St peace College / dhet

Assessment career job :

-application name : tshingombe tshitadi

Permit award :

N diploma certificate n saqa permit award :

Evaluation saqa vocational framework qualification nqf :

1.TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING LECTURER LEARNING WORK-INTEGRATED LEARNING:

Assessment in order

College and institute;

College and institute engineering school business study

College and institute police school, integrity

Institution accreditation seta sasseta police merest /

Integration report annual case book order public library theory relate trade theory and report trade theory in report annual city power trade theory bibliotheca city power tendered report annual , report mission company industrial trade theoretical ,

In order practical trade workshop lab city workplace training artisan relate orientation industrial

Overview vision mission focused company city municipality government industrial

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College and institute ;

College and institut engineering school business studie

College and institut police school, integrity

Institution accreditation seta sasseta police merseta /

Integration report annual case book order public libraries theory relate trade theory and report trade theory in report annual city power trade theory bibliotheca city power tendered report annual , report mission company industrial trade theoretical ,

In order practical trade workshop lab city workplace training artisan relate orientation industrial

Overview vision mission focused company city municipality government industrial

Company mission college non profit company design relate case conciliation practical Manuel . mission join contractor company force , mission trade industrial profit target product money market , vision

Overview mission meeting mission city power meeting Eskom career ,,department trade in theoretical practical libraries bibliotheca

2..Learning Management System Acceptance Factors for Technical and Vocational Education Training (TVET) college and Institutions graduation

2. 1Design work base methodology research / criteria requirement	Yes	Not
1.Higher education institutions use dhet Learning Management System (LMS) to support and enhance the teaching and learning process. However, teaching and learning activities at Technical and Vocational Education and Training (TVET) institutions differ from non-TVET institutions, so the LMS is believed to be underutilized. This paper aims to investigate why LMS use in TVET is different from the non-TVET institutions. Additionally, this paper seeks to discover important factors that can help improve the acceptance of LMS at TVET institutions. Important factors are identified from a literature review study published tvet dhet sasseta . Seven domain experts in LMS at TVET institutions were interviewed for their opinions on the initial list of factors and performed the content validity assessment seta . merseta , sasseta ceta , hseta ,agri seta, edpseta, **factors are System Quality,** **Service Quality, Information Quality saqa framework body insurance** **Qcto : Motivation, Self-Discipline, Practical Training, Intention to Use, User Satisfaction and Actual Use. This study also reveals new factors that can increase the acceptance of** **LMS in teaching and learning in TVET institutions** **This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 4.0** **License** **2. developers, and LMS stakeholders in understanding the use of LMS at TVET institutions to ensure online TVET teaching and learning effectiveness.** **Keywords – acceptance factors, content validity, learning management system, Lawshe, technical and vocational education.** **1. Introduction** **Learning Management System (LMS) comprises tools for delivering, monitoring, and managing online** **training, teaching, and learning**		

3. LMS integrated with learning activities , it provides lecturers the ability to generate and distribute content, as well as evaluate and keep track of student progress . The history of LMS started after Web Based Learning platform was introduced after 15 years of the internet phenomenon created the world . Among the popular LMS are Moodle, Blackboard, Schoology, and Google Classroom. According to a study conducted by an independent **research body** **4. management system solutions, which is among the driving factors for LMS. Since the emergence of information and communication technology, the conventional teaching technique has dramatically changed []. New teaching approaches and practices that employ technology improvements have been carefully designed. This strategy allows students to be actively involved in creating an information society and enhance online learning at both conventional and technical institutional levels. LMS in TVET differs from traditional LMS as it transfers technical knowledge to its users]. LMS TVET refers to learning that involves psychomotor methods that provide exposure to students with technical skills . Therefore, LMS TVET emphasizes not only cognitive skills but also psychomotor skills.** **The use of LMS in TVET is an increasingly popular learning strategy. In addition, technology has changed learning styles and how people prefer to learn and improve the quality of their education. LMS is also a method of communication and discussion between students and lecturers at TVET institutions . Lecturers make LMS the critical venue for teaching and learning among students. However, a few issues have arisen with the utilization of LMS by lecturers and students in TVET. It is claimed that LMS is implausible, which makes this system relatively underutilized Statistics on the use of LMS by one of the TVET institutions in rsa /saqa show an inconsistent graph for five years (. LMS Usage in TVET Institution** **According to Dhanapal the challenges of online learning are problems related to compatibility, efficiency, language usage, and application features used. In addition, issues related to system, service and information quality are among many issues that have been discussed by previous researchers** **Users' perspectives on the LMS features are sometimes cited as part of the implementation's difficulties. a comprehensive competency analysis of the used system and staff competencies will improve the vocational institution's services. This study investigates the critical aspects of assuring the successful use of LMS in TVET institutions. Thus, this study identifies and validates LMS acceptance factors in TVET institutions based on expert views**		

and provides a conceptual factors approach for efficient LMS implementation.

The paper is organized as follows. The first section will describe the LMS, related works on LMS in TVET, and the theory and model underlying this study. The subsequent section discusses the study's methodology, followed by sections on the expert evaluation, findings, and discussion. The acquired results will be summarised at the end of this study.

2. Learning Management System

The development of educational technology has made online learning increasingly popular around the world. The ways and methods used in learning have also changed over time. Distance learning has encouraged various innovations and technologies to create an open and flexible learning environment , LMS is a web-based course management system that allows students to retrieve learning materials made available by lecturers through a web browser. The system comprises several basic facilities that control learning content and provide various communication tools to maximize the delivery and management of content. The transition in education from conventional to online learning allows access to learning materials and enables the lecturers to share with the students LMS allows students to engage more in their learning by using the forum as a conversation platform. Through forums, lecturers and students can have timed discussions with a chat function. This strategy facilitates information interchange, idea generation, and technical and vocational education feedback. More specifically, LMS allows teaching and learning on the same platform and in a self-managed time. The lecturers can evaluate students learning directly on the LMS platform. The LMS also allows collaboration between students, lecturers, and organizations to achieve educational objectives and increase teaching and learning quality.

2.1 LMS in TVET

TVET institutions or TVET training centers often educate students for training that combines theoretical knowledge and practical skills, enabling TVET students to deal with problems, such as identifying deficiency components or systems. Students can focus on improvised components or systems by emphasizing TVET education through the equivalence of skills and knowledge so that the sequence, scope, and selection of components and systems work. The use of LMS in TVET institutions across the world has been reported by a significant number of researchers. Table 1 shows several studies that were conducted by previous work between Based on the findings, LMS plays an essential role in digital integration through the digitization of TVET. The study also shows that using technology 4. This study investigates the factors influencing students' use of LMS in higher education.

There are some issues with the studies that have been

done on the success and use of LMS systems at the level of TVET institutions. The following sections discuss the use of LMS in TVET institutions and the theories and models underpin this stu

Theories and Models underpinning this study

Technology success involves technical and non-technical issues. The literature review recommends perceived ease of use, perceived usefulness, user satisfaction, intention to use and actual use of technology as success factors. Information system success was closely related to user acceptance of information technology. LMS designers should consider technology factors when designing an LMS The Information System (IS) Success Model

[] and the Technology Acceptance Model (TAM) are models commonly used by researchers to determine the level of success produced by information systems. In 1989, Davis introduced The Technology Acceptance Model (TAM) which states that users can measure the success of technology based on their estimated use and convenience. Over the past two decades, technology acceptance has been explained by the TAM model

This model was developed to evaluate user acceptance of information systems and has been tested with varying levels of experience and systems. The TAM model allows individuals to decide whether to accept an information technology and users have a high awareness of an information system described by their behavioral goals Based on the Theory of Reasoned Action (TRA), perceived ease of use and perceived usefulness affect individual acceptance of information technology systems, according to the TAM model. Previous research used TAM to measure acceptance, with modifications to meet specific study goalsIn this case of influencing LMS acceptance , two key factors: perceived ease of use and perceived usefulness which predict actual use of IS.

introduced the Information Systems Success Model, and McLean states that technology success can be assessed by the extent the information system being used (intention to use), satisfaction that user have with the information system and positive impact that the system has on the institution operation and goals (net benefit). The quality of an information system, the information it provides, and the level of service offered to users are among the factors that can influence its success Challenges in using information technology systems nowadays encourage this model to be explored in various contexts and give different results. Intention to use and user satisfaction are key to forecasting technology adoption in both models.

According to the Information Systems Success Model, system utilization is an important factor in enhancing user satisfaction and users' intentions to use the system. [38]. Previous study has examined the impact of user satisfaction on LMS intention and actual use. A study conducted by Nair

found that user satisfaction will impact the utilisation of e-learning. Findings from Nair's work also found that effect on e-learning acceptance and use related with user satisfaction. Perceived usefulness and ease of use are two important factors that significantly influence the overall level of satisfaction of users with information systemsUsers are more motivated to continue using the system if it convenient and easy to access Users who are satisfied with an information system have a positive perception that drives progress in its use The more accessible and valuable an LMS system is, the more users will like it. LMS acceptance improves online learning and user satisfaction. In this study, TAM and IS Success Model will be used as primary reference in evaluating the acceptance and success of LMS systems.

There were 3 stages to this study's preparation. In the first stage, essential factors are identified by conducting a content analysis thorough literature review. Second, experts were asked to give opinions and emphasize the most significant factors. In the third stage, findings from the second stage will be used to finalize the factors.

Literature review approach for determining the factors

The literature review approach was the most often utilized strategy for determining the factors influencing LMS technology acceptance . There are several steps involved in doing a literature review for this study. First, search keywords and sources of a research article are identified. The IEEE, Google Scholar, Emerald, and Springer are among the source of research publications that are sought. Second, Boolean AND/OR operators are used to search related articles.

This study uses terms such as "Learning Management System", "LMS", "TVET', "Technical and Vocational Education", "Technology Acceptance Model Information System Model" and "Information System Success Model". Third, all articles were arranged according to relevance, and the content was studied and discussed in-depth to understand the issue better.

Data Extraction

In the initial stagewere selected based on the title and abstract. Seventy-three items in all were found and taken into consideration for the next stage. At the final stage. Thus this indicates the acceptance of the items in the instrument.

5. Discussion

Learning Management Systems have different levels of system quality features that are able to attract students to use them. Based on the findings can be summarized as follows: Identify acceptance factors of LMS in TVET institutions.

This study explored user intention to use LMS

based on TAM and IS Success Model, focusing on the acceptance of LMS in TVET institutions. A positive user experience may lead to increased efficiency and effectiveness or better performance when using the system. Based on TAM, system functionality should meet perceived usefulness and perceived ease of use to have an important result on system use [11]. Adaptability in delivering the course will make the learning process efficient and effective . TVET LMS development requirements need to involve the user's needs. LMS TVET user satisfaction is believed to positively affect both actual use and intention to use which increases LMS utilization. This has an impact on how the information system (IS) is actually used, which is affected by what the user wants and how they act.

5.2 Validate the acceptance factors based on expert views

Based on the expert review analysis, 51 items are accepted from 53 items by experts based on the CVR results discussed above. The expert calculation items are in the range of 0.6 to 1.0, which shows that the items are needed to evaluate the acceptance of LMS in TVET. Additionally, two items are rejected, SQ10 and PT8, based on the CVR value. Item SQ10 was rejected because the item had the same meaning as SQ7, as commented by experts. At the same time, item PT8 was commented on as irrelevant.

The overall S-CVI average for expert consensus is 0.98. Based on the findings suggest a robust and reliable instrument can measure and predict LMS TVET acceptance. However, it is suggested that the following research tries to assess the validity of the factors and obtain more expert views while expanding the study to an enormous scope. Based on this study, system quality, information quality, service quality, motivation, practical training, self-discipline, user satisfaction, intention to use and actual use are among the critical factors identified. The IS Success Model and its use in TVET served as the inspiration for the motivational design. The proposed factors for LMS TVET contain multi-components aimed at technology and the human dimension. New factors like self-discipline, practical training, and motivation are among the factors that identified affect LMS acceptance in TVET institutions. Based on the literature review, there are still not many studies related to LMS acceptance in TVET because LMS is mainly used in conventional institutions and colleges. As contribution of knowledge this study intends to explore technology acceptance of LMS in TVET. In addition, the exploration of LMS research in TVET is still relatively new, with some studies providing relatively limited empirical data.

6. Conclusion

LMS plays a vital role in modern learning. Therefore, this study is essential in identifying user acceptance factors, especially in technical and vocational fields that are evolving from time to time.

This study differs from past studies as follows: First, this study attempts to implement an integrated IS Success Model and TAM model in the context of LMS usage in TVET institutions. Second, this study will compare past studies between conventional and TVET institutions in LMS usage. Unlike some studies that only study the construct level, this study will investigate the effect of actual use through user satisfaction and the intention to use LMS in TVET institutions. Hence, the current study will provide different outcomes and provide invaluable		

2..The adoption of the e-portfolio management system in the Technical and Vocational Training Corporation (TVTC) in rsa

2.1 **Highlights** • • **The study extends the Technology Acceptance Model (TAM).** • • **Second-order factors (Technology, Organization, Environment), had significant and positive effects on EPMS adoption.** • • **First-order factors of were significant to EPMS adoption.** • • **Behavioral intention towards EPMS adoption has positive relationship with individual performance.** • • **TAM, De Lone and McLean and TOE were good choice for EPMS a** **2.2 The Electronic Portfolio Management System / saqa dhet** **(EPMS) is one such system, but despite its importance, its extensive adoption among institutions remains low because the end-user rejects its use. EPMS adoption in Technical and Vocational Training Corporation (TVTC). Hence, in the context of TVTC organizations, EPMS adoption needs an effective framework to highlight the factors influencing EPMS adoption and eventually**		

positively affecting the employees' performance. This study classified the factors into three dimensions (technological, organizational, and environmental) based on the level of interaction. With the help of the Technology Acceptance Model (TAM), De Lone and Mc Lean's IS model, and the Technology, Organization and Environment (TOE) model, this study developed and proposed a robust framework. The study used a quantitative approach in which copies of an online questionnaire were passed and distributed to respondents in TVTC institutions. The analysis of the collected data was done using AMOS-SEM 3 statistical software. The finding revealed that technology, organization, and environment, which are second-order factors, had significant and positive effects on EPMS adoption. The results also supported a substantial relationship between EPMS adoption and the performance of employees (Academicians and Managerial), with the entire first-order factors comprising of technological factors, namely perceived usefulness, perceived ease of use, perceived information quality, perceived system quality, and perceived service quality, organizational factors, namely financial support, top management support and training, and environmental factors, namely cloud computing ability, government role, and big data facility were examined for their role in the adoption of EPMS rsaTVTC, and were and were found to be significant and accounted 43% of the variance in the EMPS adoption. At the same time, the EPMS adoption explains 39% of the variance extracted from employees' performance. This study contributes theoretically by filling a gap in the literature and providing new validation for the TAM, De Lone and Mc Lean's IS model, and TOE. The practical value lies in giving the policy makers and decision makers essential information to adopt EPMS in less time and effort.

Keywords

Second-order data analysis
Electronic portfolio management system
Technical And Vocational Training Corporation
Technology adoption
Framework
Technology Acceptance Model
TOE
Individual performance

1. Introduction

In most countries, there has been a fantastic realization of the requirement for an outcome-based approach for continuous educational improvement because of the increasing number of unemployed graduates. Higher educational institutions have begun responding to this concern and focusing on the required preparation of students in their professional and career lives by emphasizing the outcomes/abilities that the market demands. Such approaches are outcome-based and are directed towards assessing the student's performance and knowledge, enabling their learning and practical career to match (Tam, 2014, Zhang et al., 2021).

More specifically, the relative novelty of the outcome-based model in both developed and developing nations have been created to enable cooperation between students and faculty members in learning promotion. The model marks a significant shift from the traditional model that assumes students accept and retain knowledge to one that can achieve the most optimum outcome, the curriculum, and teaching model, which leads to a specific planning process (

Added to the above, Outcome-Based Education (OBE) refers to an education method that focuses on the student's learning behavior and not their learning process. The first step entails defining after which the curriculum is created retrospectively to realize the outcomes. The decisions regarding curriculum and teaching are based on the best way to bring about the optimum results, which requires a planning process different from the traditional planning process (curriculum is based on a pre-determined outcome). The requirement to identify the learning outcomes at the beginning is argued to be based on various reasons. First, the learning outcomes are what define explicit learning. While to the lecturers, this may assist them in preparing lectures to achieve the students' work, it may help them focus on enhancing their performance and determining the

course goals to be gauged for assessment purposes (

Generally speaking, educational institutions all over the globe acknowledge that information value and contribution towards making decisions and management have resulted in developing different systems using computer hardware, software, and the internet. Concerning this, EPMS is defined as people, hardware, software, methods of communication, and data resources working towards an organized method of collection, transformation, and dissemination of information (TVTC institutions, as part of this

Literature review

OBE's fundamental focus is on students' learning behavior changes and related changes, not on their learning process. The first step entails the definition of learning outcomes, after which the curriculum is created retrospectively to realize the outcomes. The decisions regarding curriculum and teaching are based on the best way to bring about the optimum results, which could lead to a planning process that is distinct from that of the one carried out in traditional education – in the former, the results are pre-determined before the curriculum development. The requirement to identify the learning outcomes at the beginning is argued to be based on various reasons. The outcomes of learning form the explicit learning definition. While to the lecturers, this may assist them in preparing lectures to achieve the outcomes, to the students, this may help them in focusing on enhancing their performance and determining the course goals to be gauged for assessment purposes Generally speaking, educational institutions all over the globe are slowly but surely accepting the importance of information value in the management processes and making decisions, which has resulted in the development of different systems using computer hardware, software, and the internet is the combined resources comprising people, software and hardware, communications channels, and other relevant materials that work towards collecting, transforming, and disseminating information within an organization

The Constructs in each part of the questionnaire.

Part	Description	Constructs
A	Technological Factors	Perceived Ease of Use
		Perceived Usefulness
		System Quality
		Service Quality
		Service Quality
B	Organizational Factors	Top Management Support
		Financial Support
		Training
C	Environmental Factors	Government Role
		Cloud Computing Ability
		Big Data Facility
D	Adoption	Intention to Adopt
E	Use EPMS	Individual performance
F	Demographic Information	Age
		Gender
		Years at Current Job Positions
		Education
		Type of Job

Questions on the perceived teacher performance.

Factor	Questions	Adapted from
Perceived Individual performance	The expected performance for me; My overall performance is sufficient	

4.2. Data analysis

After the surveys were collected, they were processed into SPSS software, where Cronbach's alpha and descriptive analyses were performed. Internal consistency and dependability were also evaluated using Cronbach's alpha. In this investigation, a novel conceptual model for measuring was developed initially, and then hypotheses and linkages within a structural model were established. Then they turned to the state-of-the-art Amos software. Academics utilize this kind of software to help them perform more in-depth and accurate examinations of relationships (Awang, 2012).

4.2.1. Reliability

A scientific instrument's reliability can be gauged partly by how well it performs in these conditions. Hair, Black (Hair et al., 2010) state that valid results demonstrate the instrument's consistency. Prior to the major detailed analysis, the preliminary research findings in this study have been validated using a validity and reliability analysis. For reliability analysis purposes, Cronbach's alpha is a measure of the consistency among components of the same build. Specifically, (Hair et al., 2010) states that it needs to be at least 0.7 to be considered very accurate and dependable, which is achieved by this study.

4.2.2. Assessment of normality and common method bias

For structural equation modeling, it is necessary to ensure that the data are normally distributed (Byrne, 2010). Two approaches were used to verify the accuracy of the conceptual model. First, to validate the measurement and structural models, we utilized AMOS for normality testing and common method bias checks. Then we used CFA to confirm that our findings held up.

All the measurements in the dataset were normally distributed, with skewness and kurtosis values below the threshold of ± 2 (Hair et al., 2010). The dataset may have been affected by common method bias due to using a single instrument to evaluate all variables (MacKenzie, Podsakoff, and Podsakoff, 2011). The single-factor test helped with this issue (Fuller et al., 2016), which shows the study free from bias.

5. Results

The obtained results from the analysis are presented in this section.

5.1. Profile of demographic variables

Total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	0		0	**0**	**0**	**0**

. Theoretical contributions

This study and its findings extend theoretical and empirical research on EPMS adoption for effective decision-making, and the study's contribution are enumerated as follows;

First, this study developed and proposed an EPMS adoption framework to enhance employee performance in TVTC institutions. Second, in so doing, the study minimizes the literature gap made by the scarcity of studies dedicated to the underlying factors that drive EPMS adoption in educational institutions to make informed decisions. The study examined the issue and presented

the factors and sub-factors that can affect such adoption.

Thirdly, the study developed the basis upon which effective EPMS adoption can be built in consideration of the relevant adoption drivers for

. Practical contributions

The above theoretical contributions lay the basis of a practical system that supports decision-making in TVTC, through the EPMS adoption framework development. The framework essentially sheds light on adopting EPMS to enhance the performance of TVTC employees in rsa . Clearly stated, the study's practical contributions concern organizations and policymakers. The study underlines the general role of EPMS in TVTC performance, particularly the lecturers, with the contributions enumerated

6.2. Limitations of the research

Every study has limitations, and this holds for the present one, among which is the study's focus on public sector institutions, which calls for caution when generalizing the findings to private institutions. However, based on evidence, variations in adoption issues between public and private entities are likely to be minimal and, thus, may be overlooked. So, although the study findings were based on government institutions in the educational sector, similar results may be expected from the private ones. Regardless of such similarities, further studies may begin re-examining the factors in the context of private entities, as such entities may have specific activities that could influence the outcomes.

The present study is also limited in its focus on developing a research doctrine by developing EPMS support of employees' performance at the individual level, with the students' performance out of its scope.

6.3. Suggestions for future research

This section is dedicated to providing avenues for future studies, enabling the cross-validation of results found in this study and extending their level of generalization. Future studies are recommended to test the framework's applicability in private educational institutions and examine the framework's generalizability to private educational institutions. Future studies are also advised to include additional factors other than the ones discussed in the study, particularly those that are based on culture.

The study findings can be further extended and developed by investigating the relationships among the determinants of EPMS adoption and the performance of the institution as a whole, as well as their effect on the managers' decisions of higher learning institutions.

Regardless of the several EPMS factors examined that have the potential to influence intention towards EPMS adoption among TVTC employees, investigation of such factors is confined to their effects. Meanwhile, other factors have not been examined but could have a key role in driving the intention to adopt. Therefore, further studies can focus on additional factors and their influence on the attitudes and intentions investigated based on the underpinning theories or other IS theories. Another limitation is related to the study sample, which was obtained from Saudi TVTC institutions – this sample only represents a single educational model type in the Kingdom. Several other educational models exist (e.g., universities), but it goes without saying that the study findings do not reflect those of different types and levels of institutions. In this regard, further studies can rectify this limitation by including other educational institution types and levels in light of their adoption of EPMS.

