary

| Assessment   | Dates   | Hours | Final mark |
|--------------|---------|-------|------------|
| Final Report | Week 20 | 56    | 100%       |

## 6 Learning Activities

When you active involved with Project IV you should:

- Understand what is expected of each training section you undertake in the workplace to provide a solution to a problem.
- Ensure that you attain the outcome for each training section you undertake in the workplace since you must be declared competent in order to receive the credit for the subject.
- Do all learning activities (exercises) as outlined by your mentor to provide a possible solution to a problem.
- Be well prepared for all work activities and report for work on time.
- Successful completion of each activity stipulated by your mentor is compulsory.
- Submit the final report fully completed and signed off by the mentor and/or manager, on time.

## 7 Time schedule / Semester planner

You must make sure that you adhere to all dates of all learning activities in the workplace environment

This is a scheduler for your use to ensure punctuality.

| Week | Activity   |
|------|--|
| 6    | 7.2 Complete Progress Report and submit to Co-operative education at VUT Vanderbijlpark Campus |
| 20   | 7.3 Complete Final Report and submit to Co-operative education at VUT Vanderbijlpark Campus    |



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**Annexure A**

**Progress Report**

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## GENERAL INFORMATION - PROGRESS REPORT **WPBL (EEPRJ4A)**

|  |  |   |
|--|--|---|
| <b>STUDENT NUMBER:</b><br><br>INITIALS & SURNAME:<br><br>ID NUMBER:<br><br>E-MAIL:<br><br>TELEPHONE (WORK):  |  | <b>STUDENT'S POSTAL ADDRESS:</b><br><br><br><br><br><br>CELL PHONE:   |
| <b>COMPANY NAME:</b><br><br>DIVISION:<br><br>TRAINING SITE/STREET ADDRESS:   |  | NUMBER OF EMPLOYEES:<br><br>NUMBER OF STUDENTS IN TRAINING:<br><br>NUMBER OF ECSA REGISTERED STAFF:<br><br>COMPANY'S SPECIALIZATION FIELD OR PRODUCTS |
| <b>MENTOR INITIALS &amp; SURNAME:</b><br><br>E-MAIL:   |  | ACCREDITED ASSESSOR: <span style="float: right;">Y / N</span><br><br>CELL OR TELEPHONE:   |
| <b>WPBL PROGRESS REPORT START DATE:</b>  |  | END DATE :  |
| <b>VUT OFFICE USE :</b> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <span><i>ACCEPTED</i> <input type="checkbox"/></span> <span><i>DECLINED</i> <input type="checkbox"/></span> </div> |  |   |

**PROGRESSION WRT PROJECT**

Problem Outline:

Approach:

Budget:

**PROGRESS WRT INVESTIGATION POSSIBLE SOLUTIONS**

Equipment identified:

Measuring methods identified:

Data analysis methods identified:





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**Annexure B**

**Final Report**

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**MENTOR'S DECLARATION - FINAL REPORT WPBL (EEPRJ4A)**

|   |                                   |   |
|---|-----------------------------------|---|
| <b>STUDENT</b>  | <b>INITIALS AND SURNAME :</b>     |   |
|   | <b>VUT - STUDENT NUMBER :</b>     |   |
|   | <b>ID NUMBER :</b>                |   |
| <b>COMPANY :</b>  |                                   |   |
| <b>TRAINING PERIOD</b>  | <b>WPBL :</b>                     | <i>START DATE:</i><br><i>COMPLETION DATE:</i> |
| <b>MENTOR</b>   | <b>INITIALS AND SURNAME :</b>     |   |
|   | <b>CELL OR TELEPHONE NUMBER :</b> |   |
|   | <b>E-MAIL:</b>                    |   |
| <b>ASSESSMENT</b>   | <b>MENTOR ASSIGNED MARK</b>       | <b>%</b>                                      |
| <p><b>MENTOR DECLARATION</b></p> <p>I, the above-mentioned mentor, declare that the above-mentioned student has completed the workplace based learning component (WPBL) of the qualification in the mentioned period under my supervision.</p> <p>The student was found competent in the outcomes as specified in the assessment report.</p> <p>The mark indicated above may be awarded to the student as the final result for work integrated learning WPBL.</p> <p><i>Signature</i> _____ <i>Date</i> _____</p> |                                   |   |
| <b>VUT OFFICIAL</b>   | <b>FINAL MARK:</b>                | <b>%</b>                                      |

