VAAL UNIVERSITY OF TECHNOLOGY

Inspiring thought. Shaping talent.

STUDY GUIDE

Faculty	Engineering and Technology
Department	Electrical Engineering: Electronics
Course	Diploma in Engineering
Title	Engineering Project IV – EEPRJ4A
Compiled By	RM Schoeman
Year	2021
NQF Level	6
Credits	30

Instructional offering: Engineering Project IV

Code: EEPRJ4A

Instructional programme: Diploma: Engineering: Electrical

Assessment: Continues Workplace Based Learning

Document revision: 01/Nov/2021

Advisory committee approved: 23/Nov/2018

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1 Word of welcome

The Department of Electrical Engineering – Electronics 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 and Trust

Compiled by	Mr R.M. Schoeman	
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Revision dates	Document revision Advisory committee approved	01/Nov/2021 23/Nov/2018

2 General requirements

- It is the responsibility of the student to register for WBL before training commences.
  Registration may only occur once all modules required credits has been achieved.
- The student should simultaneously register for EEEXC1A, EEEXC2A and EEPRJ4A, which are the three components of the workplace based learning.
- The registration, completion and submission of reports must be done according to the guidelines.
- An accredited assessor, appointed by industry, will do the assessment of each relevant topic. This assessor must have a qualification that is equal to or higher than the qualification being assessed.
- The student must do the training under the supervision of a mentor, which could also be the assessor if the mentor has the necessary qualifications.
- A VUT accredited staff member will act as examiner.
- The assessor must complete and sign all required assessors reports before submission to VUT.
- If the mentor or assessor needs any assistance feel free to contact the coordinator at VUT (see top of page) .
- To fulfil the requirements of the Diploma: Electrical Engineering, the student must successfully complete all academic requirements, as well as the three Workplace Based Learning components.
- Topics that are not included in the list of topics in this document, but are required by the training company should be added using the Other Topics under unit 7 of the final reports evaluation rubric. Add as many topics as needed.
- Graduate attribute 12 (GA 12) must be covered in this module as part of the requirements of the Engineering Counsel of South Africa (ECSA).

3 Philosophy of Teaching and Learning the subject Project IV

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

4 Module

Name:	Engineering Project IV	EEPRJ4A
Prerequisite:	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.

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)

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	Complete Progress Report and submit to Co-operative education at VUT Vanderbijlpark Campus
20	Complete Final Report and submit to Co-operative education at VUT Vanderbijlpark Campus

Vaal University of Technology

Faculty of Engineering and Technology

Department Electrical Engineering - Electronics

VUT

Annexure A

Progress Report

Instructional offering: Engineering Project IV

Code: EEPRJ4A

Instructional programme: Diploma: Engineering: Electrical

Assessment: Continues Workplace Based Learning

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

STUDENT NUMBER:		**STUDENT'S** POSTAL ADDRESS:
INITIALS & SURNAME:		
ID NUMBER:		
E-MAIL:		
TELEPHONE (WORK):		CELL PHONE:
COMPANY NAME:		NUMBER OF EMPLOYEES:
DIVISION:		NUMBER OF STUDENTS IN TRAINING:
TRAINING SITE/STREET ADDRESS:		NUMBER OF ECSA REGISTERED STAFF:
		COMPANY'S SPECIALIZATION FIELD OR PRODUCTS
MENTOR INITIALS & SURNAME:		ACCREDITED ASSESSOR: Y / N
E-MAIL:		CELL OR TELEPHONE:
WPBL PROGRESS REPORT START DATE:		END DATE :

VUT OFFICE USE : *ACCEPTED* □ *DECLINED* □

PROGRESSION WRT PROJECT

Problem Outline:

Approach:

Budget:

PROGRESS WRT INVESTIGATION POSSIBLE SOLUTIONS

Equipment identified:

Measuring methods identified:

Data analysis methods identified:

PERSONAL GROWTH

The following is a summary of what I have learned during the past three months in the units that I have completed.