There is an urgent need to research in the education field, especially with mobile learning, and how it affects students' engagement and facilitates performance. In addition to that, there is also necessary to identify new factors that influence the adoption of education technologies in Saudi

Arabia following Vision 2030, that is, for digital transformation. Further research should also identify the factors mediating the adoption of any technology, such as technostress and exhaustion or even privacy invasion. **7. Conclusion** **In educational institutions and organizations, EPMS can significantly contribute to daily operations, and the system's application and adherence to the regulations bring about the survival of the entity and the optimum performance of its employees. However, the literature reviewed indicated that studies dedicated to EPMS in the academic realm are still limited, specifically those focusing on its role in enhancing the performance of lecturers. This is particularly true as a framework is yet to be established to guide the effective and successful adoption of EPMS in TVTC institutions. The present study is expected to lessen the literature gap by developing and proposing an EPMS adoption framework to support the performance of lecturers in the TVTC institutions, underpinned by UTAUT, De Lone**		

Model Product Testing and Model Testing in the Industry

The WBL-based industrial apprenticeship learning guide model that has been compiled is continued with model testing through expert ju

The importance of apprenticeship as a teaching method

Learning by doing is one of Pratt's five teaching approaches. Bloom and his colleagues designated psycho-motor skills as the

Key features of apprenticeship

Apprenticeship in online learning environments

The apprenticeship model of teaching can work in both face-to-face and online contexts, but if there is an online component, it usually works best in a hybrid format. One reason why some institutions are movin

Design work base methodology research / criteria requirement	yes	no

• 1. Watch this Video on Theories of Learning
• 2. The Nature of Knowledge and the Implications of Teaching
• 3. Scenario: A Pre - Dinner Party Discussion
• 4. Art, Theory, Research, and Best Practices in Teaching
• 5. Epistemology and Theories of Learning
  ○ 5.1. What is Epistemology?
  ○ 5.2. Epistemology and Theories of Learning
• 6. Objectivism and Behaviourism
  ○ 6.1. The Objectivist Epistemology
  ○ 6.2. Objectivist Approaches to Teaching
  ○ 6.3. Behaviourism		

9.1 INTRODUCTION **9.2 METHODOLOGICAL REFLECTIONS ON THE STUDY** **9.3 REVIEW OF THE STUDY** **9.4 DISCUSSION OF THE KEY FINDINGS** **9.4.1 Lack of technical skills among lecturers in operating machines and equipment .** **9.4.2 Promotion of WIL and self-initiated learning through induction processes** **9.4.3 TVET lecturers gained technical know-how about industrial processes** **9.4.4 Lack of knowledge about safe working procedures** **9.4.5 Lack of interpersonal skills** **9.4.6 Creativity and cost-saving skills among civil engineering TVET lecturers** **9.4.7 Lack of problem-solving skills** **239** **9.4.8 Evidence of the use of work schedules** **9.4.9 Training helped in the formation of industry connections** **9.4.10 Participants suggest colleagues to participate in** **host industries** **9.4.11 Lack of lecturer WIL support** **9.5 RECOMMENDATIONS BASED ON KEY FINDINGS** **9.5.1 Recommendation 1** **9.5.2 Recommendation 2** **9.5.3 Recommendation 3** **9.5.4 Recommendation 4** **9.5.5 Recommendation 5** **9.5.6 Recommendation 6** **9.5.7 Recommendation 7** **9.5.8 Recommendation 8** **9.5.9 Recommendation 9** **9.5.10 Recommendation 10** **9.5.11 Recommendation** **xiii** **9.6 CONTRIBUTION OF THE STUDY** **9.7 A PROPOSED MODEL FOR TVET LECTURER WIL** **9.7.1 Structure of the model** **9.7.2 Role players** **9.7.3 Challenges and benefits** **9.7.4 Model summary** **9.8 RECOMMENDATIONS FOR FURTHER STUDY** **9.9 CONCLUSION**		

Job Title: Trade Assistant Job Grade: TASK 4 **Job Reports to: Team Leader** **Job Purpose: Assist electricians with the restoration of electrical supply and general electrical maintenance.** **1. Support the execution of work orders with general duties which include:**		

1.1. Prepare and maintain equipment, tools and materials for use
1.2. Demarcating of work areas
1.3. Fetching equipment as required
1.4. Clean site area before and after work execution
1.5. Clean vehicles and fleet utilized
2. Assist in the authorized erecting of scaffolding, movable and immovable staging and various rigging to gain access
to difficult areas.
3. Comply to Safety, Health, Environment and Quality (SHEQ) requirements
3.1. Adhere to SHEQ regulations
3.2. Identify hazardous conditions and faulty equipment that can impact overall safety
3.3. Adhere to the organisations environmental management programme and policies
3.4. Participate in monthly toolbox talk meetings
3.5. Contribute towards work risk assessments for all work conducted
4. Execute general work that may be required from time to time in support of daily maintenance and repair to ensure
sound electrical infrastructure.
Minimum Requirements:
NQF 1 Equivalence: Grade 9 / ABET Level 4
The following requirements will be an added advantage:
NQF 2 Equivalence: N1 Electrical Engineering / Grade 10
NQF 3 Equivalence: N2 Electrical Engineering / Grade 11
How to apply:
1. Download the application form from the City Power website or click the link below:
https://www.citypower.co.za/careers/Documents/Application%20form%20for%20Trade%20Assistant.pdf , complete it in
full and attach all the required documents.
2. Applications can be hand delivered to City Power Head Office, 40 Heronmere Road, Booysens, Main Building Reception
or email to recruitment.HR&T@citypower.co.za
3. Hand delivered applications should be signed for on register when delivered.
4. Applicants will be required to undergo an onsite assessment du
Change Management Plan
Through change management, City Power was able to increase its effectiveness in executing against a mandate for change
by proactively managing change fatigue, rebuilding the trust base with relevant stakeholders and actively supporting the
implementation of strategic, operational and tactical interventions.
Change management has also been identified to assist in alleviating possible projects failure as follows:
• Aligning the change within the existing organisational structures and systems.
• Integrating and coordinating the project change initiatives with other current organisational change initiatives such as the
culture program.
• Gaining stakeholder commitment across the board.
• Delivering tangible changes in culture, behaviour and attitudes.
• Setting the groundwork for future implementations.
• Improving and sustaining organisational and process performance levels.
4.8. Employment Equity and Affirmative Action Plans and Programmes
As a designated employer, City Power is fully committed to complying with the Employment Equity Act. Diversity and inclusion
remain key drivers of our transformation journey and are, we believe, integral to building a workforce that reflects our commitment, to equal employment opportunities regardless
and reflects the
demographics of the country. There has been an ongoing focus on the development of talent, with particular progress representation
on people with disabilities, youth and gender equality and representation at a senior level, taken as an opportunity when filling
emergent talent gaps during the course of the year.
Employment Equity Figures,
Staff
Establishment Filled

Positions
Affirmative Action Gender Equity People with
Disabilities
Target Achieved Target Achieved Target Achieved
Employment equity ratios display an overall improvement in comparison to. It is also important to note that City Power
consistently achieved its set targets as per the employment equity plan. We have a five-year employment equity plan and seek to
ensure that we not only meet our targets but we also mirror the target of the Province, particularly on the gender profile.
However, we note that the drop from the previous year in the ratio related to people with disabilities and when we recruited for the
FY2021/22 internship programme, we were deliberate in bringing in people with disabilities, with the intention that upon successful
completion of the internship programme, the interns will be appointed into permanent positions. Looking forward, it is our goal to
increase our people with disabilities target from
Overall Employee Landscape for Each Occupational Skills Level
Occupational Skills Level Male Female Total
Top Management
Senior Management
Professional Qualified ,
Skilled Technical ,
Semi-Skilled ,
Unskilled Total Staff Complement
Table 71: Occupational Skills Level per Gender
Table 72: Workforce Profile in Terms of Age, Race, Gender and Foreign National Status
Occupational Skills Level African Indian Coloured White Total
Top Management ,
Senior Management Professional Qualified :
Skilled Technical ,
Semi-Skilled ,Unskilled ,
Total Staff Complement 1,,
180CITY POWER INTEGRATED REPORT 2020/2021 181CITY POWER INTEGRATED REPORT 2020/2021
Breakdown of Current Staff Compliment of 1
Occupational
Level
Age
Group
Male Female Foreigner Total
Number
nagement
(Level 1-2)
Senior Management
(
Professional Qualified
(Level 5-6)
Skilled Technical
(Level 7-8)
Semi-Skilled
(Level 9-10)
Unskilled
(Level 11)
Total Temporary
Table 73: Percentage Standing on Race and Gender
Occupational
Level
Age
Group
Male Female Foreigner Total
Top Management

(Level 1-2)
Senior Management
(Level 3-4)
Professional Qualified
(Level 5-6)
.9. Employee Induction
Employee induction is the first step towards gaining an employee's commitment. Induction is aimed at introducing the company
to the employee and the employee to the company. Induction involves the orientation of the employee in the company culture,
introducing the employee to the company's Conditions of Service, Policies and expected Ethical Conduct. The aim is to conduct
employee induction on a quarterly basis – in-line with new employee intake.
In-line with the 2020/21 recruitment plan/initiatives, most of the intake was internal; however inductions for the year were mainly
for Interns, GITs, Technicians in Training and Artisans in Training as well as the youth intake (interns). Inductions took place
throughout the year in partnership with UNISA Enterprise and all City Power groups.
4.10. Boost Compliance
Capacity development programmes must enable appropriate staffing and optimal use of the workforce adherence to transformation
imperatives, employment regulations and organisational directives. It is also intended to embed a culture of accountability in order
to drive behaviour/conduct that is informed by the City Power policy environment, regulatory and legislative prescripts.
HR and Transfomation Policy Review
Policies establish boundaries for acceptable behaviour, accountability and guidelines for best practices in certain work situations.
They offer clear communication to employees as to how the organisation expects them to act. HR Policies contribute to the
overall culture of the workplace, because they instil norms and values. Further to that, HR Policies help to ensure compliance
with applicable laws and regulations and contains guidelines for governance; and/or sets limits within which people are expected
to operate.
Accordingly, during the period under review, HR and Transformation reviewed all its policies, processes and procedures to support
the High Performing Organisation Principle and align to the HR Regulatory Framework and BBBEE Codes.
Below are the reviewed Human Resources and Transformation policies:
-3 REPORT 2020/2021 185CITY POWER INTEGRATED REPORT 2020/2021
4.11. Rewards Policy
The Remuneration Policy was renamed to: Rewards Policy and 2021/22 Schedule of Payments Guidelines;
• The policy is a consolidation of 2 policies, pr

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- **Municipal Rates and Taxes (Not in arrears for more than 90 days)**
- **SHEQ Regulations**
- **Invitation to Bid (MDB 1)**
- **Form of Offer (MBD 3.1)**
- **Declaration of Interest Form (MBD 4)**
- **Declaration for Procurement above R10 000 000 (MBD 5)**
- **Preference Claim Form (MBD 6.1)**
- **Declaration Certificate for Local Content (MDB 6.2)**
- **Declaration for Purchase of Goods (MBD 7.1)**
- **Declaration of Bidder's past SCM practices (MBD 8)**
- **Certificate of Independent Bid Determination (MBD 9)**
- **B-BBEE Certificate**
- **Valid Tax Clearance Certificate or SARS Pin**
- **Financial Statements for the past three years**
- **Central Supplier Database (CSD) Registration Report**
- **Additional Soft copy of Bid Document must be submitted on Memory Stick**
- **Letter of good standing CIOD**
- **Letter of compliance UIF**

4.2 OTHER DOCUMENTS REQUIRED FOR EVALUATION PURPOSE
4.3 DOCUMENTS THAT WILL BE INCORPORATED IN THE CONTRACT
PART 5: SCOPE OF WORK
5.1 EVALUATION CRITERIA
SPECIFICATION FOR QUALITY OF SUPPLY
STATISTIC AND CHECK METERING
INSTRUMENT WITH BILLING CAPABILTIES
REFERENCE REV
CP_TSSPEC_003 3
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ANNEXURE C(1) - Technical schedules A and B
Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered
Item Sub-clause of
CP_TSSPEC_
003
Description Schedule A Schedule B
66 xxxx Electrical for QoS Inputs
67 xxxx Power supply As per
clause
68 xxxx Mains supply frequency As per
clause
69 xxxx Supply protection requirements As per
clause
70 xxxx Electrical connections As per
clause
71 xxxx Electromagnetic compatibility (EMC) As per
clause
72 xxxx Mechanical
73 xxxx Case As per
clause
74 xxxx Resistance to shock As per
clause
75 xxxx Resistance to vibration As per
clause
76 xxxx Resistance to heat and fire As per
clause
77 xxxx PQDIAS
78 xxxx General requirements As per
clause
79 xxxx Infrastructure
80 xxxx Central data base As per

clause
81 xxxx Web-based As per
clause
Note: Ticks [√, X], Asterisk [*], Word [Noted] or TBA ["to be advice"] will not be accepted.
Tender Number: _____
Tenderer's Authorized Signatory: _____ _____
Name in block letters Signature
Full name of company: _____
SPECIFICATION FOR QUALITY OF SUPPLY
STATISTIC AND CHECK METERING
INSTRUMENT WITH BILLING CAPABILTIES
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ANNEXURE C(1) - Technical schedules A and B
Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered
Item Sub-clause of
CP_TSSPEC_
003
Description Schedule A Schedule B
82 xxxx Security and Encryption As per
clause
83 xxxx Users As per
clause
84 xxxx Measurement sites As per
clause
85 xxxx Data acquisition As per
clause
86 xxxx Alarms As per
clause
87 xxxx Reports As per
clause
88 xxxx Analysis functions As per
clause
89 xxxx Licences As per
clause
90 xxxx Database As per
clause
91 xxxx Tests for QoS capability As per
clause
92 xxxx Performance verification As per
clause
93 xxxx Marking and packaging As per
clause
94 xxxx Documentation As per
clause
95 xxxx Declaration As per
clause
96 xxxx Training As per
clause
97 xxxx Quality management accreditation As per
clause
98
99
xxxx
xxxx
Environmental management
accreditation
Health and safety accreditation
As per

clause
As per
clause
Note: Ticks [√, X], Asterisk [*], Word [Noted] or TBA ["to be advice"] will not be accepted.
Tender Number: _____
Tenderer's Authorized Signatory: _____ _____
Name in block letters Signature
Full name of company: _____
SPECIFICATION FOR QUALITY OF SUPPLY
STATISTIC AND CHECK METERING
INSTRUMENT WITH BILLING CAPABILTIES
REFERENCE REV
CP_TSSPEC_003 3
PAGE 42 OF 46
Technical schedules A and B
Deviation schedule
Any deviations offered to this specification shall be listed below with reasons for deviation.
In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by City Power.
Item Sub-clause of
CP_TSSPEC_003
Proposed deviation
Tender Number: _____
Tenderer's Authorised Signatory: _____ _____
Name in block letters Signature
Full name of company: _____
SPECIFICATION FOR QUALITY OF SUPPLY
STATISTIC AND CHECK METERING
INSTRUMENT WITH BILLING CAPABILTIES
REFERENCE REV
CP_TSSPEC_003 3
PAGE 43 OF 46
ANNEXURE C(2) - Item No. 1 – 10 Amp 56/400 volt Thee Phase Bulk or Intake Meters – SAP NO.
Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item Sub-clause of CP_TSSPEC_003	Description	Schedule A	Schedule B
1	Manufacturer	xxx	
2	Rated voltage	V	56/400
3	Rated amperage	A	1 - 10
4	Rated frequency	Hz	50
5	Class accuracy		Class 0.2
	Reactive Energy		Class 1
6	Lightning protection		Required
7	Over voltage protection		Required
8	Communication- Optic-Electronic Port		Required
9	Communication-		Required
10	Programming and security comply?		Required
11	Clock and calendar		Required
12	Meter provided with internal battery?		Required
13	Number of auxiliary inputs		2
14	Number of auxiliary outputs		4
15	Number of LED pulses per kWh		xxx
16	Number of LED pulses per kVarh		xxx
17	LCD display comply?		Required
18			

Auxiliary power supply derived from all three phase to phase voltages? Required **19** **Auxiliary power supply derived from all three phase to neutral voltages Required** **20 Load profile recording comply? Required** **21 Programmable demand measurements kVA** **22** **23** **Energy measurement** **Data retention** **kVAR/kWH** **Years** **Both** **10** **23 Data extraction comply? Required** **24 Is the meter capable of self-diagnostics? Required** **25 Does the meter provide for minimum time of use? Required** **SPECIFICATION FOR QUALITY OF SUPPLY STATISTIC AND CHECK METERING INSTRUMENT WITH BILLING CAPABILTIES REFERENCE REV** **CP_TSSPEC_003 3** **PAGE 44 OF 46** **26 Is the meter programmable for external VT's and CT's Required** **27 Meter sealable Required** **28 Hand held units available Required** **29 Capable of AMR Required** **30 Available software and hardware Reset / Programming xxxx** **SPECIFICATION FOR QUALITY OF SUPPLY STATISTIC AND CHECK METERING INSTRUMENT WITH BILLING CAPABILTIES REFERENCE REV** **CP_TSSPEC_003 3** **PAGE 9 OF 46** **2-31** **Test Ec, free fall procedure 1 the transport packaging Free fall 500 mm Number of stresses: 2 each side** **Resistance to heat and fire** **SANS/IEC 60068-** **Description Schedule A Schedule B** **Manufacture of Current Transformer** **1 manufacturer xxxx** **2 manufacturer's type designation xxxx** **3 date of manufacture xxxx** **General requirements** **4 4.2 ambient air temperature oC -10 to 40 xxxx**		

5 4.2 altitude m 1800 xxxx
6 4.2 average humidity % 95 xxxx
7 4.2 level of pollution very heavy
System details
8 4.1.2 indoor or outdoor use indoor
9 nominal r.m.s. voltage (un) kV 6.6 / 11
10 number of phases 3
11 frequency Hz 50
12 4.42 basic insulation level kV 75 / 95
13 4.6 Insulation medium Gas , oil ,
resin resin
Dry type current transformer
14 Is the core included in the
encapsulation? Yes/ no Yes
Primary terminals
15 material copper
16 Type of primary terminal Stem/ pad Pad
Dimensions and orientation of
stem type
17 diameter mm
18 Minimum length mm
19 orientation Horizontal/
vertical VertiSPECIFICATION FOR HV CURRENT
TRANSFORMER
REFERENCE REV
Guidance from the manufacturer with regard to the following is required:
8.1 Long term storage of spare transformers;
8.2 Handling and preparation for transport with details of lifting and support positions; and
8.3 Correct handling and slinging methods.
9 TRAINING
9.1 The following certified training courses, for City Power's staff, shall be provided:
9.1.1 Installation, and
9.1.2 Maintenance of all components of the current transformer.
8.2 The associated costs for the certified training courses in 7.1 shall be given per person and shall be fixed for the period of the contract.
10 QUALITY ASSURANCE
A quality management system shall be set up in order to assure the quality of the current transformer during design, development, production, installation and servicing. Guidance on the requirements for a quality management system may be found in the following standards: ISO 9001. The details shall be subject to agreement between the purchaser and supplier.
11 ENVIRONMENTAL MANAGEMENT
An environmental management system shall be set up in order to assure the environmental compliance of the current transformer throughout its entire life cycle (i.e. during design, development, production, installation, operation and maintenance, decommissioning and disposal phases). Guidance on the requirements for an environmental management system may be found in ISO 14001 and City Power Policy. The details shall be subject to agreement between the purchaser and supplier.

SPECIFICATION FOR HV CURRENT CURRENT TRANSFORMER CORE ARRREFERENCE REV
CP_TSSPEC_029 0
SPECIFICATION FOR ADJUSTABLE CABLE
CLAMPS
PAGE 11 OF 17
ANNEX C – Item 2 - CLAMP CAB SIZE 75-100 SINGLE – SAP NO. 458
Schedule A: Purchaser's specific requirements
Schedule B: Guarantees and technical particulars of equipment offered
Item Sub clause of
CP_TSSPEC_029
Description Schedule A Schedule B
1 Manufacturer xxxxx
2 2.1.1 Material of cable clamp Polypropylene

3 2.3 Does the design of the clamp comply with the drawing? Yes/No Yes **4 2.3 Do the threaded rod lengths comply? (220mm / 380mm) Yes/No Yes** **5 3.2 Do the accessories comply? Yes/No Yes** **6 4 Do the cable clamps comply with the marking, labelling and packing? Yes/No Yes** **7 4.2.3 SAP numbers on the label Yes/No Yes** **8 4.3.2 Installation instructions Yes/No Yes**		
MIL-STD-462D **11 JANUARY 1993** **DEPARTMENT OF DEFENSE** **INTERFACE STANDARD** **REQUIREMENTS FOR THE CONTROL OF ELECTROMAGNETIC INTERFERENCE CHARACTERISTICS OF SUBSYSTEMS AND EQUIPMENT** **AMSC F7352 AREA EMCS** **DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited SCOPE** **1.1 Purpose** **1.2 Application** **1.2.1 General applicability.** **1.2.2 Tailoring of requirements.** **1.3 Structure.** **1.4 Emission and susceptibility designations** **2. APPLICABLE DOCUMENTS** **2.1 Government documents.** **2.1.1 Government documents, drawings, and publications.** **2.2 Non-Government publications** **2.3 Order of precedence.** **3. DEFINITIONS** **3.1 General.** **3.2 Acronyms used in this standard.** **3.3 Above deck.** **3.4 Below deck** **3.5 External installation.** **3.6 Flight-line equipment** **3.7 Internal installation** **3.8 Metric units.** **3.9 Non-developmental item** **3.10 Safety critical.** **3.11 Test setup boundary.** **4. GENERAL REQUIREMENTS** **4.1 General.** **4.2 Interface Requirements.** **4.2.1 Joint procurement.** **4.2.2 Filtering (Navy only** **4.2.3 Self-compatibility.** **4.2.4 Non-Developmental Items (NDI).** **4.2.4.1 Commercial items.** **4.2.4.1.1 Selected by contractor.** **4.2.4.1.2 Specified by procuring activity** **4.2.4.2 Procurement of equipment or subsystems having met other EMI requirements.** **4.2.5 Government Furnished Equipment (GFE** **4.2.6 Switching transients**		