ASSESSMENT: FINAL REPORT WPBL EEPRJ4A

SYLLABUS: ELECTRONIC ENGINEERING

UNIT GUIDE

**F= Fundamental (Compulsory)**  
**C= Core (Compulsory for specialization field)**  
**E= Elective (Choice)**

|                |  |  |  | ASSESSORS USE |          |           |
|----------------|--|--|--|---------------|----------|-----------|
| PROJECT        |  |  |  | START DATE    | END DATE | SIGNATURE |
| <b>Unit 11</b> | Industrial project   |  |  | <b>F</b>      |          |           |
|                | Documentation  |  |  | <b>F</b>      |          |           |
|                | After completion of this unit the student should be able to do the following: <ul style="list-style-type: none"> <li>• Use of project management tools.</li> <li>• Successful completion of a project.</li> <li>• Submit project report for assessment.</li> </ul> |  |  |               |          |           |

| Student name:                   |  | Student Number: | Date:          |                |
|---------------------------------|--|-----------------|----------------|----------------|
|                                 |  |                 | <b>Maximum</b> | <b>Awarded</b> |
| Background                      | Realistic and indicate the change required.          |                 | 3              |                |
| Problem statement               | Clear, precise and relevant.                         |                 | 3              |                |
| User requirements               | Are they relevant, measurable and prioritized        |                 | 3              |                |
| Concept study                   | Are the solutions relevant and clearly explained     |                 | 3              |                |
| Decision matrix                 | Was the requirements used. Is the data realistic     |                 | 3              |                |
| Best solution selected          | Is it clear from the matrix and motivated            |                 | 3              |                |
|                                 |  |                 | <b>Maximum</b> | <b>Awarded</b> |
| Design                          | Circuit neat and correct                             |                 | 3              |                |
|                                 | Component values calculated                          |                 | 3              |                |
|                                 | Practical values used                                |                 | 1              |                |
| Test plan                       | Test procedures listed                               |                 | 3              |                |
|                                 | Will the test, measure all values correctly          |                 | 3              |                |
|                                 |  |                 | <b>Maximum</b> | <b>Awarded</b> |
| Product construction            | Neat wiring and component placing                    |                 | 3              |                |
|                                 | Has photo graphic evidence of solution been provided |                 | 3              |                |
|                                 | Input/Output/Connections clearly marked              |                 | 3              |                |
| Testing                         | Test results noted                                   |                 | 3              |                |
|                                 | Results compared to requirements                     |                 | 3              |                |
|                                 | Deviations explained                                 |                 | 3              |                |
| Problems encountered            | Problems clearly explained                           |                 | 3              |                |
|                                 | Solutions clearly explained                          |                 | 3              |                |
|                                 | Solutions correctly implemented                      |                 | 3              |                |
| Result discussion               | Successful implementation                            |                 | 3              |                |
|                                 | Deviations explained (requirements, Cost, Plan)      |                 | 3              |                |
|                                 |  |                 | <b>Maximum</b> | <b>Awarded</b> |
| Title page                      | Complete and correct.                                |                 | 1              |                |
| Management summary              | Is it a true reflection of the project               |                 | 3              |                |
| Index                           | Complete and correct.                                |                 | 1              |                |
| Report structure                | Is the layout correct                                |                 | 2              |                |
| Fonts                           | Same font and consistent sizing                      |                 | 1              |                |
| Paragraphs                      | Justified  |                 | 1              |                |
| Numbering                       | Paragraphs, sketches and tables                      |                 | 1              |                |
| References                      | Correct and complete (website URL and date)          |                 | 1              |                |
| <b>Project Total</b>            |  |                 | <b>75</b>      |                |
| <b>Final Project Percentage</b> |  |                 | <b>%</b>       |                |
| <b>Remarks:</b>                 |  |                 |                |                |

## Annexure C - Notes

### Prioritization

Various ways of prioritizing different actions or needs are available. One such way is to use the SUR method. This method considers the following:

S – Seriousness. This reflects the need for modification and the impact if it is not considered. A value of 10 is critical and a value of 0 indicates that change is not really required.

U – Urgency. This is a measure of how quickly action should be taken. A value of 10 indicates a high need for change and a value of 0 that the change can be done later.