WPBL (EEPRJ4A) Progress report compiled by:		
Students signature	*Initials & Surname*	*Date*
WPBL (EEPRJ4A) Progress report WPBL certified as correct:		
Mentor's signature	*Initials & Surname*	*Date*

Vaal University of Technology

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Annexure B

Final Report

Instructional offering: Engineering Project IV

Code: EEPRJ4A

Instructional programme: Diploma: Engineering: Electrical

Assessment: Continues Workplace Based Learning

MENTOR'S DECLARATION - FINAL REPORT WPBL (EEPRJ4A)

STUDENT	**INITIALS AND SURNAME :**	
	VUT - STUDENT NUMBER :	
	ID NUMBER :	
	COMPANY :	
TRAINING PERIOD	**WPBL :**	***START DATE:*** ***COMPLETION DATE:***
MENTOR	**INITIALS AND SURNAME :**	
	CELL OR TELEPHONE NUMBER :	
	E-MAIL:	
ASSESSMENT	**MENTOR ASSIGNED MARK**	**%**

MENTOR DECLARATION

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.

The student was found competent in the outcomes as specified in the assessment report.

The mark indicated above may be awarded to the student as the final result for work integrated learning WPBL.

Mentor Signature *Mentor Initials & Surname* *Date*

VUT OFFICIAL	**VUT OFFICIAL FINAL MARK:**	**%**

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
Unit 11	Industrial project	**F**			
	Documentation	**F**			
	After completion of this unit the student should be able to do the following: • Use of project management tools. • Successful completion of a project. • Submit project report for assessment.				

Student name:		**Student Number:**	**Date:**	
			Maximum	**Awarded**
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	
			Maximum	**Awarded**
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	
			Maximum	**Awarded**
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	
			Maximum	**Awarded**
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	
		Project Total	**75**	
		Final Project Percentage	**%**	
Graduate Attribute Have the student achieved all the outcomes mentioned wrt problem solution design and using entering methods and principals to achieve graduate attribute 12 of the ECSA stipulations			**YES**	**NO**
Remarks:				

Evaluation guideline

This guideline can be used by the assessor to do student project evaluation.

Rating	Theoretical knowledge	Application of theory	Use of: advanced tools / measuring equipment	Skills integration / Competencies gained	Working speed	Accuracy	Interpersonal relations	Diligence motivation
1 **0-19%**	Has little knowledge	Cannot apply any theory	Cannot use advanced equipment	Has not integrated any skills	Very slow and do not successfully complete any tasks	Never accurate	Does not get along with any staff	Does nothing unless instructed
2 **20-39%**	Can recall some basic knowledge	Can apply some theory with assistance	Can use advanced equipment with assistance	Has integrated some documented skills	Never complete tasks successfully on time	Has to redo and then sometimes accurate	Can interact positively with most of the staff	Does just enough to keep out of trouble
3 **40-59%**	Knows the basic minimum	Can apply the basic minimum theory	Can use advanced equipment to do the basic minimum	Has integrated the basic minimum documented skills	Just complete tasks successfully on time	Just meets the minimum specifications	Interact positively with all the staff	Does the minimum expected
4 **60-79%**	Good knowledge	Can apply high level theory	Can select and use advanced equipment independently	Effectively integrate skills as needed in practical applications	Normally complete all tasks successfully before/on time	Work is always better than minimum expected	Is accepted by the staff as somebody with good personal skills	Normally looks for over and above work to do
5 **80-100%**	Excellent knowledge	Can analyse and synthesize	Optimally select and use advanced equipment	Innovatively integrate all theoretical and practical skills to solve problems	Always complete all tasks successfully before time	Work is always excellent.	Uses personality to positively influence other staff	Ambitious and eager to prove talents beyond requirements

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 (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 extend.

After this the Weighted Scores are found by Weight x 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.