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4.3.3 Other test sites
4.3.4 Ambient electromagnetic level.
4.3.5 Ground plane
4.3.5.1 Metallic ground plane.
4.3.5.2 Composite ground plane.
4.3.6 Power source impedance4.3.7 General test precautions
4.3.7.1 Accessory equipment.
4.3.7.2 Excess personnel and equipment.
4.3.7.3 Overload precautions.
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5.9.2 CS104 lim
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5.10.1 CS105 applicability
5.10.2 CS105 limit
5.10.3 CS105 test procedures.
5.10.3.1 Purpose
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11 Calibration of measuring equipment. Test equipment and accessories required for measurement in accordance with this standard shall be calibrated in accordance with ANSI/NCSL Z540-1 or ISO 10012-1 or under an approved				**calibration program traceable to the National Institute for Standards and Technology. In particular, measurement antennas, current probes, field sensors, and other devices used in the measurement loop shall be calibrated at least**			

every 2 years unless otherwise specified by the
procuring activity, or when damage is apparent.
4.3.11.1 Measurement system test.
At the start of each emission test, the complete test system (including measurement receivers, cables, attenuators, couplers, and so forth) shall be verified by injecting a known signal, as stated
in the individual test procedure, while monitoring system output for the proper indication. When
the emission test involves an uninterrupted set of repeated measurements (such as evaluating
different operating modes of the EUT) using the same measurement equipment, the measurement
system test needs to be accomplished only one time.
4.3.11.2 Antenna factors.
Factors for test antennas shall be determined in accordance with SAE ARP-958.
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Test
Antenna
TEST SETUP
BOUNDARY
30 cm
> 30 cm
RF absorber placed above,
behind and on both sides of
test setup boundary, from
ceiling to ground plane
RF absorber placed
behind test antenna,
from ceiling to floor
> 30 cm
> 30 cm
> 50 cm
FIGURE 1. RF absorber loading diagram.
MIL-STD-461E
19
2 m
80-90 cm
EUT
Bond strap
Power
Source Interconnecting Cable
2 cm LISNs
Ground Plane10 cm
5 cm
Non-Conductive Standoff
Access
Panel
FIGURE 2. General test setup.
MIL-STD-461E
20
2 m
Power
Source Interconnecting Cable
80-90 cm
EUT
Bond strap
10 cm
2 cm LISNs
Ground
Plane
Non-Conductive Table
Access
Panel
FIGURE 3. Test setup for non-conductive surface mounted EUT.
MIL-STD-461E
21 EUT
Enclosure
Access Panel
5 cm
Ground Plane -
Shielded Room
Floor2 m
LISNs
Power Input
Interconnecting Cable
Bond Strap
Non-Conductive Standoff
FIGURE 4. Test setup for free standing EUT in shielded enclosure.
MIL-STD-461E
22
Non-Conductive
Standoff
2 m
LISNs
Power In
1.5 meters
minimum 1.5 meters
minimum
1.5 meters
minimum
1.5 meters
minimum
5 cm
Ground Plane
FIGURE 5. Test setup for free standing EUT.
MIL-STD-461E
23
To EUT
To 50 Termination
Or 50 Input Of
Measurement
Receiver

To
Power
Source
Signal Output
Port
5 1k

50 H
8 F 0.25 F
FIGURE 6. LISN schematic.
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Frequency (Hz)
Impedance (Ohms)
Tolerance ±20%
100
10
1
10k 100k 1M 10M 100M
FIGURE 7. LISN impedance.
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5. DETAILED REQUIREMENTS
5.1 General.
This section specifies detailed emissions and susceptibility requirements and the associated test procedures. Table IV is a list of the specific requirements established by this standard identified by requirement number and title. General test procedures are included in this section. Specific test procedures are implemented by the Government approved EMITP. All results of tests performed to demonstrate compliance with the requirements are to be documented in the EMITR.3 Emission and susceptibility requirements, limits, and test procedures. Individual emission or susceptibility requirements and their associated limits and test procedures are grouped together in the following sections. The applicable frequency range and limit of many emission and susceptibility requirements varies depending on the particular platform or installation. The test procedures included in this section are valid for the entire frequency range specified in the procedure; however, testing only needs to be performed over the frequency range specified for the particular platform or installation.
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TABLE IV. Emission and susceptibility requirements.
Requirement Description
CE101 Conducted Emissions, Power Leads, 30 Hz to 10 kHz
CE102 Conducted Emissions, Power Leads, 10 kHz to 10 MHz
CE106 Conducted Emissions, Antenna Terminal, 10 kHz to 40 GHz
CS101 Conducted Susceptibility, Power Leads, 30 Hz to 150 kHz
CS103 Conducted Susceptibility, Antenna Port, Intermodulation, 15 kHz to 10 GHz
CS104 Conducted Susceptibility, Antenna Port, Rejection of Undesired Signals, 30 Hz to 20 GHz
CS105 Conducted Susceptibility, Antenna Port, Cross-Modulation, 30 Hz to 20 GHz
CS109 Conducted Susceptibility, Structure Current, 60 Hz to 100 kHz
CS114 Conducted Susceptibility, Bulk Cable Injection, 10 kHz to 200 MHz
CS115 Conducted Susceptibility, Bulk Cable Injection, Impulse Excitation
CS116 Conducted Susceptibility, Damped Sinusoidal Transients, Cables and Power Leads, 10 kHz to 100 MHz
RE101 Radiated Emissions, Magnetic Field, 30 Hz to 100 kHz
RE102 Radiated Emissions, Electric Field, 10 kHz to 18 GHz
RE103 Radiated Emissions, Antenna Spurious and Harmonic Outputs, 10 kHz to 40 GHz
RS101 Radiated Susceptibility, Magnetic Field, 30 Hz to 100 kHz
RS103 Radiated Susceptibility, Electric Field, 2 MHz to 40 GHz
RS105 Radiated Susceptibility, Transient Electromagnetic Field
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TABLE V. Requirement matrix.
Equipment and Subsystems Installed In, On, or Launched From the Following Platforms or Installations
Requirement Applicability
CE101
CE102
CE106
CS101
CS103
CS104
CS105
CS109
CS114
CS115
CS116
RE101
RE102
RE103
RS101
RS103
RS105
Surface Ships A L A S S S A L A A A L A A L
Submarines A A L A S S S L A L A A A L A A L
Aircraft, Army, Including Flight Line A A L A S S S A A A A A L A A L
Aircraft, Navy L A L A S S S A A A L A L L A L

Aircraft, Air Force A L A S S S A A A A L A Space Systems, Including Launch Vehicles A L A S S S A A A A L A Ground, Army A L A S S S A A A A L L A Ground, Navy A L A S S S A A A A L A A L Ground, Air Force A L A S S S A A A A L A Legend: A: Applicable L: Limited as specified in the individual sections of this standard S: Procuring activity must specify in procurement documentation MIL-STD-461E CE101 28 20 August 1999 5.4 CE101, conducted emissions, power leads, 30 Hz to 10 kHz. 5.4.1 CE101 applicability. This requirement is applicable for power leads, including returns, that obtain power from other sources not part of the EUT for submarines, Army aircraft & (including flight line) and Navy aircraft* & *For equipment intended to be installed on Navy aircraft, this requirement is applicable only for aircraft with Anti-Submarine Warfare (ASW) capability. & For AC applications, this requirement is applicable starting at the second harmonic of the EUT power frequency. 5.4.2 CE101 limits. Conducted emissions on power leads shall not exceed the applicable values shown on Figures CE101-1 through CE101-3, as appropriate, for submarines and Figure CE101-4 for Army aircraft (including flight line) and Navy ASW aircraft. 5.4.3 CE101 test procedure. 5.4.3.1 Purpose. This test procedure is used to verify that electromagnetic emissions from the EUT do not exceed the specified requirements for power input leads including returns. 5.4.3.2 Test equipment. The test equipment shall be as follows: a. Measurement receivers b. Current probes c. Signal generator d. Data recording device e. Oscilloscope f. Resistor (R) g. LISNs 5.4.3.3 Setup.			The test setup shall be as follows: a. Maintain a basic test setup for the EUT as shown and described in Figures 2 through 5 and 4.3.8. The LISN may be removed or replaced with an alternative stabilization device when approved by the procuring activity. b. Calibration. Configure the test setup for the measurement system check as shown in Figure CE101-5. c. EUT testing. MIL-STD-461E CE101 29 20 August 1999 (1) Configure the test setup for compliance testing of the EUT as shown in Figure CE101-6. (2) Position the current probe 5 cm from the LISN. 5.4.3.4 Procedures. The test procedures shall be as follows: a. Turn on the measurement equipment and allow a sufficient time for stabilization. b. Calibration. Evaluate the overall measurement system from the current probe to the data output device. (1) Apply a calibrated signal level, which is at least 6 dB below the applicable limit at 1 kHz, 3 kHz, and 10 kHz, to the current probe. (2) Verify the current level, using the oscilloscope and load resistor; also, verify that the current waveform is sinusoidal. (3) Scan the measurement receiver for each frequency in the same manner as a normal data scan. Verify that the data recording device indicates a level within ±3 dB of the injected level. (4) If readings are obtained which deviate by more than ±3 dB, locate the source of the error and correct the deficiency prior to proceeding with the testing. c. EUT testing. Determine the conducted emissions from the EUT input power leads, including returns. (1) Turn on the EUT and allow sufficient time for stabilization. (2) Select an appropriate lead for testing and clamp the current probe into position. (3) Scan the measurement receiver over the applicable frequency range, using the bandwidths and minimum measurement times specified in Table II. (4) Repeat 5.4.3.4c(3) for each power lead. 5.4.3.5 Data presentation. Data presentation shall be as follows: a. Continuously and automatically plot amplitude versus frequency profiles on X-Y axis outputs. Manually gathered data is not acceptable except for plot verification.		

b. Display the applicable limit on each plot. c. Provide a minimum frequency resolution of 1% or twice the measurement receiver bandwidth, whichever is less stringent, and a minimum amplitude resolution of 1 dB for each plot. d. Provide plots for both the measurement and system check portions of the procedure. MIL-STD-461E CE101 30 20 August 1999 100 90 80 70 60 50 Limit Level (dBA) 10 100 1k 10k 100k Frequency (Hz) 2.6 95 76 For load currents 3 amperes, use the limit curve as shown. For load currents between 3 and 185 amperes, relax the limit curve by 20 log (I/3). For load currents 185 amperes, relax the limit curve by 35 dB. 1. 2. 3. LIMIT SHALL BE DETERMINED AS FOLLOWS: FIGURE CE101-1. CE101 limit for submarine applications, DC. MIL-STD-461E CE101 31 20 August 1999 Limit Level (dB A) Frequency (Hz) 130 and forwarded to the Command or agency concerned for evaluation prior to acceptance of the			

Descript						y	n	n/a	
Activité 1 : Le	cm de côté	parallélogramm	En s'inspirant	pyramide	mince				

tangram Fiches Techniques à confectionner Chaque matériel confectionné est accompagné d'une fiche technique, qui est un tableau comportant : les matériaux, les outils, la procédure de fabrication, l'utilisation, le prolongement et le transfert. Matériaux Outils Procédure Utilisation Prolongement Activité 1 : Le tangram Matériaux Outils Procédure Utilisation Prolongement Carton : calendrier, Papier canson, cartoline etc.... Crayon, règle, Gomme, ciseaux.	2. Placer E milieu de [AB], placer F milieu de [AD], tracer [EF]. 3. Tracer les diagonales, placer G milieu de[EF]effacer [AG]Les diagonales se coupent en H. 4. placer I, le milieu de [DH], tracer [FI] 5. Placer J, le milieu de [BH].tracer [GJ] 6. Découper : • [FE] • [DB] • [HC] • [FI] • [GH] et [GJ]. 1. Former des ensembles (carré triangles, losange...) 2. Réaliser les figures telles que trapèze rectangle, trapèze isocèle,	e. 3. Introduire la notion d'unité de mesure des aires. 4. comparer des aires des figures du tangram. 5. Chercher les axes de symétrie dans les pièces du tangram. Reproduire des figurines pour réaliser des tableaux de décoration. Activité 2 : L'équerre par pliage Matériaux Outils Procédure Utilisation Prolongement Feuille blanche néant Double pliage : - Plier la feuille sans faire correspondre les bouts. - Plier de nouveau en faisant correspondre les bords du premier pliage -poser sur un carton et découper. Matériel de substitution de l'équerre. - Vérifier un angle droit. - Tracer un carré ou un rectangle. 11 Activité 9 : Réalisation expérimentale d'une boussole Matériels	de la fiche technique, réaliser un dispositif expérimental de simulation de la boussole. N° Phase Matériaux Outils Procédure Représentation 01 Remplissage du récipient Remplir à moitié le récipient 02 Aimantation de l'aiguille Aiment Frotter un seul bout avec le pôle nord (si on frotte le bout avec le pôle sud, l'aiguille prendra le sens sud) S N 03 Expérimentation Planter horizontalement l'aiguille dans le flotteur en veillant à l'équilibre. Placer le flotteur avec son aiguille sur la surface de l'eau et au milieu du r Activité 6 : Réalisation d'une maquette de pyramide à base carrée En se basant sur la fiche technique, réaliser une maquette de pyramid	Ciseaux, lame, cutter Prévoir de chaque coté de 2 triangles opposés, une petite bande de collage Découper la figure ainsi obtenue. 04 Pliage des triangles (faces) Rège plate mince Plier les triangles sur le carré en vue d'obtenir en les réunissant des plans inclinés (leurs sommets concourent en un point qui est le sommet de la pyramide) 05 Collage Colle blanche, ruban adhésif ... Pinceaux, bâtonnet, lame, etc.... 06 Séchage (si on utilise de la colle) Laisser sécher quelques minutes 17 4 7 18 Activité 7 : Réalisation d'une maquette de prisme En se basant sur la fiche technique, réaliser	Procéder au pliage : -ABCD par rapport à AB -A'B'C'D' par rapport à A'B' -AA'D'D par rapport à AA' -BB'C'C par rapport à BB' -CC'D'D par rapport à CC' -A'B'C'D' par rapport à A'B' 03 Découpe du développement du prisme Ciseaux, lame, cutter Procéder à la découpe en prévoyant la bande de collage. 04 Collage Colle blanche, ruban adhésif ... Pinceaux, lamelle, bâtonnet lame, etc.... 05 Séchage (si on utilise de la colle) Laisser sécher quelques minutes 19 5.00 4.00 7.00 4.00 5.00 6.00 A A' B B' C C' D D' C' D' D D				

		nécessaires : 1 récipient non métallique 1 tige ou une lame mince magnétisable 1 flotteur (liège ; polystyrène expansé...) 1 aimant N S L'aiment est un matériau qui a la propriété d'attirer certains métaux. Il présente deux p ôles (nor d ; sud). La terre se présente comme un gros aimant ayant également son pôle nord au nord et son pôle sud au sud. Quand on dépose dessus une aiguille aimantée, elle voudrait se présenter p arallèlement à l'axe nord - sud et dans la même disposition, mais des problèmes d'adhérence au sol l'en empêcherait. N S Aiguille aimantée Terre Fiche technique :	e pareille à celle ci-dessous conformément au dessin coté. Fiche technique : N° Phase Matériaux Outils Procédure 01 Traçage du carré de coté donné. Feuille de papier, papier canson, carton etc.... Crayon, règle graduée, équerre -Tracer un carré de coté donné -Tracer les médianes en traits interrompus courts fins 02 Traçage des triangles latéraux (base =coté du carré et hauteur = hauteur de la pyramide Crayon, règle graduée, équerre Tracer 4 triangles de hauteur donnée et de base égale au coté du carré 03 Découpage de la	une maquette de prisme pareille à celle ci-dessous conformément au dessin coté : Fiche technique A A ' B B' C C' D D' N° Phase Matériaux Outils Procédure 01 Traçage du développement du prisme Feuille de papier, papier canson, carton etc.... Crayon, règle graduée, équerre Reprendre le dessin de définition en respectant les dimensions données. 02 Pliage Rège plate	D' C 5.00 NB :le pavé droit se construit de la même façon. Dans ce cas, il n'ya pas de plan incliné. C'est un parallélépipèd e rectangle. 20 Activité 8 : Electricité : montage en série – montage en parallèle Les lampes L 1 et L 2 s'allument ou s'éteignent en même temps. Si l'une est hors d'usage, l'autre ne s'allume pas. Les 2 lampes sont traversées par la même intensité de courant I. Si la lampe L 1 a une résistanceR 1 U 1 = R 1 x I La lampe L 2 une résistance R 2 , U 2 = R 2 x I La tension :				

					U = U 1 + U 2 L 1 L 2 1 : montage en série L 1 L 2 2 : montage en parallèle Les lampes L 1 et L 2 s'allument ou s'éteignent en même temps. Mais si l'une est hors d'usage, l'autre peut s'allumer. I = I 1 + I 2 U 1 = U 2 I I I 1 I 2 U 1 = R 1 xI U 2 =R 2 xI U 1 = R 1 x I 1				

					U 2 = R 2 x I 2 G K G K 21 En s'inspirant de la fiche technique, réaliser un panneau électrique pour une expérience sur le montage en série et le montage en parallèle. Fiche technique N° Phase Sous phase Matériaux Outils Procédure Représentation -Découpe du panneau				
bois **-Couper une tablette ou une réglette sur du bois tendre (ou chercher une chute de contre plaqué).** **01 Réalisation du support** **Fixation des fils et des vis** **-vis en acier de**	1 tige ou une lame mince magnétisable 1 flotteur (liège ; polystyrène expansé...) 1 aimant N S L'aiment est un matériau qui a la propriété d'attirer certains métaux. Il présente deux p								

taille adapté (environ 1cm de long) **-ampoule de 2,5V** **-fils souples de faible section** **Tourne vis** **Fixer les fils sur les 3vis et fixer les vis sur le bois de façon à immobiliser l'ampoule.** **02** **Réalisation du boîtier des piles** **Réalisation du cylindre** **Papier épais** **Ciseaux** **règle** **Voir réalisation du cylindre** **03** **Montage de l'ensemble boîtier + pile + fils** **Montage du panneau** **Scotch** **3 ampoules de 3V** **2 piles de 1,5V** **fils** **Ciseaux** **A l'aide de scotch fixer les 2 fils aux bornes des piles dans le boîtier** **22** **Activité 9 : Réalisation expérimentale d'une boussole** **Matériels nécessaires :**	ôles (nord ; sud). La terre se présente comme un gros aimant ayant également son pôle nord au nord et son pôle sud au sud. Quand on dépose dessus une aiguille aimantée, elle voudrait se présenter parallèlement à l'axe nord - sud et dans la même disposition, mais des problèmes d'adhérence au sol l'en empêcherait. N S Aiguille aimantée Terre Fiche technique : En s'inspirant de la fiche technique, réaliser un dispositif expérimental de simulation de la boussole. N° Projection framework in framework								

1 récipient non métallique	cpd to trade orthographics circuite								

Projection framework in framework cpd to trade orthographics circuite :

Career lecture student :1 career outcome , career lecture , 4subject ,8 subject work day ..

Learner engineering work post engineering module engineering electrical „ trade theory

Lecture work periode job

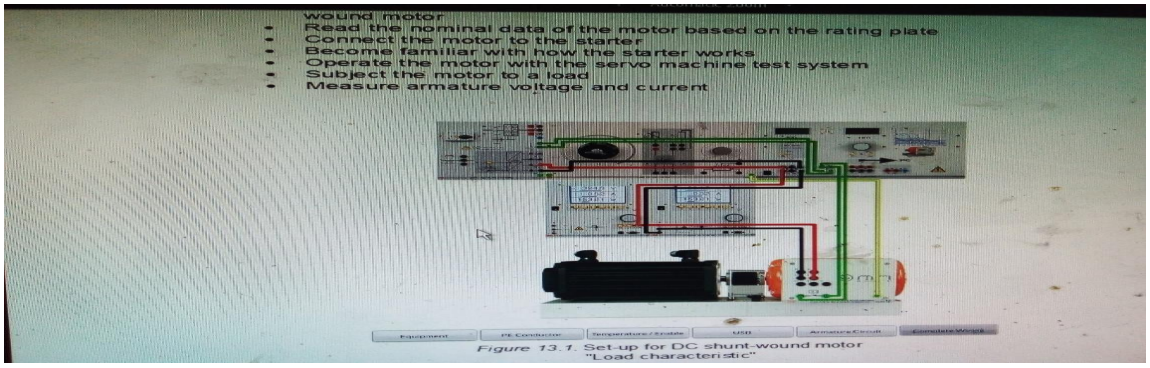
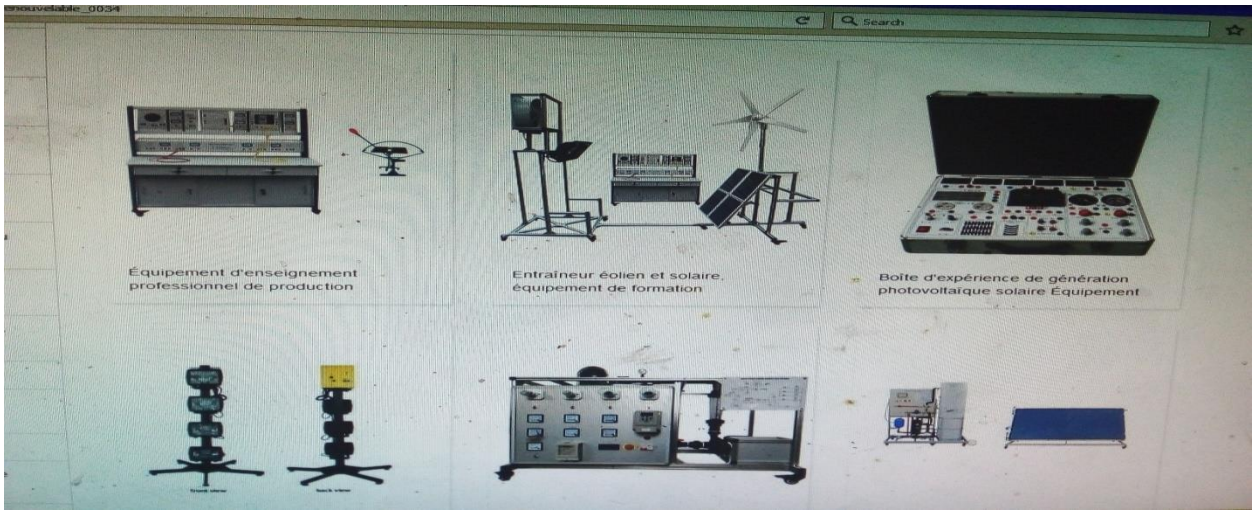