R – Reaction. This is a measure of what will happen if no action is taken. A value of 5 is used if the problem will not change. A value of 6 to 10 show that the problem will become worse and a figure of 4 to 0 that it will actually improve if no action is taken.

The values are added to give a total between 0 and 30. This will be the priority order. For items with the same value, the one with the highest Seriousness is placed first. If this is still the same then the one with the highest Urgency is placed first. A prioritization table can be used as follows:

| Task                            | Seriousness | Urgency | Reaction | Total | Order |
|---------------------------------|-------------|---------|----------|-------|-------|
| Modification to Pressure system | 7           | 3       | 5        | 15    | 2     |
| New controller                  | 4           | 6       | 7        | 17    | 1     |
| Monitoring system               | 5           | 3       | 6        | 14    | 3     |
| Extension to Plant B            | 2           | 5       | 5        | 12    | 5     |
| More Network memory             | 6           | 2       | 6        | 14    | 4     |

Selecting a solution.

People quite often have a preference for a particular solution to a problem but it is not necessarily the best solution. To be able to make the correct decision you can use a decision matrix. This is used to select between various options. The original reasons for change will lead to certain criteria that the modification should conform to. These criteria is prioritized (can be done using the SUR method) and listed. Each one is assigned a weight (value relative to the others). If the SUR method of prioritization was used this total can be used as the weight otherwise a value out of 100 is assigned with the most important requirement (or must have requirements) being assigned a value of 100 and the other requirements assigned lower values reflecting the importance of the requirement.

The options are then evaluated and if it will perform totally to the set requirements a value of 100% is assigned. If it does not meet the requirement at all, a value of 0% is assigned. These values are multiplied by the weight and then added. The option with the highest value is the option that will best address the original problem.

A typical decision matrix is as follows:

| Criteria | Weight<br>(SUR/100) | (Option 1) |               | (Option 2) |               | (Option 3) |               | Rem |
|----------|---------------------|------------|---------------|------------|---------------|------------|---------------|-----|
|          |                     | Score      | Weighed Score | Score      | Weighed Score | Score      | Weighed Score |     |
| (Req1)   | 22                  | 80%        | 17,60         | 70%        | 15,40         | 90%        | 19,80         | Req |
| (Req2)   | 17                  | 20%        | 3,40          | 40%        | 6,80          | 65%        | 11,05         | Req |
| (Req3)   | 15                  | 70%        | 10,50         | 20%        | 3,00          | 10%        | 1,50          | NTH |
|          | Totals              |            | 31,50         |            | 25,20         |            | 32,35         |     |

Remarks can be any of the following:

Req – Required, NTH – Nice to Have, NE – Not Essential, DQ – if present, disqualify this option

All information in the table shown in brackets must be replaced by the actual values. For example instead of (Option 1) it should be “Buy product ABC” and instead of (Requirement 1) it should be “Operational pressure not to exceed 2300 kPa”

The Weight of a criterion can be handled in two different ways:

Method 1 is to use the results of the SUR as in the example above.

Method 2 is used if no prioritization was done. In this case the importance (to the user) is considered and the most important criterion is given a Weight of 100. The least important criterion is given the lowest value and all others are given values between the lowest value and 100 according to the relevant importance of each one.

After this each option is evaluated against the requirements and a percentage (%) score is allocated. If the option will fully address the specific requirement a score of 100% is given and if it will not do it at all a score of 0% is given. Anything in between (will meet the requirement to certain extend but not in total) a percentage match is allocated.

The Process is repeated for each option. A good idea is to consider each requirement for all options. You can then determine which of the options address the requirement best (highest %) and which option will do it the least (lowest %). Different options can address the same requirement to the same extent.

After this the Weighted Scores are found by  $\text{Weight} \times \text{Score}$ .

The last step is to add the Weighted Scores for each option. The best option to proceed with will be the one with the highest total score.

This indicates that "Option 3" should be the best solution.

One of the criteria should always be the cost. Options above the budget cost will be rejected before the table is compiled or the user should be informed for adjustment to the budget. The lowest cost option will be assigned 100%. (Cost = man-hours + equipment).

In some cases you may decide not to use the highest score option for certain practical reasons. In all cases, using the highest one or not, the selected option must be indicated and a short reason/motivation given why this option will be used for the design.