Figure 13.1. Set-up for DC shunt-wound motor "Load characteristic"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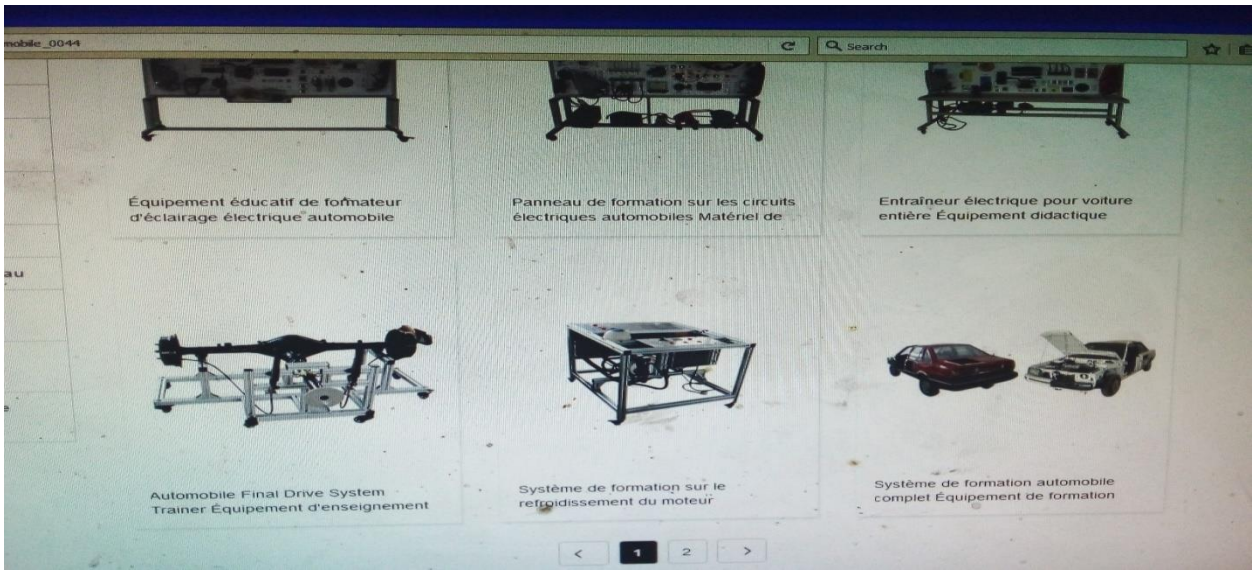
Équipement d'enseignement professionnel de production
Entraîneur éolien et solaire, équipement de formation
Boîte d'expérience de génération photovoltaïque solaire Équipement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Panneau de formation sur les circuits électriques automobiles Matériel de
Entraîneur électrique pour voiture entière Équipement didactique
Automobile Final Drive System Trainer Équipement d'enseignement
Système de formation sur le refroidissement du moteur
Système de formation automobile complet Équipement de formation
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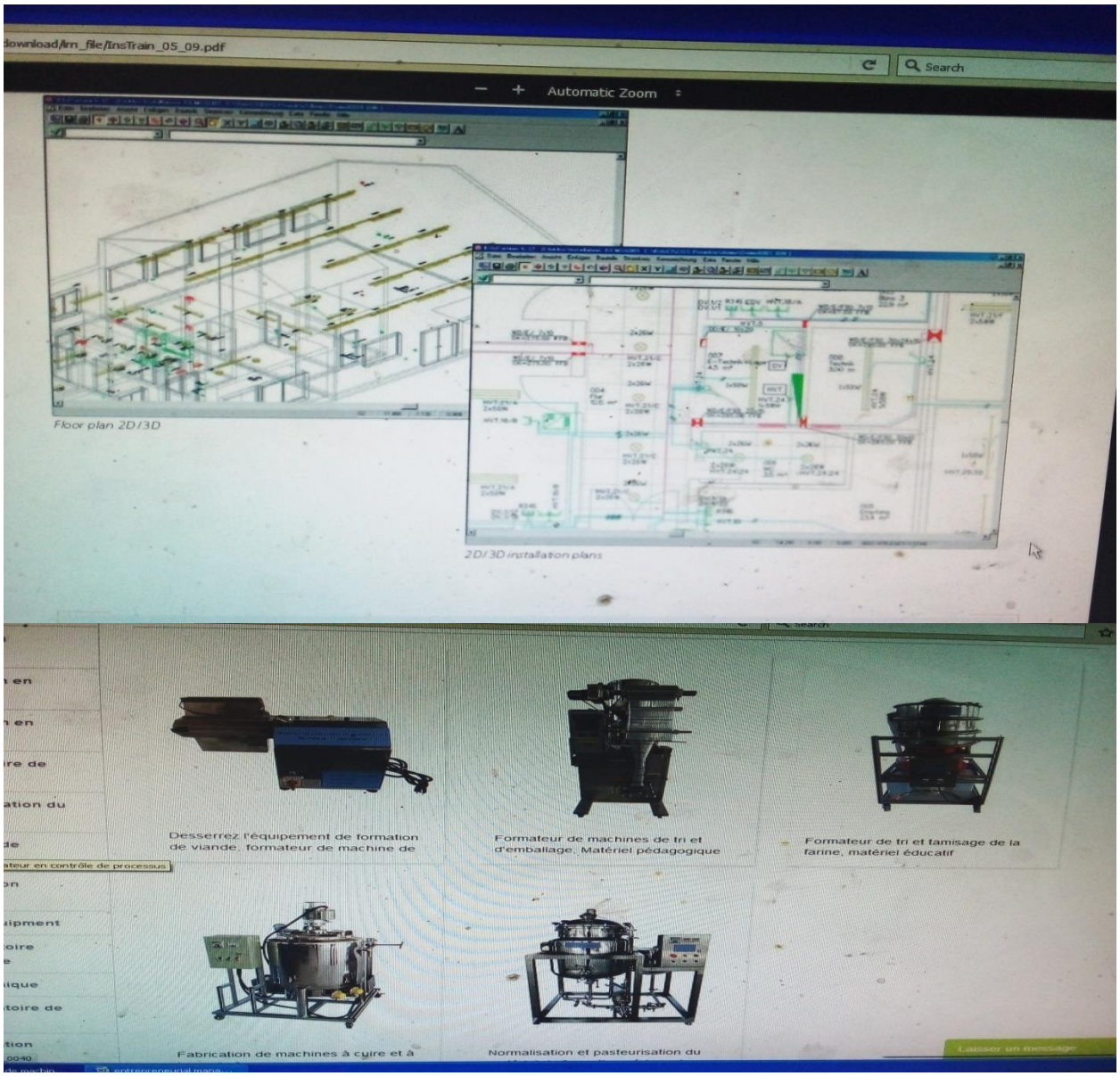
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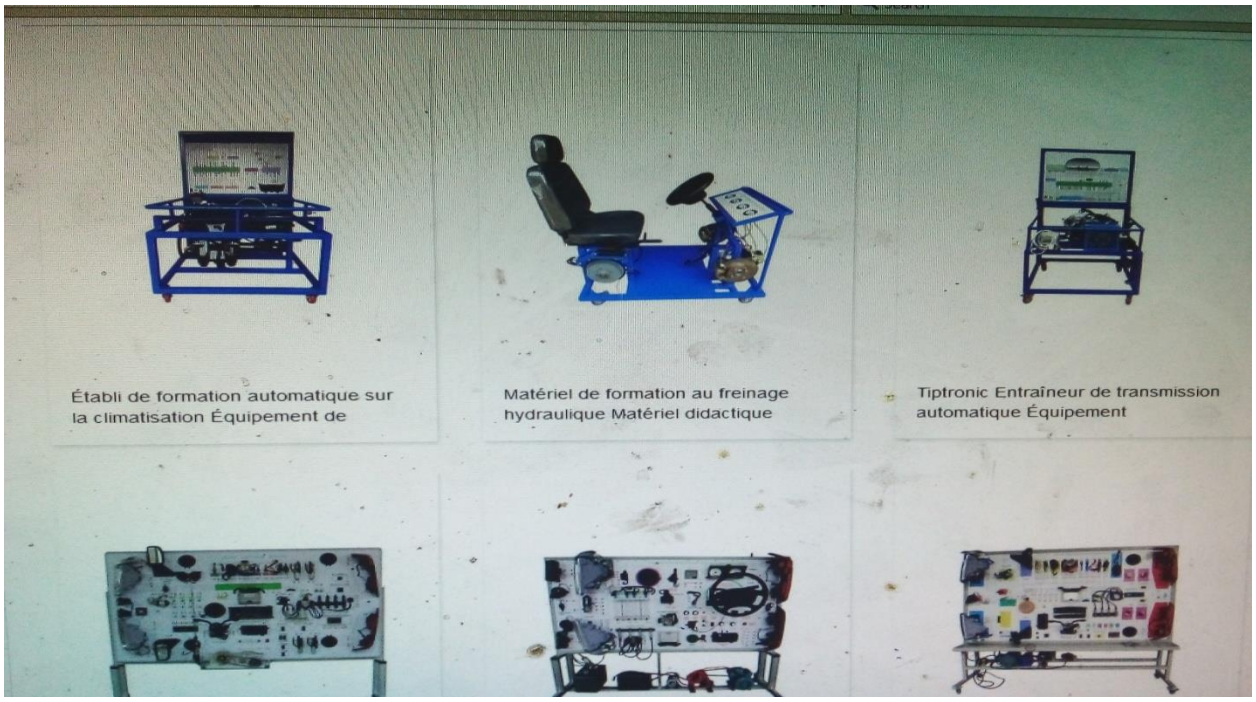
2D/3D installation plans
Desserrez l'équipement de formation de viande, formateur de machine de
Formateur de machines de tri et d'emballage, Matériel pédagogique
Formateur de tri et tamisage de la farine, matériel éducatif
Fabrication de machines à cuire et à
Normalisation et pasteurisation du
Laisser un message


Établi de formation automatique sur la climatisation Équipement de
Matériel de formation au freinage hydraulique Matériel didactique
Tiptronic Entraîneur de transmission automatique Équipement


Matériel didactique Théorie électrotechnique, entraîneur de
PIC Trainer, équipement didactique, kit d'entraînement pour
Boîte d'expérimentation de moteur pas à pas Équipement didactique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Search
Machine à souder à refoulement à montage en surface, équipement de
Machine de gravure de jet de carte PCB, équipement d'expérience de
Machine de gravure de jet complètement automatique,


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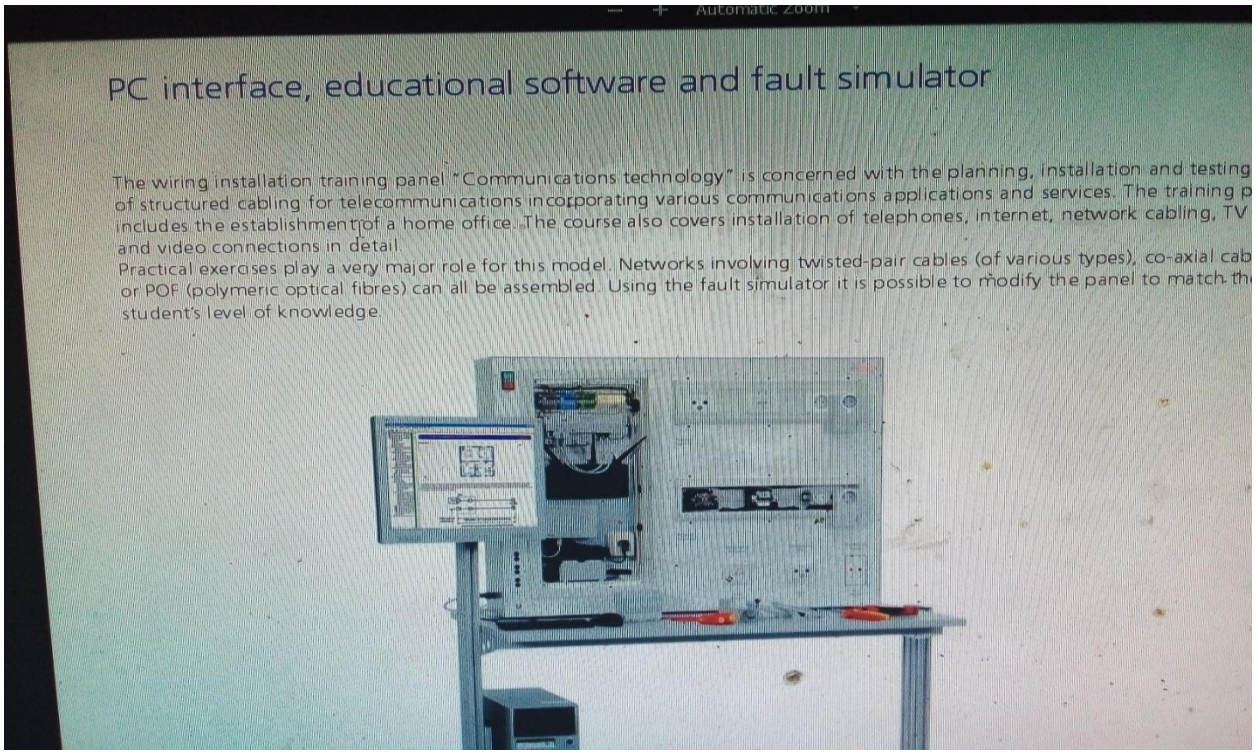
Multimedia Installation Lab
For electrical
wiring installation
instrain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PC interface, educational software and fault simulator
The wiring installation training panel "Communications technology" is concerned with the planning, installation and testing
of structured cabling for telecommunications incorporating various communications applications and services. The training p
includes the establishment of a home office. The course also covers installation of telephones, internet, network cabling, TV
and video connections in detail.
Practical exercises play a very major role for this model. Networks involving twisted-pair cables (of various types), co-axial cab
or POF (polymeric optical fibres) can all be assembled. Using the fault simulator it is possible to modify the panel to match th
student's level of knowledge.

Training in electrical wiring techniques using the "InsTrain" system

- Installation of information technology systems
- Intra-building office communications

Wiring installation training panel "Communications Technology"

page

Practical skills with equipment

Recent developments in career structures in the electrical industries and the changes in emphasis during training mean that practical skills are carrying more and more weight in the sphere of education. A combination of new training media and experiment systems is now playing an increasing role here. Independent learning models where students gain knowledge working on their own and at their own pace provide an optimum basis for teaching skills that last.

Close to real life

In the development of this equipment, Lucas-Nülle have worked together with the leading manufacturers of instruments and software. This means the Lucas-Nülle's InsTrain system provides for highly realistic experience. Trainees using InsTrain always use authentic and up-to-date equipment and the latest data sheets.

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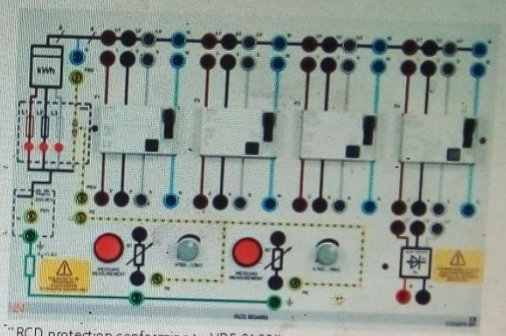
Automatic Zoom

RCDs of type A not only detect fault currents like those to which type-A model react, but also smooth DC fault currents. RCDs of this kind thus detect all types of fault current according to their tripping characteristics, i.e. both smooth DC fault currents and all varieties of AC fault current at all pure or mixed frequencies up to 1 MHz are detected and reliably cut off in the event of a fault. At the same time, it is necessary for selective cut-off to be ensured when RCDs are connected in series one after the other.

Training contents

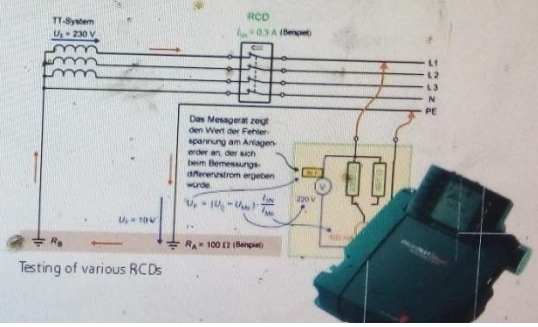
- Design and function of various RCDs
- Use of RCDs in various mains systems (TN, TT)
- Selection of RCDs as appropriate to their application (DIN VDE 0100-530:2005-06)
- Design of selectively staggered fault current protection (DIN VDE 0100-300:1996-01)
- RCDs used as ancillary protection as per DIN IEC 60364-4-41 (VDE 0100 Part 410)
- Use of type-B RCDs in educational establishments (DIN VDE 0100-723)
- Use of type-A or type-B RCDs for various types of fault current
- Measurement and evaluation of various tripping criteria for DC and AC



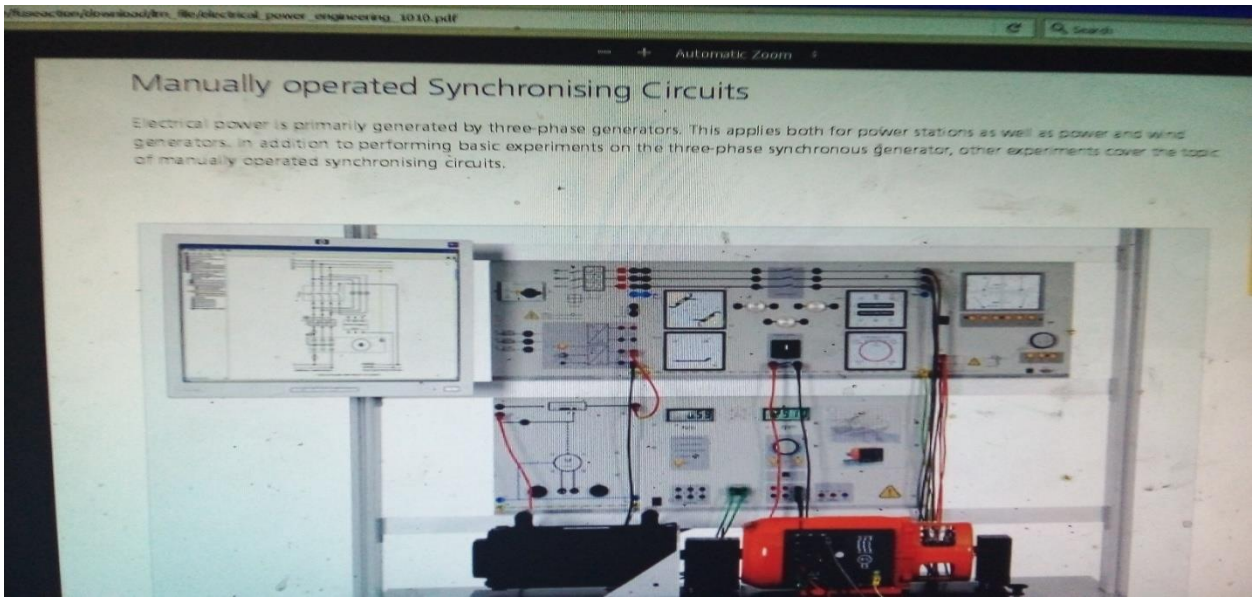
"RCD protection conforming to VDE 0100" – equipment for ESM5

Includes

- Mains system variants, TN or TT systems
- Generation of DC for type-B RCDs
- Four different varieties of RCD: 300mA type A, 300mA selective type A, 30mA type A, 30mA type B
- Additional earthing and fault simulation resistors
- Measuring button to protect against heat damage



Testing of various RCDs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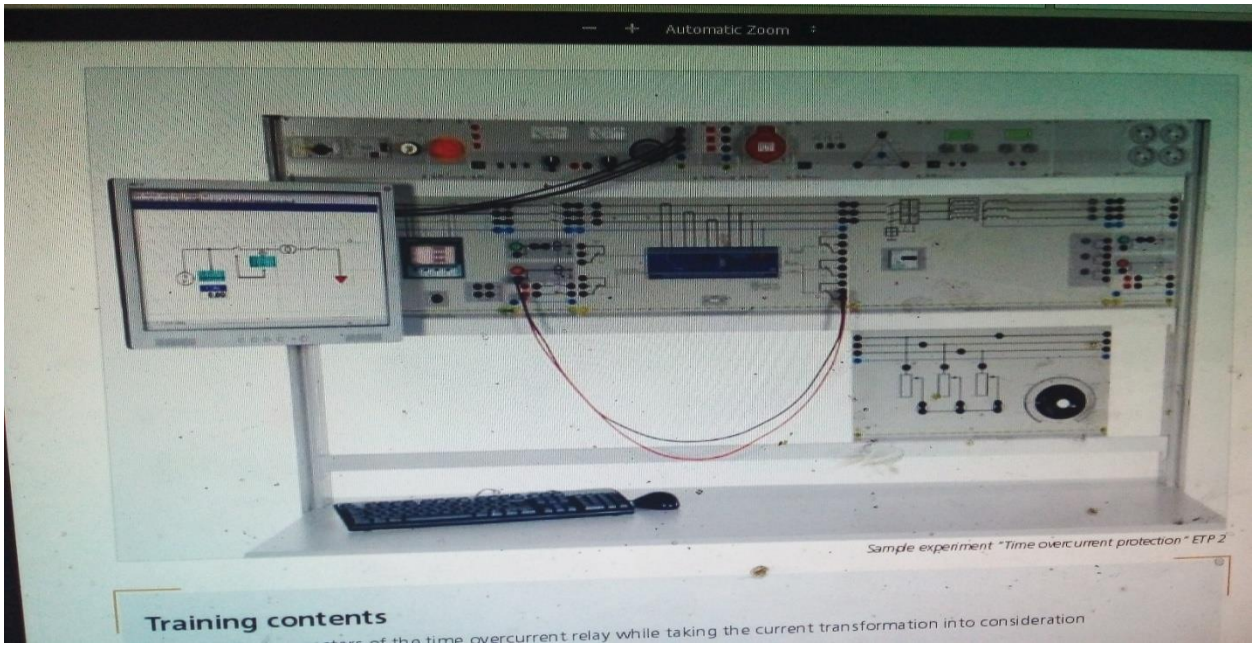
Manually operated Synchronising Circuits
Electrical power is primarily generated by three-phase generators. This applies both for power stations as well as power and wind generators. In addition to performing basic experiments on the three-phase synchronous generator, other experiments cover the topic of manually operated synchronising circuits.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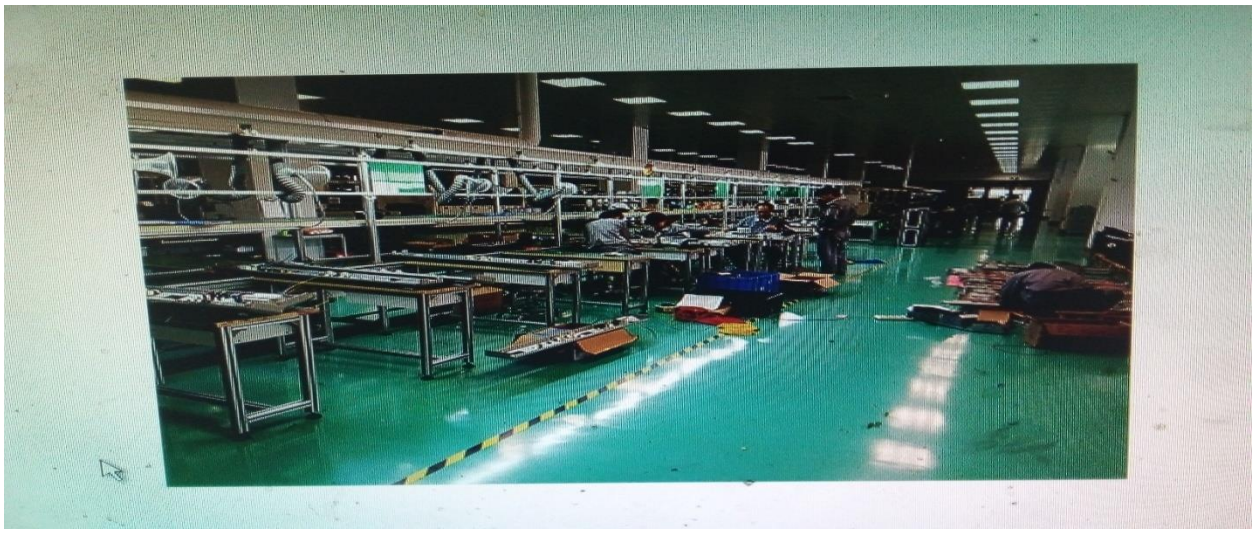
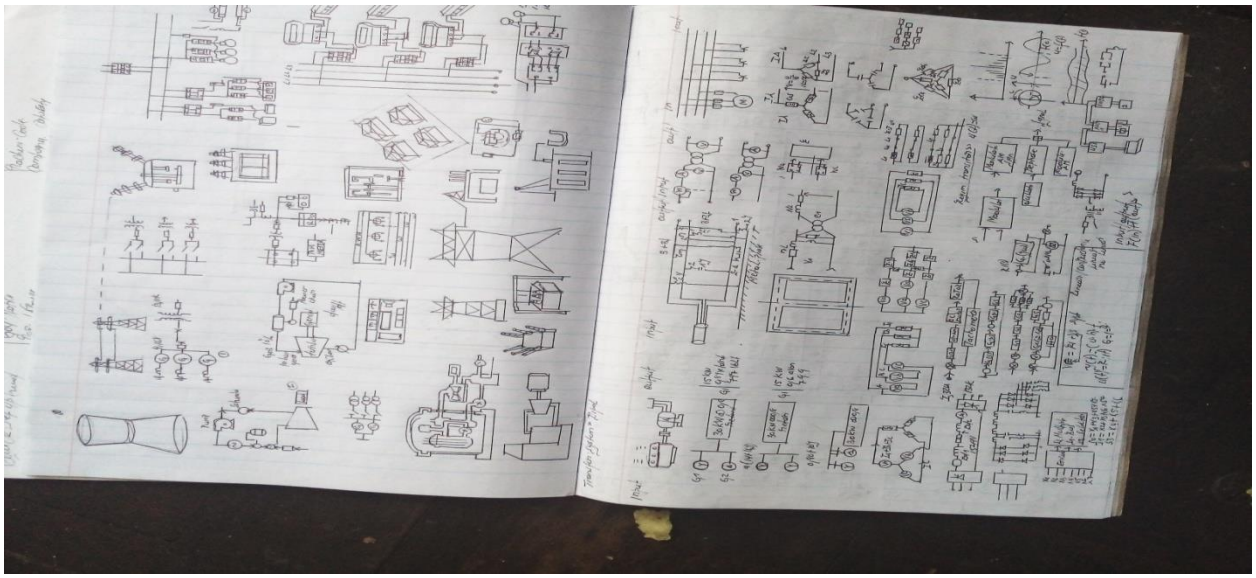
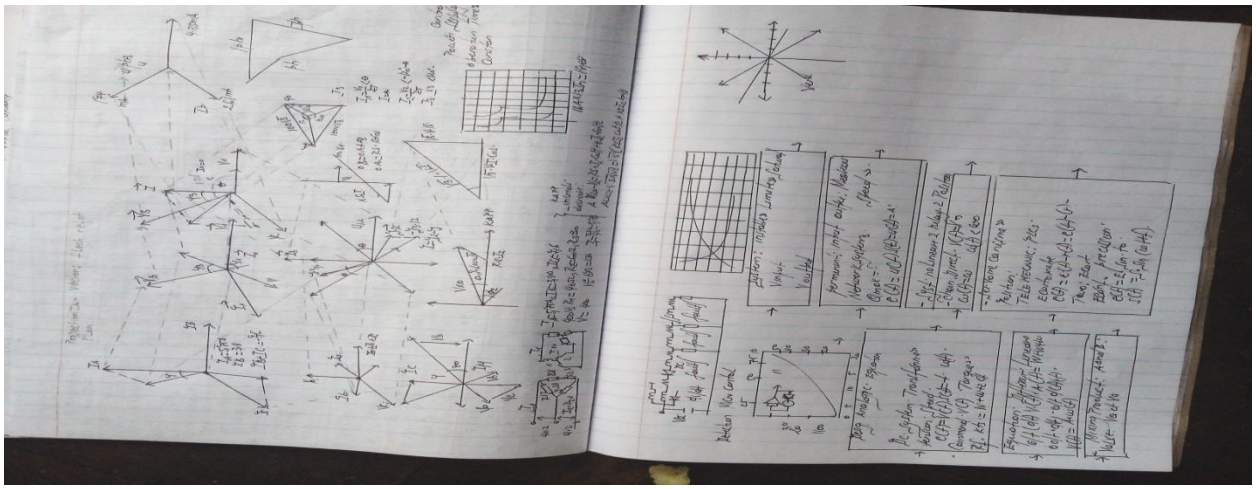
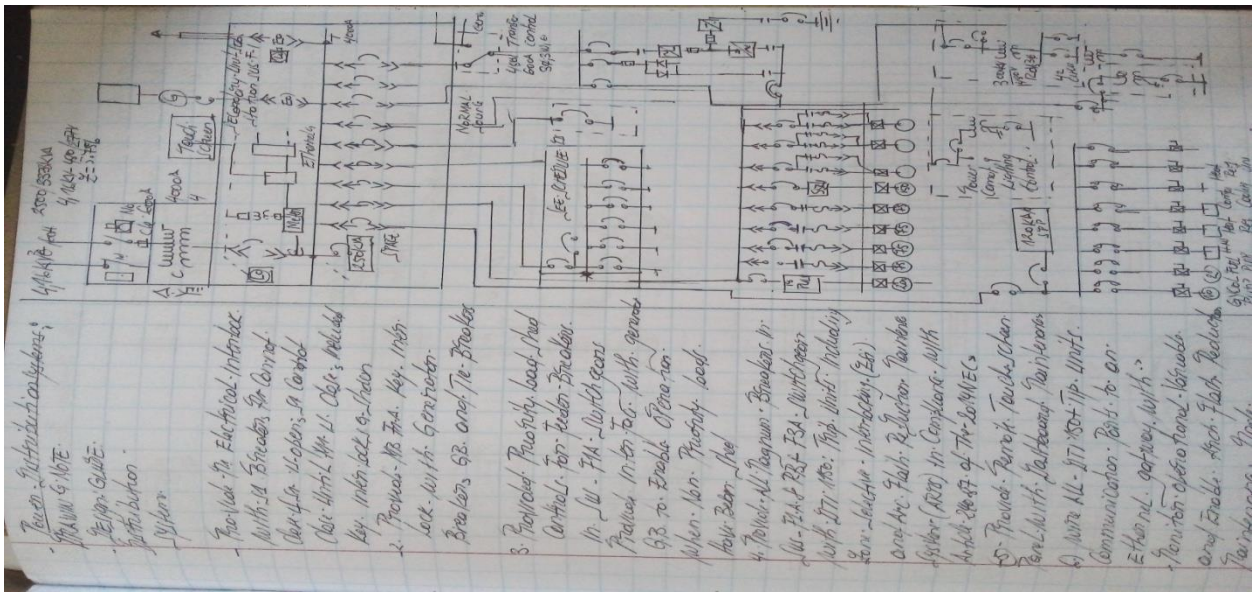
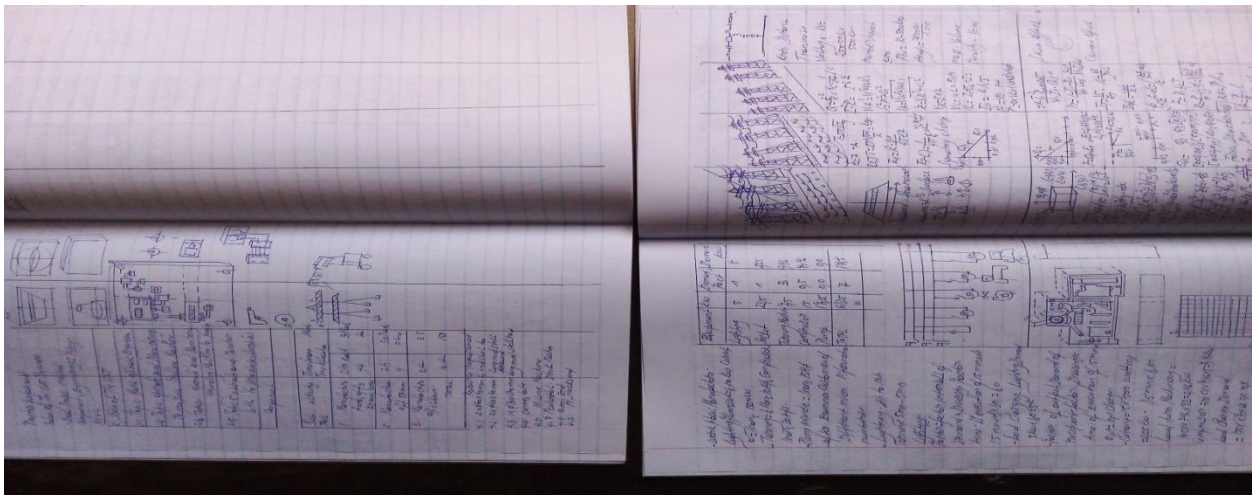
Sample experiment "Time overcurrent protection" ETP 2
Training contents
of the time overcurrent relay while taking the current transformation into consideration

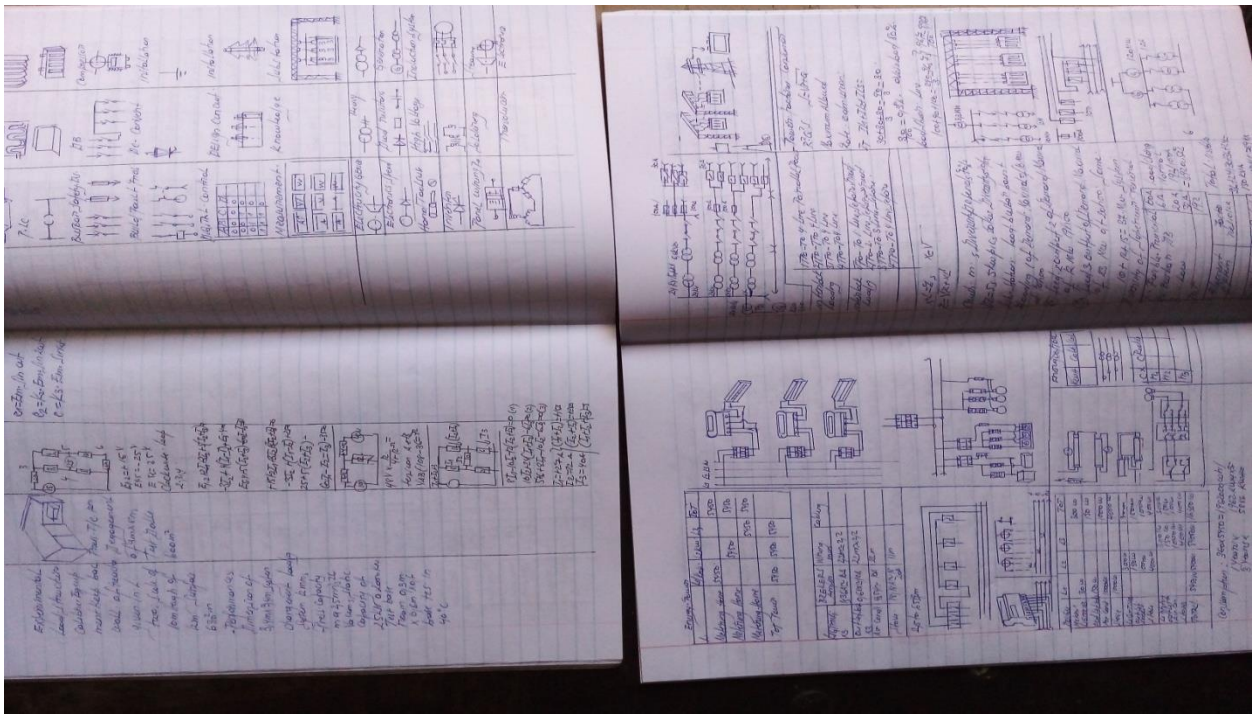


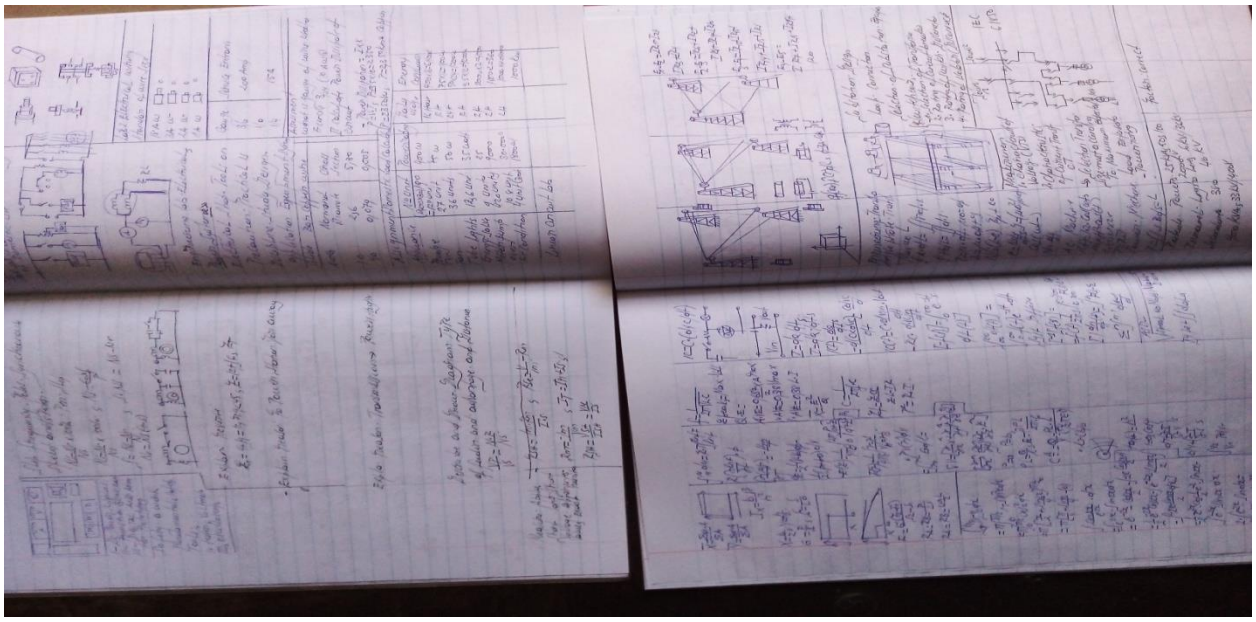


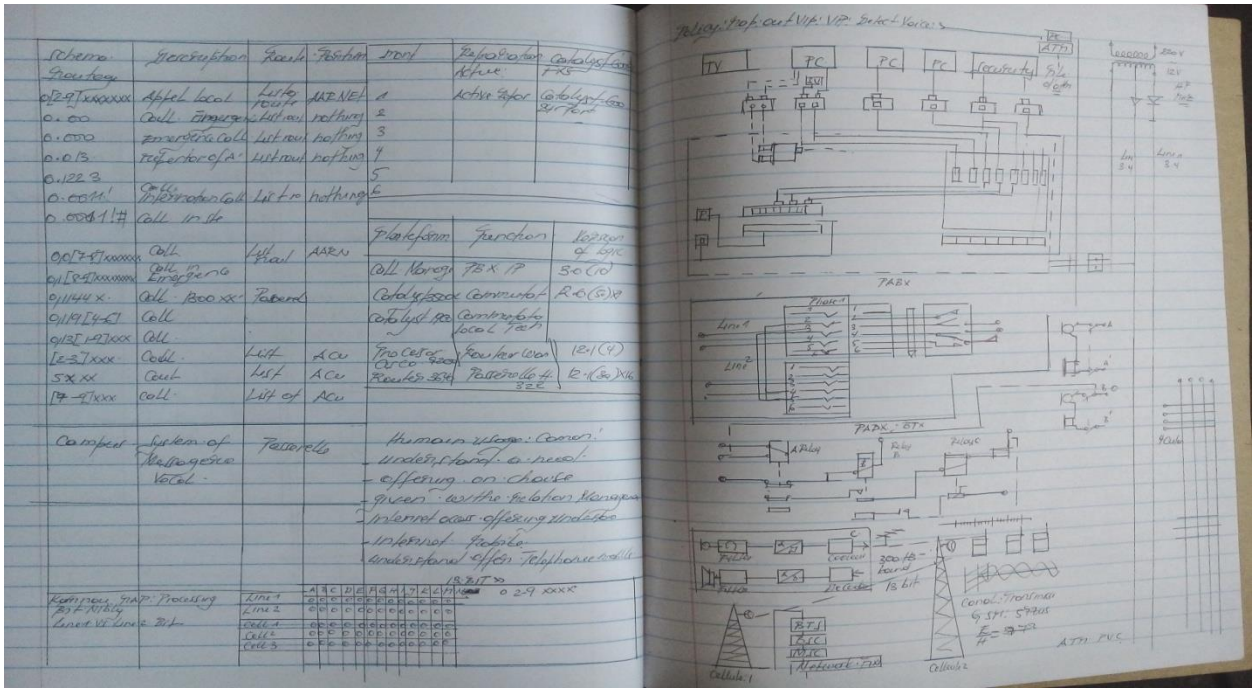


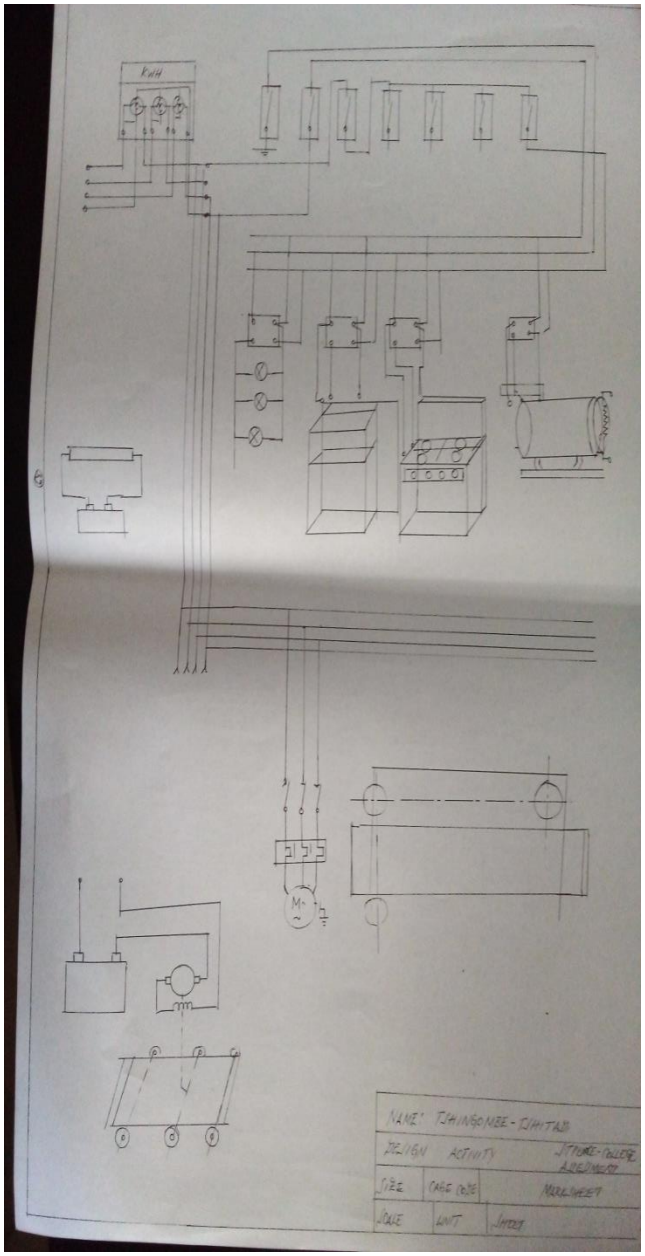


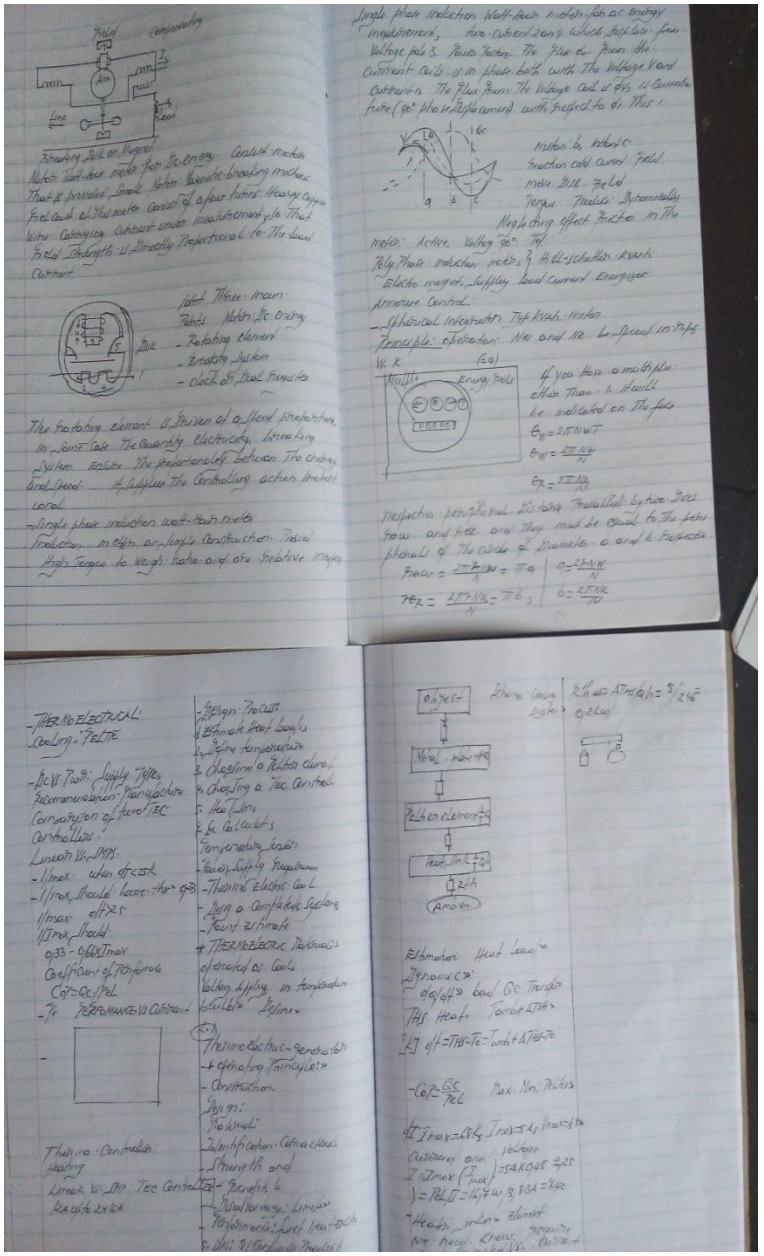


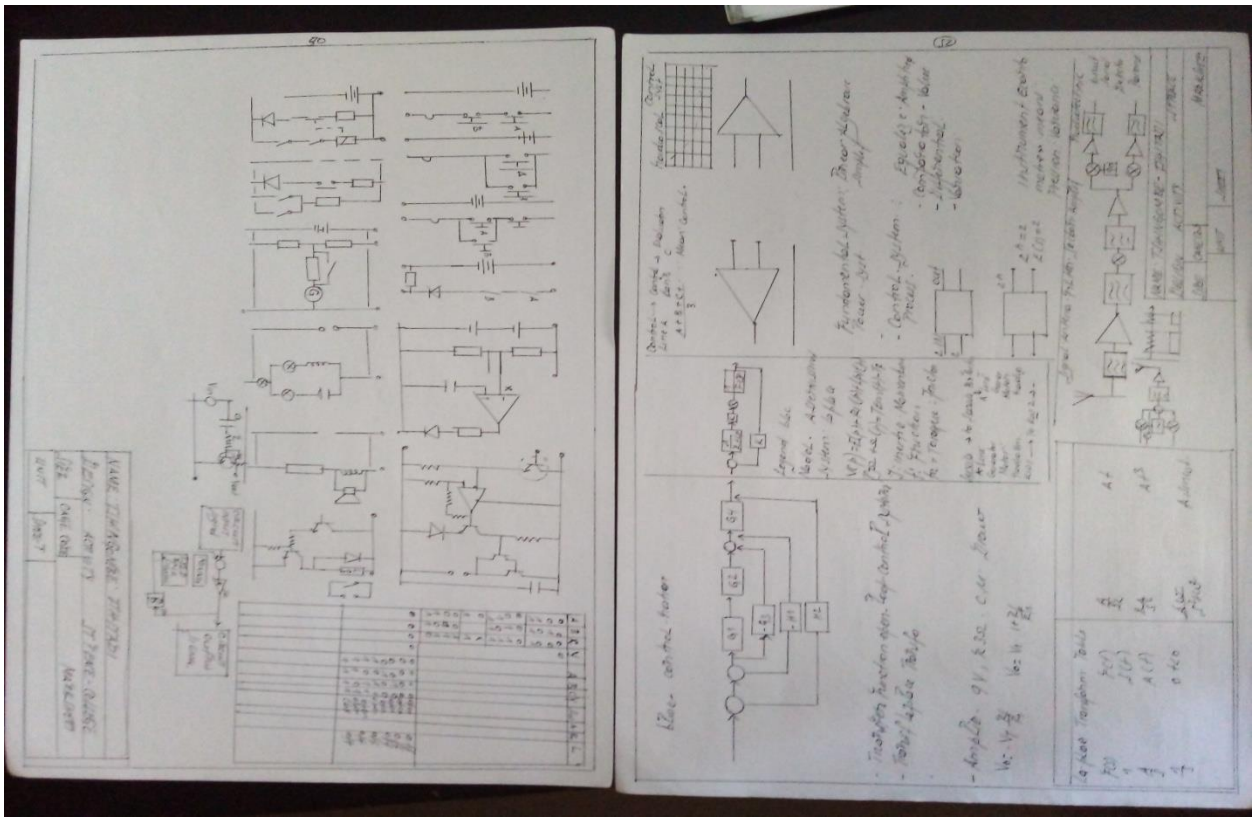


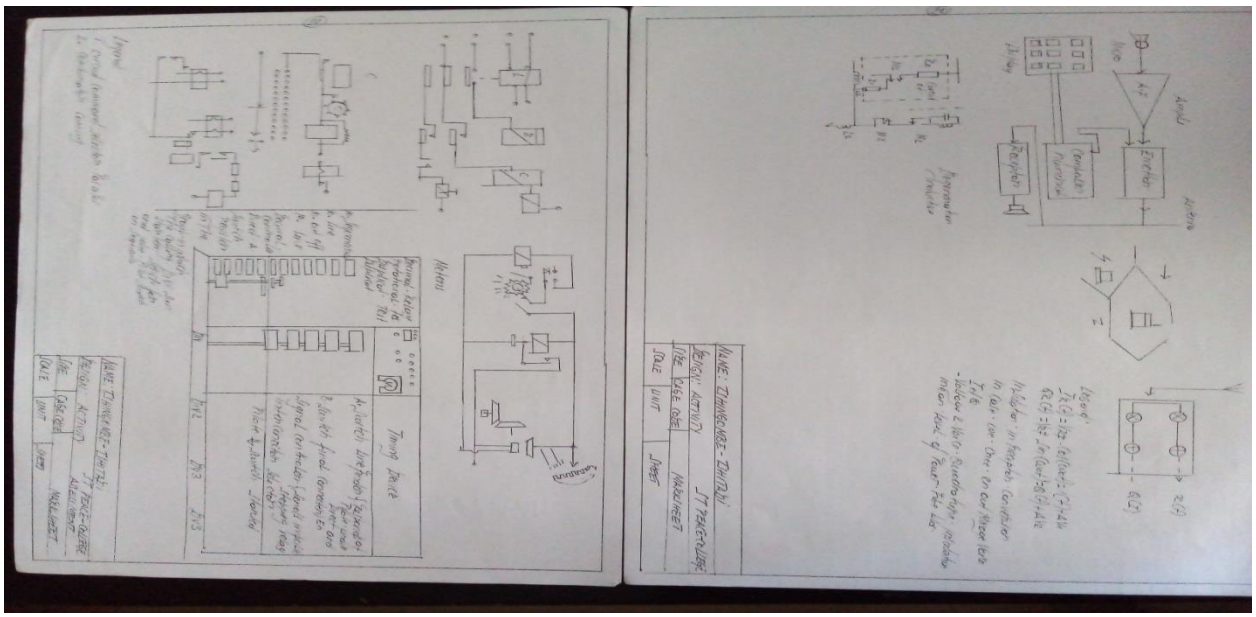


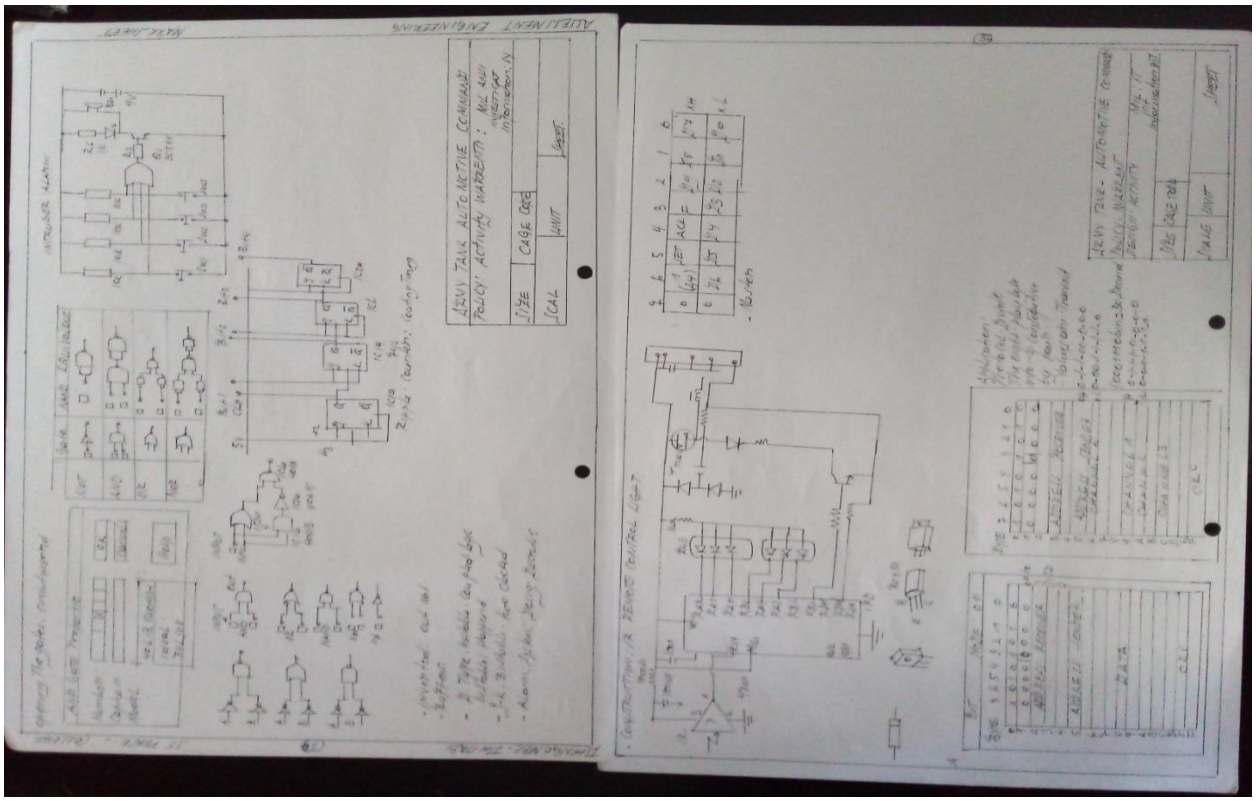


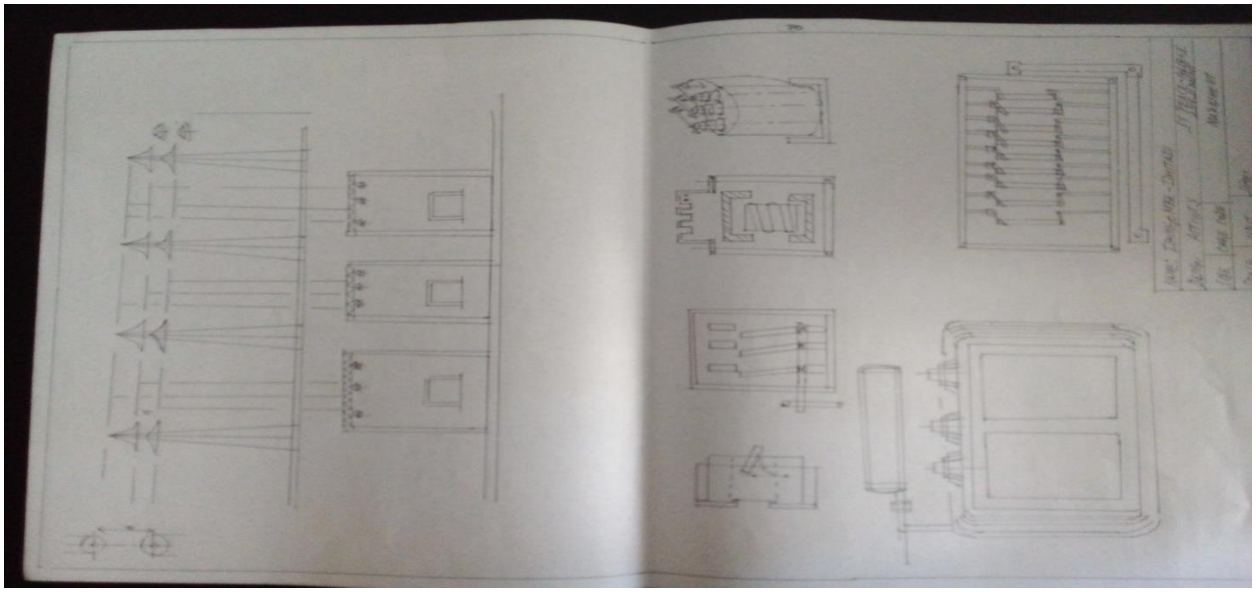


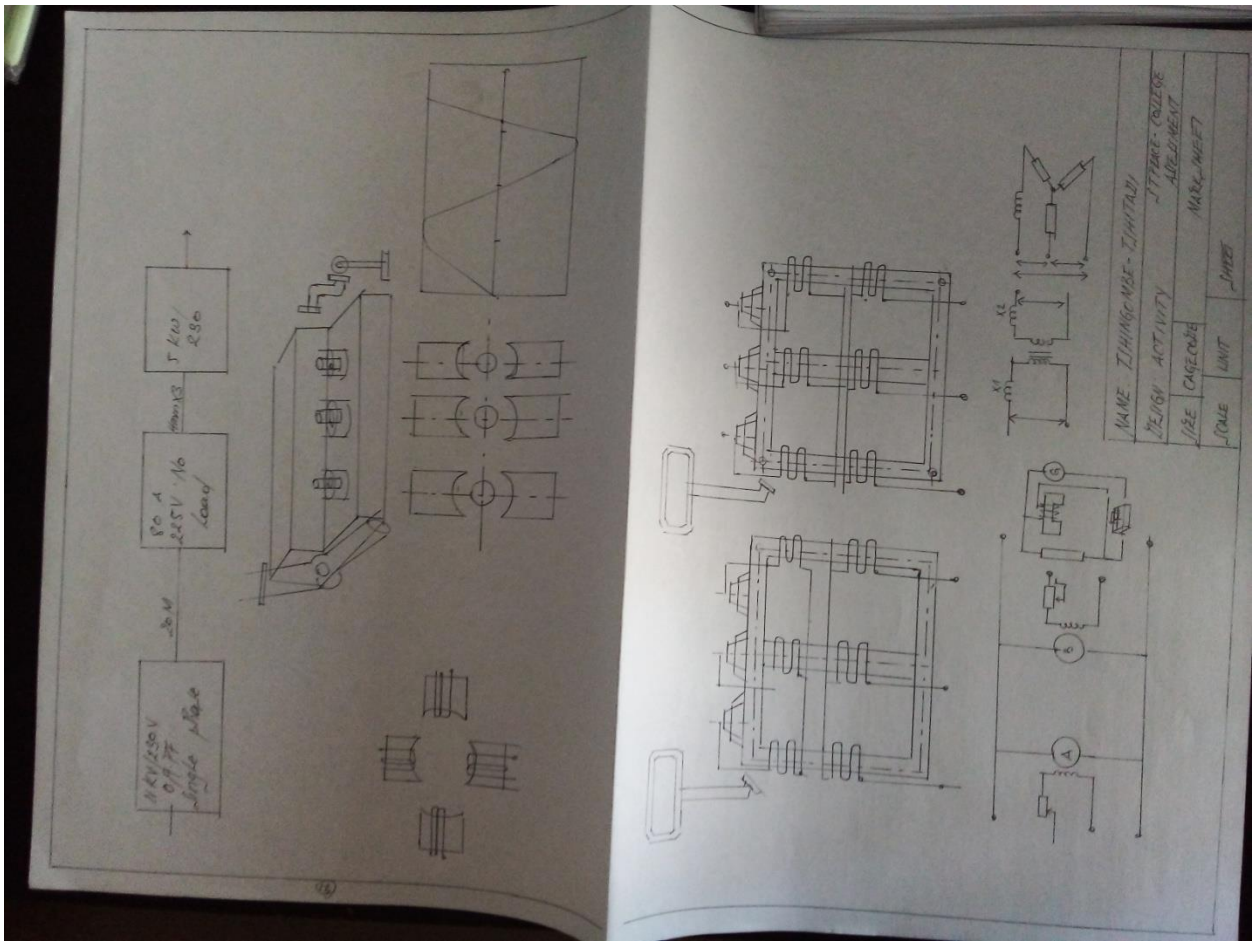


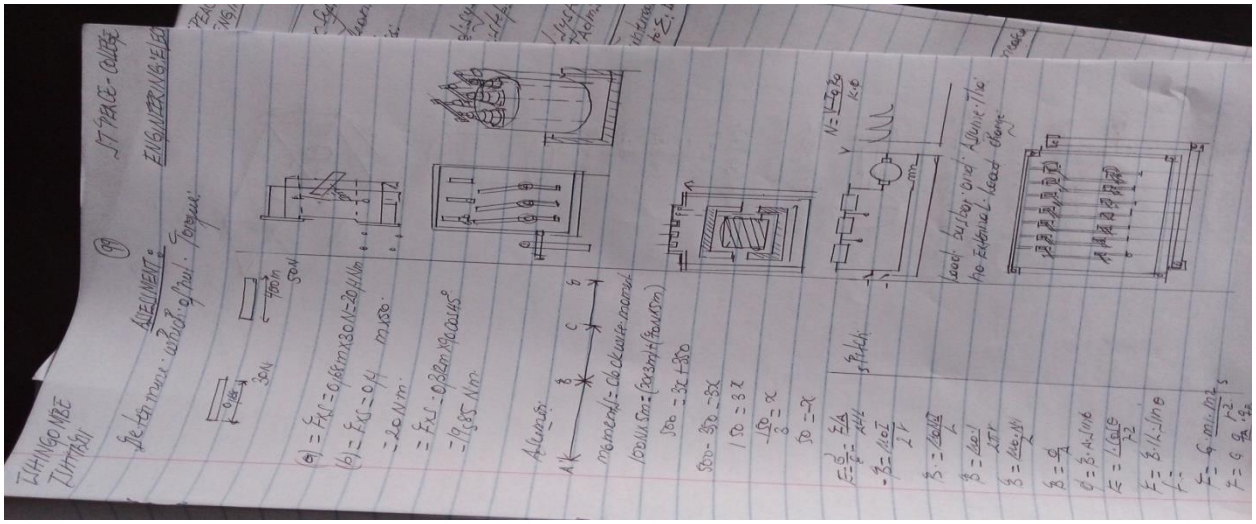


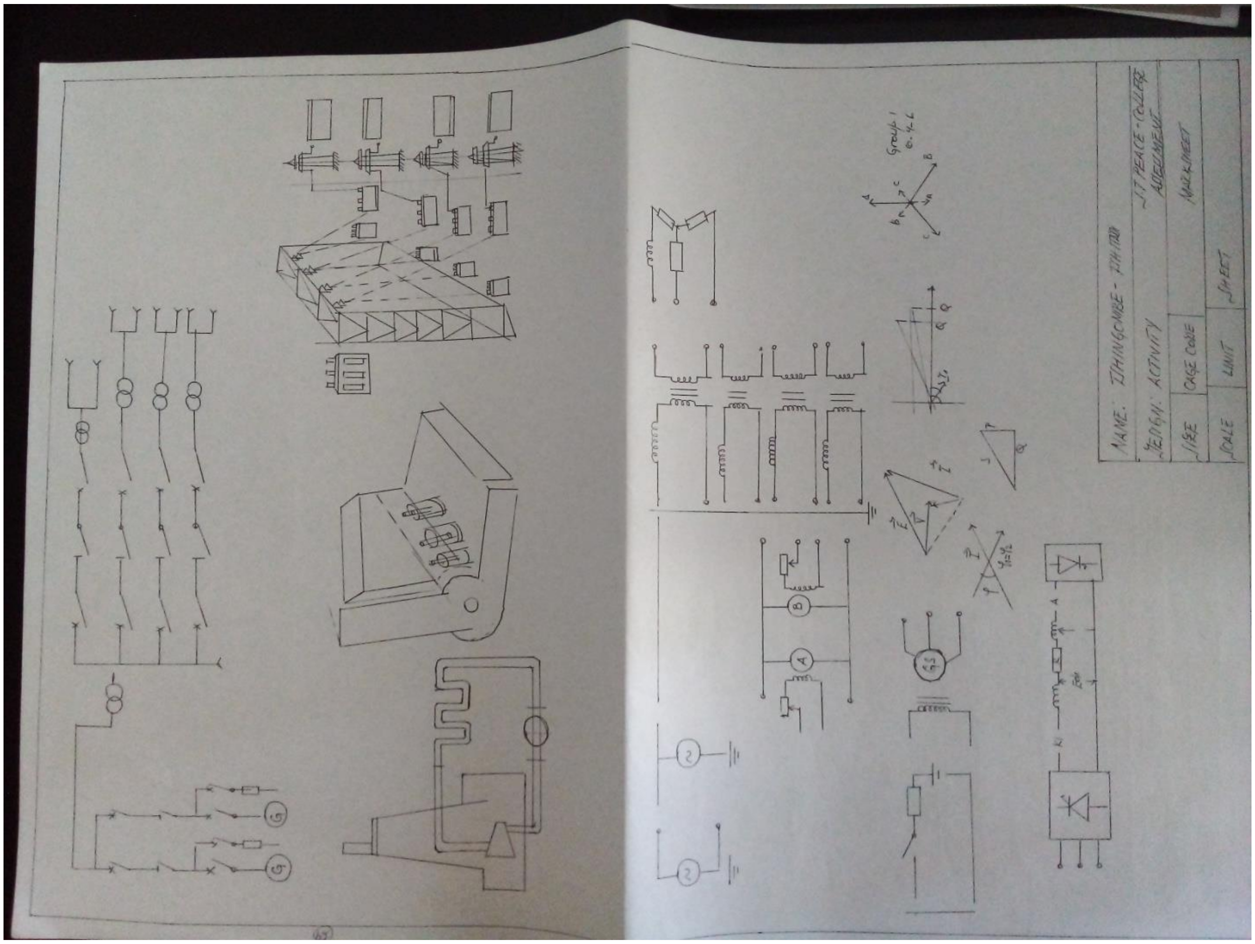


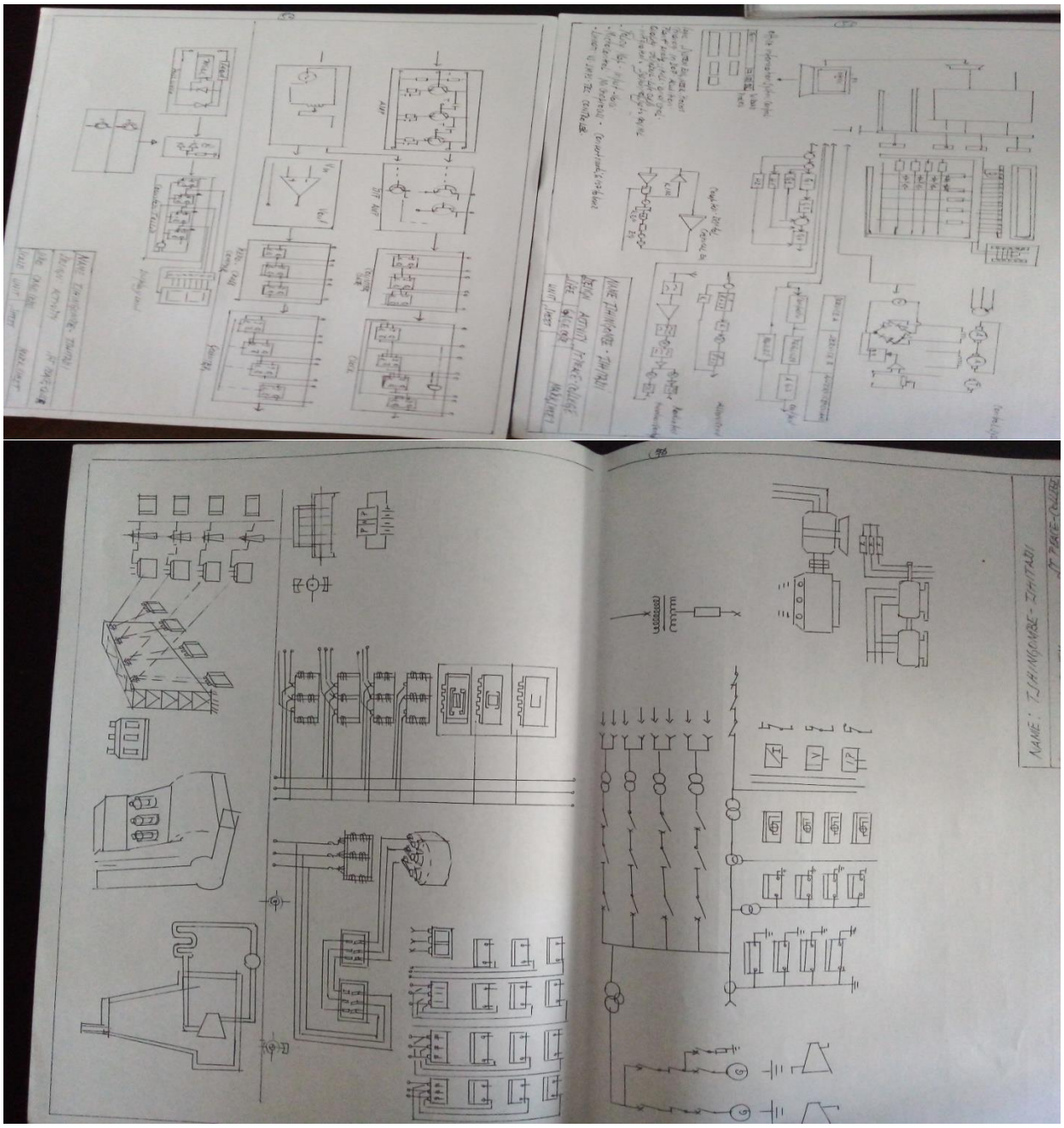












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2. 1Design work base methodology research / criteria requirement	**y**	**n**

- Experiment 8 Measuring the band gap of a semiconductor
- Experiment 7 Thermoelectric Effect
- Experiment 6 Measuring the induction voltage in a conductor loop moving within a magnetic field
- Experiment 4 Analysing the thermodynamic cycle of the heat pump using the Mollier diagram
- Experiment 1 Magnetic field outside a straight conductor
- Physics Practical on Determining speed of sound in air

Warning: TT: undefined function: 32
EXPERIMENT 5: Measuring the magnetic field of an air coil

Objectives - Measuring the magnetic field B of a long air coil as a function of the current I. - Measuring the magnetic field B of a long air coil as a function of the length L and the number N of turns of the coil.

Apparatus 3*coils, 1*high-current power supply, 1*teslameter, 1*axial B-probe, 1*multicore cable, 6-pole, 1 m long, 1*stand for coils and tubes, 1*saddle base

Experimental set-up

The equipment was set up as in diagram.~ The coil was laid on the stand for coils and tubes, with variable number of~ turns per unit length, and the high-current power supply was connected to it. The axial B-probe was connected to the teslameter by means of the multicore~ cable, clamped with the stand rod from the scope of supply of the probe, and aligned so that the Hall sensor (a) was positioned in the centre of the plastic body of the coil.

Experimental procedure Measuring as a function of the current I: The zero of the teslameter was calibrated with the key Compansation. A~ measuring range of 20 mT was selected at the teslameter.

Current I was enhanced in steps of 2A and the corresponding magnetic field B~ was noted. Before each new measurement current was turned back to 0A, and the teslameter set to zero. The experiment was repeated for other 2 coils.~

Theory - Biot-Savart law implies that the sum of contributions gives rise to the magnetic field B generated at the location P by an arbitrary conductor through which a current I is flowing. The sum is given by: dB = uo. I ds * r Eq. (I) 4 π r 2 r where uo = 4 π .10-7 Vs/Am r is the radius vector from the respective part of the conductor to the point P vector ds describes the length and direction of the individual parts of the conductor

- **Calculating the total magnetic field calls for the computation an integral. Usually the integral is complex to do but relatively easier for conductors with certain symmetries where an**

analytic solution is obtained.

- For cases where the field of a long coil is calculated, Ampère's law (which also can be derived from Maxwell's equations) is very easier to use. Ampère's law: B. ds = mo. j = uo (II) where j: current density, IA: current through the area A, S: closed boundary curve of the area A
- A and S are chosen In order to calculate the magnetic field of a long coil. The magnetic field inside the coil is parallel to the axis of the coil If the coil is sufficiently long, and almost vanishes outside the coil, i., only on the part S 1 of the boundary curve S will a component of the magnetic field in the direction of the boundary curve be different from zero.
- Therefore we obtain B ds = mo. B ds B L (III) Where L: length of the part S 1
- also I A = N (IV) Where N: number of turns inside A, I: current through the coil
- thus

B = uo

쬑 쀍

- In this experiment, the magnetic field inside a long coil will be measured by means of an axial B-probe in order to verify the result (V). The probe contains a Hall sensor which is sensitive in the direction parallel to the axis of the probe.

Analysis of results

Using B = uo 쬑 쀍

Plotting B against I gives us gradient m =

푆푁 L

From graph 1:

m = 푆푁 L = 0.

쬒쬑 쀍 y intercept, b = -0

From graph 2:

m = 푆푁 L = 0.

쬒쬑 쀍 y intercept, b = 0

From graph 3:

m = 푆푁 L = 0.

쬒쬑 쀍 y intercept, b = 0

NB. For all the statistical calculations (standard deviations about regression, of the slope, of the intercept, etc) please refer at the back of graphs.

Discussion:

- The experiment investigated the effects on the induced magnetism of changing the current flowing at fixed length and fixed number of turns of the coil.
- For all the graphs y intercepts were so small for significant changes that it can be negligible.
- Therefore we would have B = mI. From which we can conclude that the magnetic field in a cylindrical coil is directly proportional to the current flowing in the coil.
- There were possible sources of errors: ▪ Random errors might have come from setting the current from the analog knob. ▪ The accuracy of the experiment dependent on the sensitivity of the Hall sensor. If it was not minutely sensitive then errors surfaced in the calculations. ▪ If there were other magnetic objects around then the magnetic field values measured were not entirely due to the coil.
- To reduce the errors, 3 experiments were done to compare the results afterwards. Since there were only slight differences therefore the experiment

can be considered valid. Also the very small standard deviations makes the experiment acceptable.

Conclusion

- The results take the form B = mI. We therefore conclude that the magnetic field in a cylindrical coil is directly proportional to the current flowing in the coil if the length of coil and the number of turns is fixed.

EXPERIMENT 5: Measuring the magnetic field

of an air coil
Objectives
• Measuring the magnetic field B of a long air coil as a function of the current I.
• Measuring the magnetic field B of a long air coil as a function of the length L and the number N of turns of the coil.
Apparatus
3*coils, 1*high-current power supply, 1*teslameter, 1*axial B-probe, 1*multicore cable, 6-pole, 1.5 m long, 1*stand for coils and tubes, 1*saddle base
Experimental set-up
~ The equipment was set up as in diagram.
~ The coil was laid on the stand for coils and tubes, with variable number of turns per unit length, and the high-current power supply was connected to it.
~ The axial B-probe was connected to the teslameter by means of the multicore cable, clamped with the stand rod from the scope of supply of the probe, and aligned so that the Hall sensor (a) was positioned in the centre of the plastic body of the coil.
Experimental procedure
Measuring as a function of the current I:
~ The zero of the teslameter was calibrated with the key Compansation. A measuring range of 20 mT was selected at the teslameter.

Experiment 8 Measuring the band gap of a semiconductor

Physics II100% (11)

Experiment 7 Thermoelectric Effect

Physics II100% (7)

Experiment 1 Magnetic field outside a straight conductor

Physics II93% (15)

Experiment 8 Measuring the band gap of a semiconductor

Physics II100% (11)

Experiment 7 Thermoelectric Effect

Physics II100% (7)

- **8Experiment 1 Magnetic field outside a straight conductor**

Company

Experiment Name: Verification of the Transformation ratio of the Transformers.
Objective: Determine the Transformation ratio of the Transformers.
:equipment Required
♣ Transformer Board.
♣ Single-phase AC Power Supply 230 V and 50 Hz.
♣ Regulating Transformer, Auto Transformer (0-250V).
♣ 2 Ammeters, range (1-10 A).
♣ 2 Voltmeters, range (0-500 V).
♣ 2 Wattmeters.
♣ Load (R = 1 kΩ).
Experiment Diagram:
Results Table:
Primary Side
Secondary Side
□
□ (V)
□□ (A)
□
□ (W)
□
□ (V)
□□ (A)
□
□ (W)
200
150
100
1
Page | 1
) Experiment No. (
Experiment Name: Determination of Efficiency and Voltage Regulation of a single-phase Transformer by direct loading.
Objective: Determine the Efficiency and Voltage Regulation of a single-phase Transformer by direct loading.
:equipment Required
♣ Transformer Board.
♣ Single-phase AC Power Supply 230 V and 50 Hz.
♣ 2 Ammeters, range (1-10 A).
♣ 2 Voltmeters, range (0-500 V).
♣ 2 Wattmeters.
♣ Load (1 kΩ).
♣ 1 Switch.
Experiment Diagram:
Results Table:
Primary Side
Secondary Side
□
□ (V)
□□ (A)
□
□ (W)
□
□ (V)

□□ (A)
□
□ (W)
2
) Experiment No. (
Experiment Name: Determining the no-load characteristics of the single-phase transformer.
Objective: Determine the no-load characteristics of the transformer in the TRANSFORMER BOARD as: □□□ □□□□ □□.
:equipment Required
♣ Transformer Board.
♣ Single-phase AC Power Supply 230 V and 50 Hz.
♣ Regulating Transformer, Auto Transformer (0-250V).
♣ Ammeter, range (1-10 A).
♣ Voltmeter, range (0-500 V).
Experiment Diagram:
Connection circuit diagram of a transformer to determine the no-load characteristics.
Results Table:
No-load characteristics of the single-phase transformer

□ (V)	□□ (A)
0	
25	
50	
75	
100	
140	
160	
180	
200	
220	
230	

3
) Experiment No. (
Experiment Name: Single-phase Transformer current and voltage ratios with different types of loads.
Objective: The object of this experiment is to measure the load current □□ and the secondary voltage □
□ of a single-phase transformer with different types of loads.
:equipment Required
♣ Transformer Board.
♣ Single-phase AC Power Supply 230 V and 50 Hz.
♣ Resistive, Inductive and Capacitive loads.
♣ Ammeters, range (1-10 A).
♣ Voltmeters, range (0-500 V).
Experiment Diagram:
Results Table:
Transformer load voltage and current with different types of loads□

Load	□□ (mA)	□ (V)
□□ No-load		
□□ Lamps (R)		
□□ Inductive (L)		
d□ Capacitive (C)		

4
) Experiment No. (
Cage Rotor)-(Squirrel phase induction motor-Operation of a three :Experiment Name in star and delta circuit.
Objective: Operate the three-phase induction motor first in star and then in delta connection, find torque characteristics.
:equipment Required
♣ Three-phase Induction Motor (Type 2707)
♣ Brake Unit (Type 2719)
♣ Control Unit (Type 2730)
♣ Universal Power Supply (Type 2740)
Experiment Diagram:
Results Table:

2nd sub-value	1st sub-value
Min. speed	
Pull-out torque	
Rated speed	
No-load speed	
Characteristic points at	
Nr (r.p.m)	
T (N.m)	

5
) Experiment No. (
Experiment Name: Efficiency, current and power factor of a three-phase Induction Motor.
Objective: Determine the characteristics for efficiency, current and power factor of a three-phase induction motor with squirrel cage rotor.
:equipment Required
♣ Three-phase Induction Motor (Type 2707).
♣ Brake Unit (Type 2719).
♣ Control Unit (Type 2730).
♣ Universal Power Supply (Type 2740).
♣ Power factor meter (10 A).
♣ Ammeter, range (1-10 A).
♣ Voltmeter, range (0-500 V).
Results Table:

2nd sub-value	1st sub-value
Min. Speed	
Pull-out torque	
Rated speed	
No-load speed	
Characteristic points at	
Nr (r.p.m)	
T (N.m)	
(kW)	
V (Volt)	
I (A)	
(kW)	

η
6
Experiment Diagram:
Page | 7
: BUILDING A MODERN POWER ELECTRONICS AND ELECTRIC
MACHINES LABORATORY. Topics
Lecture
(hours)
1 Review of basic single/three-phase circuits 3
2 Review of rotational motion and magnetic field; The linear DC machine 6
3 Transformers: Ideal transformer; Real single-phase transformer 6
4 Introduction to AC machinery fundamentals 6
5
Synchronous generators: The speed of rotation; Internal generated
voltage; Equivalent circuit; Phasor diagram; Power and torque
6
6 Synchronous motors: Basic principles of operation 6
7
Induction motors: Basic concepts; Equivalent circuit; Power and toque;
Torque-speed characteristics
6
8 Introduction to DC machinery fundamentals 6
Page 12.329.3
Table II. Course structure of Power Electronics I
No. Topics
Lecture
(hours)
1 Introduction to Power Electronics 1
2 Semiconductor devices 2
3 Review of basic electrical concepts 4
4 Line-frequency Diode Rectifiers 5
5 Line-frequency Phase Controlled Rectifiers and Inverters 4
6 DC-DC Switch-mode Converters 4
7 PWM with bipolar and unipolar switching 4
8 Switch-mode DC-AC Inverters 4
9 Power Supply Applications 4
10 Motor Drive Applications 4
11 Computer Lab 9
A newly developed Power Electronics and Electric Machines Laboratory is strongly coupled
with the power program requirements of Figure 1 and course structure of Table I and Table II.
With the help of three modern facilities, Modular Lab-Volt equipment, Power-pole board, and
DSPACE, all topics in the two prerequisite courses are covered in the Laboratory course as an
efficient utilization and combination of these three totally different methods. The structure of
Power Electronics and Electric Machines Laboratory is shown in Table III.
Table III. Structure of Power Electronics and Electric Machines Laboratory
No. Topics Description Equipment
1 Transformers
Determination of transformer parameters by performing no
load and short circuit test. Voltage Regulation and
Efficiency.
Lab-Volt
2
AC/DC
Rectifiers
Operation of Single-phase and Three-phase Diode/Thyristor
rectifiers;
Lab-Volt
Power-Pole
3
DC/DC
Choppers
Introduction to DC/DC choppers: Buck, Boost, Buck-Boost
choppers;
Verification of output voltage versus duty ratio; The effect of switching control signal
frequency;
Measurement of the output power versus input power.
Lab-volt
Power-pole
4
DC/AC
Inverters
Variable voltage, variable frequency single – phase switchmode
single-phase and three-phase inverters.
Lab-Volt
Power-Pole
5
Synchronous
Motors and
Generators
The effect of load changes on a synchronous motor;
The effect of field current changes on a synchronous motor;
The effect of load changes on a synchronous generator
operating alone.
Lab-Volt
6
Introduction
to DSPACE
Mechanical systems modeling.
Example of building a real-time system through simulink
and DSPACE.
Operation and control of DC machines by using DSPACE.
DSPACE
7
Induction
Motors
Determination of induction motor parameters.
Steady state performance at various torque loadings.
Control of induction machines
Lab-Volt
DSPACE
Page 12.329.4
New Laboratory Workstations

Power Laboratory at Cleveland State University consists of three Lab-Volt test benches, four Power Board test benches and four DSPACE test benches.
Lab-Volt Test Benches
The Lab-Volt Power Electronics Training System is a versatile, flexible, modular, and complete
teaching system [1]. It consists of all different types of modules including power supplies, power
electronics circuits and variable-speed drive modules, AC and DC machines and transformers,
wiring cables, control panels, power meters and various measuring instruments [2]. Lab-Volt test
bench is shown on Fig.2.
Figure2. Lab-Volt Test Bench
Power-pole board Test Benches
The Power-pole boards shown on Fig.3 is a building-block-based power electronics reconfigurable circuit board which contains power-pole circuit as well as on-board isolated drive
circuits, PWM generation, fault protection, output filter, and switched load [3]. The main feature
of the Power-pole Board is the reconfigurable power-pole consisting of two MOSFETs and two diodes. The drive circuits for the MOSFETs are incorporated on the board, and so are the various
Page 12.329.5
protection circuits for over current and over voltage. PWM signals to control the MOSFETs can
be generated onboard or supplied from an external source. The power-pole can be configured to
work in various topologies using three magnetic boards which plug into the Power-pole board. In
addition, there is an option of doing frequency analysis of each topology by injecting a smallsignal
sinusoidal control voltage. The board can also be operated in voltage/current feedback
mode using an external control circuit mounted on a daughter board which plugs into the Powerpole
board [4].
Figure3. Power-Pole Board
DSPACE Test Benches
DSPACE DSP controller board shown on Fig.4 is an interface between the host computer, the driving circuit, and the motor drive system, including PWM inverters, transducers, serial interfaces, sensors, etc. One of the best features of the DSPACE package is the ease of building real-time applications [5]. DSPACE has a software interface to the controller board based on
MATLAB-SIMULINK. Since SIMULINK is a block-oriented, graphical interface based
simulation package that works within MATLAB environment, students do not have to write a code

Qualifications Through Quality
Training Systems for Electrical Power Engineering
Animated Presentation of Complex Training Material
Project-based Training Media – Adaptable to any Training System
From Power Generation Through to Consumption
The Intelligent Electrical Power Grid of the Future
Networked Systems in the Power Engineering Lab
Well-equipped for the Future
SCADA Power-LAB Software
The Entire System at a Glance
More Than Just a Training System
The Power Engineering Lab is a Complete Solution
Contents
Fundamentals of Power Engineering
DC, AC and Three-phase Technology (UniTrain-I)
Magnetism/Electromagnetism (UniTrain-I)
Measurements with the Multimeter (UniTrain-I)
Mains Systems and Models (UniTrain-I). 25
Current and Voltage Transformers
Power Generation
Three-phase Synchronous Generators (UniTrain-I)
Control and Synchronisation
Generator Protection
Renewable Power 38
Photovoltaics (UniTrain-I)
Advanced Photovoltaics
Wind Power Plants
Fuel Cell Technology (UniTrain-I)
Advanced Fuel Cell Technology
Transformers. 58
Three-phase Transformers (UniTrain-I)
Investigating Transformers
Transformer Protection
Power Transmission
Investigations on Three-phase Transmission Lines
Parallel and Series Connection of Transmission Lines
Transmission Line with Earth-fault Compensation
Transmission Systems with Synchronous Generator
Line Protection
Power Distribution
Three-phase Double Busbar System
Overcurrent Protection for Double Busbars
Power management
Complex loads, Power Consumption Metering and Peak Load Monitoring
Dynamic Loads
Manually-operated and Automatic Reactive Power Compensation Protection of Electric Loads
Qualifications Through Quality
Training Systems for Electrical Power Engineering
Advances in technology ...
The transition in the energy industry away

from coal, oil and
nuclear power towards renewable energy sources is gaining
momentum. Today, technology is so advanced that solar energy,
wind power, hydrogen power and biomass can be exploited as
environmentally friendly energy sources.
In order for this trend to continue, well-trained technicians and
specialists are needed all over the world.
In the wake of so-called intelligent (smart) power grids, people
all over the world are talking about power generation, transmission
and distribution as well as the protection of power engineering
facilities and the economic exploitation of energy.
... are having a huge impact on training and education
Now, the Lucas-Nülle training system on power engineering
gives instructors the opportunity to demonstrate and convey
the technological context of power engineering to students in a
graphic and practice-oriented fashion.
Electrical power engineering includes the areas of power generation,
transmission, distribution and electrical energy utilisation
as well as safety protective measures used in these areas.
The system is so extremely versatile that it can be adapted to
fit all of the wide-ranging training requirements applicable to
skilled workers, technicians or even engineers.
Your benefits
• Comprehensive, well-rounded program – spanning power
generation and distribution techniques all the way to energy
usage and consumption
• Integration of renewable energies into conventional power
engineering
• System monitoring and controlling using SCADA
(
Supervisory Control and Data Acquisition)
• Modularly designed experiment panel system for the stepby-
step, experiment-based exploration of system interdependencies
• Bus structure of all voltage levels permits rapid and transparent
experiment setup
• Realistic simulation model of a 380-kV transmission line
with 300-km and 150-km sections
• Use of conventional industrial components in cutting-edge
digital technology
• High work-safety standards through the exclusive use of
safety sockets and safety connecting leads

• Protective technology measures for all areas of power engineering
4
Lucas-Nülle
Manuals
Manuals provide, in addition to detailed descriptions of the
experiments, also numerous projects, examples, exercises and
solutions.
Project-based Training Media – Adaptable to any Training System
Multimedia courses
Many experiment instructions are available in the form of multimedia
courses. This permits direct access to the measurement
results of many different instruments. The multimedia courses
contain:
• Questions to monitor knowledge level and learning
• Interactive experiment setups
• Navigation bars
• Animated sections devoted
to theory
Animated Presentation
of Complex Training Contents
5
Lucas-Nülle
From Power Generation
Through to Consumption
Extremely
high voltage
High voltage
The Smart Electrical Power Grid of the Future
Using the Lucas-Nülle equipment sets, it is possible to model an entire power supply grid from power generation
all the way to ultimate consumption.
Nuclear power plant
Coal-burning power plant
Industrial centre
Industrial power plant Medium-load power plant
Substation
Hydroelectric power plant
Transmission network
6
Lucas-Nülle
Low
voltage
Distribution network
10001010101010110
Wind

Description Matériel didactique Électrotechnique de base hautes performances Équipement théorique d'entraînement électri

ZE3301 Didactic Equipment Electrotechnique de base hautes performances Electrotechnique de base Matériel d'entraînement électrique
1 Aperçu du produit
1-1 Vue d'ensemble

Eskom power station generation distribution poste d, technical engineering job **Megawatt , senior , principal, training staff engineering „ duty**		

Personality training : educare personality assessor moderator , training , trainer, orienttion industrial mark, psychometrical mark career job student survey

Orientation industriel engineeing , personality module , task,

student mark final , semmester graduate mark

topics leaerner portofolio total engineering , vs lecture portofolio daily and teacher portofolio matric challenge teachnote vs learner n1,2,n3 topics cor framework qualification saqa , discussing examination assessor marking mark scaling , saqa leaver school discussing , topics leaner over stay reason non examination non years completed , no registration saqa , qtco no trade , over stay , n4/n5,n6, final irregularity report n3 subjet , statement non compliance from examnination exam n4, n3 irregularity for n4 n 3 over 2 years portofolio , non attandance n4, doing level 4 national trade , orientation life mathematics theory , reasoning , assessment rectorat additionel information n3 reason , n5,n6 finalise „ registration , institution portofolio non accountability reason databse examination framework variation award ruling time table ,

irregularity transcript material , 2020 februarie , icass, remark, suspension , n3 trade theory rerwiten 2023 november 2023 time table n 3 trade theory electrical orientation industrial , evidence argumentation framework lecture tvet institutionel no submission , vs learner portofolio remarker no scaling result matric technical n5,n6 final exam portofolio learner internal test submission id number admnistration marker chief , n2 student level trade practical external training panel trade theory electrical wiring , , final examination 3 trimester remark lecture „ assessment award student final st peae college learner ,

2. 1Design work base methodology research / criteria requirement	**y**	**n**
Lecturers have different perceptions of the effect of internal continuous assessment (ICASS) on students at tertiary vocational education and training (TVET) colleges		
omputer practice module lecturer's experience of internal continuous assessment (ICASS)		
Drawing from an interpretivist perspective, constructivist theory entailing cognitive and social constructivism guided this study. Data were collected by means of semi-structured interviews and document analysis. Collected data were transcribed, categorized into codes and themes emerged using thematic data analysis method. The findings revealed that it was difficult to complete the curriculum due to limited time and assessments methods were limited and did not meet the diverse needs of students. Lecturers had to work beyond the set assessment schedules to cater students who missed or scored below average marks. Moderation and assessment feedback were not considered as a critical aspect in the ICASS		
Theoretical Framework **This study is grounded in the constructivism theory entailing a cognitive and social constructivism perspective to attain** **the understanding of the phenomenon under study**		
which implies that **planning for assessment in TVET colleges is influenced by various stakeholders and in addition, should adhere to the** **policies of the regulatory bodies that serve as guidelines for college management and also college lecturers.** **It is crucial that TVET college lecturers are able to assess students according to their different styles of learnings in** **order to allow students equal opportunity to achieve the desired learning outcomes (Hauser, 2015). Students learn at** **different levels and in different ways, which points to the need for TVET college lecturers to offer students multiple**		

opportunities to achieve assessment standards. Knowledge of understanding students' diverse needs is derived from the cognitive constructivist theory which forms the basis of this study. Cognitive constructivists assert that students process new information based on their experiences (Piaget, 1972), which implies that TVET college lecturers need to be conversant with their students' individual learning needs.

At TVET college level, each subject is allocated to a lecturer by the academic head of the college. The lecturer's responsibility is to conduct lectures and assess students. Computer practice module lecturers should ensure that all activities relating to the management of assessment aligns with assessment guidelines (DoE, 2007). Lecturers should develop an assessment schedule at the beginning of the semester comprising the different assessment tasks and percentage marks contributing towards the students' final mark (DHET, 2018). The idea of assessment for learning in this regard is constructive in nature and is designed to allow students to actively engage in learning which in turn leads to cognitive and interactive skills development.

Research indicates that an experienced lecturer, in the role of subject head, is responsible for overseeing the establishment of schemes of work from which the lesson plans are drawn to guide the teaching and learning process (Coetzee, et al., 2015). The schemes of work provide certain content required to be taught in a particular period. Given the developed scheme of work, the computer practice lecturer is then able to set the assessment plan for a semester.

According to the DHET (2018), the computer practice module assessment plan must indicate activities that have been approved, administered, moderated and recorded. The assessment plans are then submitted to the academic head for evaluation and approval before the commencement of the teaching and learning process (DHET, 2018). Management utilises assessment plans during the internal monitoring to verify the effectiveness of the teaching, learning and assessment process. Lecturers are also responsible for coordinating the development and moderation of assessment tasks and tools (Coetzee et al., 2015).

Thereafter, the schedules should be provided to the students as they commence with their program. An assessment schedule is a timetable that shows when a particular module will be assessed (DHET, 2018). The module assessment schedule also indicates the type of assessment tasks to be administered, their duration and mark allocation (Coetzee et al., 2015). It is mandatory that students are provided with module assessment schedules as they report for lectures.

The design of assessment tasks should ensure that different aspects such as knowledge, skills and attitudes are assessed (Sephokgole & Makgato, 2019). Standardisation is therefore crucial since it ensures that the percentages marks for ICASS are not inflated due to setting simple or difficult tests that allow students to achieve either high or low marks. The implication is that careful thinking and competence in setting assessment tasks is important (DHET, 2018).

Dreyer (2014) shows that the tasks included in the ICASS mark should collectively and progressively cover what is being taught in a particular subject.

Assessments should be moderated. The Department describes moderation as a process of determining the standards applied in the setting of tasks and in assessing students (DoE, 2007). The quality of

assessment tasks together with the performance of students are judged before, during and after administration of tasks (Florez & Summons, 2013). In pre-assessment moderation, TVET college lecturers are required to develop an analysis grid that should be used to measure the tasks in relation to the learning outcomes. The analysis grid covers aspects such as the levels of knowledge of the questions, which is remembering, understanding, analysing, application and evaluation (DHET, 2018), the duration of the assessment and mark allocation (Dreyer, 2014). Thereafter, a subject expert verifies and approves the assessment task before it is completed by the students. After the assessment has been written, post-assessment moderation is then conducted on the sampled written and marked tasks (DoE, 2007). The aim is to verify the correctness of the assessment tool and to determine whether students have been fairly treated in the assessment process. Examples of assessment tools include rating scales, observation sheet, checklists, rubrics and marking memoranda/guidelines. The DHET (2018) states that assessment tools should be selected based on the type of assessment task being conducted. It is a requirement that marks achieved in the assessment tasks are converted to reflect the weighting of a particular subject (DHET, 2018). Marks have to be rounded off in order to avoid the use of decimals. The final converted mark should be indicated on the mark sheet as well as on the record sheet. These marks are then captured on the computer system that allows a text file to be sent to the DHET. After DHET approval, feedback should be given to the students. Constructive feedback is perceived as a basic aspect in the application of assessment for learning in TVET colleges (Florez & Summons, 2013).

ICASS Methods

DHET (2018) guidelines specify methods of assessing TVET college students. Lecturers should assess student performance practically and theoretically. Practical and theoretical assessments which use various modes to assess student understanding, are formal and compulsory because they contribute to students' final mark (DHET, 2018). The DHET (2018) indicates that portfolios, performance-based assessments, interview-based assessment, play-based assessment, co-operative group assessment, peer assessment, self-assessment, paper-based assessments, observation, practical presentations, field study, case studies and classroom activities should be used as assessment methods. All TVET college programmes require students to demonstrate their understanding through practical application commonly known as in-service training. If any student fails to complete this aspect of the programme, certification for a National Diploma for such a student cannot be processed (DHET, 2018). Normally, students are given the criteria needed to be followed before starting their practical training, depending on the programme and could include portfolios and logbooks. However, studies show that assessment processes in TVET colleges are inadequate due to limitations and lack of expertise, insufficient resources, poor management and negligence (Lutaaya, 2017; Sebetlene, 2016).

Computer Practice Module Lecturers' Experience of ICASS

According to Daher et al. (2017), experiences are a direct observation of or involvement in

processes as a basis of understanding. In this regard, Higgs and Smith (2006) indicate that the theory of hermeneutics stresses how TVET college lecturers can create knowledge pertaining to ICASS based on their present and past experiences in a constructivist teaching and learning environment. Therefore, TVET lecturers are responsible for setting, administering and evaluating ICASS (Newstead, 2004). This implies that TVET lecturers are central to executing assessments which are necessary for students to achieve their qualifications. However, research has found that there are factors experienced by lecturers which make it challenging to effectively execute ICASS, particularly in the computer practice module (Kanyane, 2016; Lutaaya, 2017; Matshaya, 2016; Sebetlene, 2016). **Lutaaya (2017) revealed that 34% of TVET college lecturers had no qualifications normally required to conduct teaching and assessment duties. On the same note, Kanyane (2016) and Tyler and Dymock (2021) found that some TVET college lecturers cannot handle assessment activities because they were not trained as lecturers and no initiatives had been taken to provide in-service training by the college management. This explains the inadequate expertise implementation of assessment since the majority of lecturers do not possess the minimum teaching qualifications needed to execute teaching and assessment duties. In addition, TVET college lecturers reported that college management uses a subjective selective approach to choose lecturers who can attend assessor and moderator trainings (Matshaya, 2016). Kanyane (2016) found that the majority of TVET college lecturers indicated that college management only trained a few lecturers out of the entire lecturing staff. However, the findings by Lutaaya shows that of the TVET college lecturers reported to have been trained as assessors and as moderators.** **Lectures experienced time constraints as a barrier for assessment in the computer practice module. According to Sebetlene (2016), TVET college lecturers are expected to engage in various activities such as invigilating national examinations, executing internal marking, organising, typing examination scripts and moderating their assessments during the same period. These activities involved a great deal of paperwork which in turn, impacts negatively on the quality of the assessment as some lecturers end up cutting and pasting questions from previous question papers and as a result, the assessment does not meet the standards (Kanyane, 2016). According to the DHET (2018), the computer practice module has three assessments which must be set, moderated, administered, marked and recorded within six months.** **Kanyane (2016) reported that lecturers felt that paperwork required as evidence of teaching and assessment is overwhelming and time consuming. TVET College lecturers are required to develop two files namely an assessment file and a subject file for each module they teach (DHET, 2018), which are moderated by the TVET college management on a continuous basis. Lecturers are also required to pace their various assessment activities and meet the set deadlines.** **Student absenteeism in TVET colleges is a concern because it disrupts the assessment process. Findings by Lutaaya (2017) indicate that absenteeism in TVET colleges is a result of student and school-related factors. Some students miss out ICASS due to factors such as illnesses (Sebetlene, 2016), and in addition, lecturers**		

reported on students' lack of interest in assessments resulting from complexity of TVET college programmes since some students fail to align their mental abilities with intellectual requirements of the programmes (Kanyane, 2016). Students do not see the relevancy of the TVET college curriculum and assessments in relation to their future and end up becoming demotivated and this eventually leads to absenteeism and drop out (Lutaaya, 2017). Matshaya (2016) and Sebetlene (2016) indicate that some students are irregular attendees at classes due to laziness or because they have relationship issues with either their peers or lecturers.

Infrastructure, such as computer laboratories, and equipment such as computers, printers and projectors, is a problem in most TVET colleges. Lutaaya (2017) found that computers in the laboratory were insufficient, and some were not even operational with no internet access. In addition, computer laboratories did not have functional air conditioners,

Research Design

The study was qualitative in nature underpinned by an interpretivist perspective. De Vos et al. (2011) maintain that qualitative research aims at enhancing understanding and interpretation of the essence of occurrences and situations from the participants'

hen you go to N5 and N6, you can now see those are experienced and comfortable with computers, so we can make presentation computers, that means you spend more time making them to be comfortable with computers. When you go to N5 and N6, you can now see those are experienced and comfortable with computers, so we can make presentations." Presentations were noted to be mostly applicable at higher levels of learning where students were more experienced in using computers.

Group work was proved to be one of the methods used to assess computer practice module in TVET colleges. P1, C1 explained that: "Another way which we should be using but we cannot, due to COVID-19 is to group students and have assessment session with them." Participants admitted that group work yields good results; however, since the onset of the COVID-19 pandemic, participants indicated that co-operative assessment methods were not used as pandemic protocol needed to be adhered to. However, lecturers did indicate that assessment tests are an effective evaluation that assists them in not only predicting students' final achievements but also informs further learning.

Discussion

The study revealed that out of six participants, only three of the computer practice lecturers were qualified as professional educators. The other three hold qualifications in other specialised fields. Not having an education qualification, such as a Post Graduate Certificate in Education, could compromise the assessment implementation and students' performance, which concurs with Lutaaya (2017) and Shereni, (2020) who found that lack of appropriate qualification, compromises standard of assessment practices. It emerged from the data that lecturers need supplementary training on assessment and moderation. It was assumed that lecturers were supposed to have attended in-service training, however, training was not organised. When lecturers lack knowledge, the standard of assessments

is greatly affected. As a result, lecturers tend to use traditional and convenient means to assess students without considering the expected subject outcomes. These findings coincide with Gillis (2020) and Lutaaya (2017) who assert that the majority of TVET colleges lecturers are not trained as assessors and moderators. ICASS should be planned, set, monitored and moderated in order to ensure that standards have been met. TVET college lecturers are required to develop assessment files which are continuously monitored by the DHET to verify the presence of the assessment evidence. However, it was found that assessment plans that were designed to guide processes of assessments were not followed in all the TVET colleges under study. Jaiswal (2019) states that assessments plans need to be adhered to so that learning can be easily tracked. It was found that lecturers tended to deviate from the plans to suit the demands of the circumstances. It was found that the setting of internal assessments was compromised in TVET colleges as lecturers simply copied and pasted questions from the previous examination papers.

Time allocated for teaching and assessment should ensure that the teaching, learning and assessment process attained curriculum coverage. Lecturers are tasked with the planning and implementation of ICASS which entails setting, moderation, marking, administration of remediation activities and recording of assessment marks. Lecturers are also required by the DHET to keep two files related to the teaching and assessment of their subjects. The internal examinations, administered as part of ICASS, should cover the whole curriculum. However, it was found that due to time constraints, the coverage of the whole curriculum was compromised. This means that lecturers' desire to conduct assessment effectively was disadvantaged as they only focused on meeting deadlines and not ensuring assessment of student learning. In some cases, the assessment process seemed unfair as assessment tasks administered to students included content that had not been taugh

Non-compliance was subject to disciplinary procedures for both students and lecturers. Due to COVID-19 pandemic, lecturers could not assess large groups of students at the same time in a single venue. The division of classes was required which ultimately called for more time to be able to cover all the groups. This also increased lecturers' workload as invigilation time was extended. Findings showed that assessing different groups strained the time available for teaching, learning and assessment.

Conclusion

The purpose of this study was to explore computer practice module lecturers' experiences of internal continuous assessment in TVET colleges. The TVET college lecturers perceived ICASS in different ways even though the DHET had issued guideline to ensure that the correct process is to be adhered to when conducting the ICASS. Based on the constructivism theory, the study provides the literature on the lecturers' experiences of lack of proper qualifications, a selective approach to choose lecturers to attend in-service training, time constraints, paperwork, student absenteeism, infrastructure and equipment as barriers to conduct effective ICASS. Planning of the assessments is done at lecturer, management of the college and the DHET and Umalusi levels.

The ICASS has to be moderated before it can be administered. After the assessment, students should be provided with the feedback and should consider the lecturers' comments for improvement in their learning. Different ICASS methods have to be used to prepare students for the world of work.

National External Examination

The examination is external as the Directorate Examinations & Assessment sets the examination nationally. This means that all students write the same examination paper on the same day for a particular subject. This sets national standards for assessment and achievement. The external examination counts as follows towards the final pass mark:

Vocational Subjects National Examinations:			
Theory: 35% +	ISAT: Practical: 15% +	PoE (ICASS): 50%	= Pass Mark
50%		50%	
Fundamental Subjects			
ICASS PoE: 25% +	National Examinations: 75%		= Pass Mark

NB: Students with incomplete ICASS and/or ISAT marks will not be allowed to write the final November National Examinations.

Class Attendance

- **Students must be punctual.**
- **Students who arrive late will after the start of the period, be regarded as late (but will be allowed in class) and this will be indicated on the register. Students may not be denied access to class unless they cause/display disruptive behavior. In case where the student is late for three or more consecutive days per subject, the student will be marked absent on the fourth day by the subject lecturer.**
- **Regular student absenteeism and late coming will be followed up by contacting parents/ guardians/ employers/ sponsors within the relevant faculties/departments for disciplinary action.**
- **Class attendance, academic/ programme progress and disciplinary warning(s) will affect students' testimonials.**
- **A special certificate will be awarded for 100% attendance.**
- **Attendance will be used as one of the criteria for placement of students in job situations or learnerships.**
- **Attendance will be used as a criterion for student bursary allocation.**
- **If a student was absent for three or more consecutive lecturing days due to death of a family member, evidence must be provided on the day he/she resumes classes. If absenteeism was due to illness, a medical certificate must be submitted immediately on the day he/she commences class.**
- **If a test/internal examination/assessment was written and a medical certificate or evidence of death of a family member was not submitted, a zero (0) mark will be entered on the mark sheet.**
- **Pregnant students: A medical certificate, stating the due date of birth, must be submitted as soon as the pregnancy is confirmed. The student must take maternity leave for the last 4 weeks of the pregnancy unless a medical certificate is submitted that allows the student to continue attending classes.**
- **Students may not leave the venues during periods/lecturing times unless the necessary permission has been obtained from the lecturers.**

- **Cell phones must be switched off at all times in**
  (a) lecture rooms,
  (b) examination rooms,
  (c) assemblies and
  (d) during meetings.
- **All personal appointments should be made after lecturing hours, over weekends or during vacations. Absence due to such appointments will be regarded as nonattendance, even if a student notified his/her lecturers.**
- **The student should not be allowed to register for the next trimester/ semester/ year if their average class attendance for the previous trimester/ semester/ year is less than 80%. The times absent with a valid reason e.g. a doctor's note or a copy of a death certificate of a close family member which has been submitted, must be taken into account. These absences should then not count.**
  Clothing should be neat and acceptable in a societal and co

Examination and Assessments

The final pass mark is compiled by the Internal Assessment mark and External Examination mark. Internal Assessment is continuous throughout the year and an External Examination is written during November each year. the external examination also includes an ISAT, which is a practical assessment task. ISAT exams are completed earlier in the year, before the written exam in November.

Internal Continuous Assessment

Internal Assessment comprises of Formative **and** Summative **Assessments.**

Summative Assessment includes class tests, standardised tests and performance tasks. Formative Assessment includes class work, assignments, research projects, etc. Both Formative and Summative Assessments result in a Portfolio of Evidence (PoE). This PoE is crucial as the Internal Assessment counts as follows towards the final pass mark:

Fundamental Subjects - **25% of the final mark**
Vocational Subjects - **50% of the final mark**

Engineering Studies

- **Electrical Infrastructure Construction**

nNumber and spread of assessment tasks constituting the ICASS
Trimester Mark across Report 191 trimester subjects (Engineering Studies)
SUBJECTS WEEK 2 - 4 WEEK 5 - 8 TOTAL
Trimester subjects
(46 - 49 Lecturing Days)
Natural Sciences –
Engineering Studies Test 1 Test 2 2 Tests

ssessment tasks constituting the ICASS
Semester Mark across Report 191 semester subjects (General, Business and Utilities studies)
SUBJECTS TERM 1 TERM 2 TOTAL Semester subjects (75-78 Lecturing Days)
N4 - N6 General – Business and Services Studies 1 Test or 1 Assignment 1 Test or 1 Assignment, external moderation incorporated and 1 Internal Examination 1 Test 1 Assignment 1 Internal
Exam (3 taskEvidence of Teaching and Assessment
Lecturers are required to maintain a subject file and an assessment file and to keep

the actual scripts and assignments and artifacts in storage. **For effective teaching and learning it is important that students receive assessment feedback within a reasonable period of time, which should be not more than five working days after the test was written or the assignment handed in. The following procedure should be followed:** **• The marked and moderated scripts are handed back to students;** **• The memorandum/marking guidelines are discussed with the students;** **• Students note corrections and keep a copy of the test or task and the memorandum; and** **• The marked scripts are handed back to the lecturer for safe keeping andNALYSIS GRID** **This analysis must be done for ALL tests and must be submitted for pre-assessment moderation** **SUBJECT & LEVEL: LECTURER:** **TASK: MODERATOR: Subject Aim/Learning Objective (LO) (Numbering only)** **Question** **No. or effective monitoring and reporting purposes, two types of monitoring reports are required:** **(a) A subject monitoring report (Annexure G4) per lecturer reflecting the availability of • Lecturer information** **• Subject file content** **• Assessment file content** **• Evidence of students' work and post-assessment moderation evidencPRE-ASSESSEMENT MODERATION PROCESS AND TIMELINES** **PROCESS RESPONSIBILITY TIMELINE Allocate specific examiners and moderators names, per subject per level, to each assessment on the Assessment plans. The examiner and moderator must be two different persons. (Note: Examiners and moderators must be subject experts. The allocated examiners and moderators must be teaching the subject and level. Empower all staff to develop and moderate) assessments)** **HOD / Senior lecturer Before classes commence for trimester/semester programmes Add internal college due dates to manage the time lines in order to meet the Subject committee assessment plan deadlines. HOD / Senior lecturer Before classes commence for trimester/semester programmes Managing of the due dates on the Subject committee Assessment plan. HOD / Senior lecturer Throughout the academic period Moderation of assessments tasks and tools (Pre-moderation of tests, assignments, pre-exam tests, etc.): Check that the examiner completed the 'Examiner's and Moderator's checklist':** **- Technical criteria - Content coverage - Cognitive skills Types of questions Language and bias** **- Overall impression Assessment too • Start by going through the entire assessment task and tool** **• Determine whether the students will be able to complete the assessment within the given tim• Moderator must also complete the moderator's section on the 'Examiner's and moderator's checklist'** **• Moderator must give feedback regarding changes needed and make recommendations on checklist** **• Keep all evidence of the moderation proces Subject Moderator as allocated on internal ass essment plan As per internal assessment plan** **Feedback to examiner Subject Moderator as allocated on internal assessment plan Within TWO days after receiving theassessment taskand tool Implement changes as recommended by the moderator Subject examiner asallocated on internal assessment plan Within TWO days after receiving feedback on theassessment task and tool.Final approval of the assessment instrument for printing:• Print final approved assessment task and tool(Note: Check layout, fonts and alignment before submitting for printing)Subject Moderator asallocated on internalassessment plan**		

Within ONE day after receiving the adjusted assessment task and tool Format/ Type ±Duration (Minutes) Mark allocation and Cognitive Level Total Mark Allocation Shortresponse*MediumResponseExtendedResponse***1Knowledge 2Application 3Anhecklist for the student's Assessment Evidence** **ITEM YES NO** **f) Are the students' marked assessment evidence (scripts, artifacts, etc.) available?** **g) Is there evidence of post-assessment moderation?** **uring such visits spot checks and sampling should be undertaken to ensure that the marks captured on the ICASS mark record sheets can be backed up by student assessment evidence and lecturer assessment files.** **All irregularities, whether they are administrative, technical or acts of dishonesty, experienced during implementation and/or detected during monitoring and moderation of the ICASS component must be recorded in an ICASS IRREGULARITY REGISTER (Annexure G6) at both centre and college sites. This register must be submitted to the DHET by the college on the same date that the ICASS mark sheets are required to be submitted per examination cycleLecturer information** **• Subject file content** **• Assessment file content** **• Evidence of students' work and post-assessment moderation evidenceONITORING OF IMPLEMENTATION** **The academic line management at colleges is critical to ensure that the ICASS mark component of each subject is implemented in such a manner that it does not compromise the integrity of Report 191 programmes offered at the colleg** **Lecturer information that relates to the lecturer's appointment and duties (Name, qualifications, SACE registration, teaching/lecturing experience, workplace experience)** **• Contents page** **• Class registers** **• Subject syllabus** **• Subject work schedule/ work plan / pace setter** **• Lesson plans and teaching resources** **• Evidence of additional supporting tasks as required by college academic policy** **• Evidence of review – diagnostic and statistical analysis, including notes on improvement of lessons and tasks for future use.** **• Previous question papers / revision exercises / additional exercises / homework activities / work sheets / tutorials** **• Minutes of subject meetings**		