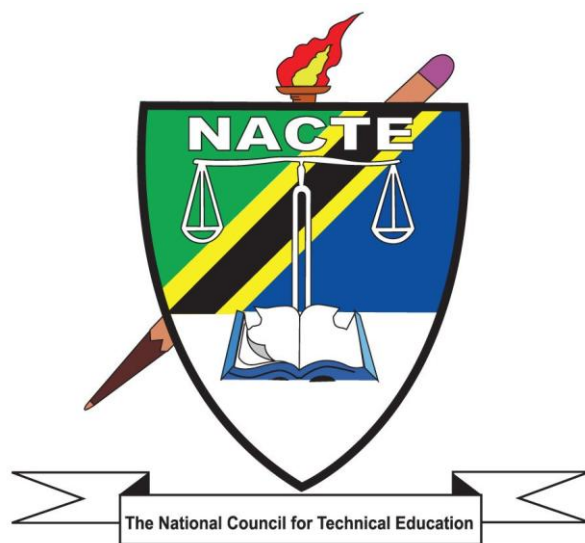


NATIONAL COUNCIL FOR TECHNICAL EDUCATION



NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

FOR COMPUTER ENGINEERING TECHNICIAN

LEVEL: NTA 4

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FOREWORD

The National Council for Technical Education (NACTE) is a corporate body established by the National Council for Technical Education Act, Cap.129. The Act provides a legal framework for the Council to coordinate the provision of technical education and training in Tanzania. The mandate of NACTE is three-fold, namely; Regulatory, Quality Assurance and Policy Advisory.

In discharging its mandate, the Council has been charged with the responsibilities, among others, to:

- (a) assist technical institutions in the transmission of knowledge, principles and training in the field of technical education and training for the benefit of the people of Tanzania;
- (b) assist technical institutions in the overall development of the quality of education they provide and to promote and to maintain approved academic standards;
- (c) establish and make awards in technical education which are consistent in standard and comparable to related awards in Tanzania and internationally; and
- (d) ensure that the quality of education required for the awards is met and maintained throughout the duration of the delivery of the course.

In the course of execution of these responsibilities, the Council has been instituting various measures aiming at advancing the quality of training provided in technical institutions in respect of the changing demands of the labour market, both local and international.

To achieve the above obligation, NACTE, under the Ministry of Education, Science and Technology implemented the East Africa Skills for Transformation and Regional Integration Project (EASTRIP), a project aiming at promoting regional integration through supporting the regional corridors and sector markets, developing common standards and qualifications, and promoting mobility of students, faculty, and graduates. The project supports the Government of Tanzania to address shortage of skills in five sectors namely:

- (a) Energy;
- (b) Construction;
- (c) Information and Communication Technology (ICT);
- (d) Transportation; and
- (e) Agribusiness.

To address the skills miss-match and shortage in the five (5) sectors in the country, the project funded, among others, a component of Development of Occupational Standards for Technical and Vocational Education and Training (TVET). In this regard, NACTE endeavored to identify qualified and highly experienced experts in the five sectors from both the industry and training institutions to carry out the development of Occupational Standards. The exercise was carried out at Morogoro Teachers College – Morogoro from 16th July to 10th August, 2021. The output of the exercise is Occupational Standards for 12 occupations. Occupational standards for Computer Engineering Technicians is among the 12 occupational standards which have been developed.

Since Occupational Standards are statements of work performance reflecting the ability to successfully complete the functions required in an occupation, as well as the application of knowledge, skills, attitudes and understanding in an occupation, it is the Council's expectations that the developed standards will form a robust base for decision making and provide explicit guidance to policy makers, curriculum developers, educators, employers and other stakeholders in matters related to manpower planning as well as execution of Technical and Vocational Education and Training undertakings.

Prof. J. W. Kondoro
Chairman

Dar es Salaam
October 2022

ACKNOWLEDGEMENT

The National Council for Technical Education (NACTE) is charged with the mandate to be the Quality Assurance organ of the Government in matters related to Technical and Vocational Education and Training (TVET) and production of qualified manpower for both local and international labour markets. In order to realize this obligation, NACTE endeavors to institute policies, guidelines and standards and to set the quality benchmarks for training institutions.

However, this is only possible if there is a strong base, linking the training institutions on one hand and the demands of the industry/labour market for relevant manpower on the other hand. Therefore, the Council undertook a step to develop Occupational Standards in sectors considered to be the engine to steer the country's desire to achieve an industrial economy. This exercise would not be a success without the input and support from our stakeholders. I am indebted to acknowledge some of them here.

I wish to acknowledge and appreciate the support from the Ministry of Education, Science and Technology through the East Africa Skills for Transformation and Regional Integration Project (EASTRIP) for the financial support which facilitated the preparation of this document. I wish also to appreciate Eng. Dr. Simon Baregu and Mrs Leah Lukindo for the tireless efforts and commitment in facilitating and guiding the standards development process, Ms. Eileen Tzamburakis and Ms. ChausikuYakweli Ibrahim for compiling and type setting the final document; and the NACTE Secretariat for coordinating the whole activity.

In a very special way I wish further to extend my sincere gratitude to this team of wonderful experts who tirelessly dedicated their time and availed their invaluable intellect in the preparation of this document. I would like to recognize the colossal inputs of the following experts:

S/N	Name	Designation	Organization
1	Dr. Dennis Lupiana	Lecturer	Institute of Finance Management (IFM)
2	Eng. Dr. Moses Makoko	Head of ICT	University of Dar-es-Salaam – College of Information Communication Technology
3	Dr. Kwame Ibwe	Lecturer	University of Dar-es-Salaam – College of Information Communication Technology
4	Dr. Nkundwe Mwasaga	Lecturer	Dar-es-Salam Institute of Technology

In addition, NACTE hopes to further enhance the internationalization of occupational standards and promote the modernization and internationalization of industries, facilitating

Tanzania's integration into the international market and exploiting its development potential. Therefore, NACTE has invited China-Africa Vocational Education Alliance and China-Africa (Chongqing) Vocational Education Alliance to participate in the development, revision and review of occupational standards documents in collaboration with Chinese vocational institutions, so as to make use of their rich experience in vocational education efforts and rely on China's advanced and complete industrial chain and its position in the international market to contribute to the development of vocational education and related industries in Tanzania.

Therefore, I would like to express my sincere gratitude to this specialized team of Chinese institutions and experts. I thank them for their hard work and dedication, and for contributing their wisdom and experience to the preparation of this document. I would like to thank the following institutions and experts for their support:

S/N	Institute	Name	Title
1	Hunan Chemical Vocational Technology College	Huang Yinxiu	Associate Professor
2		Ouyang Guang	Professor
3		Feng Xin	Associate Professor
4		Xiao Ying	Lecturer
5		Zhou Hengwei	Lecturer
6		Wu You	Assistant Lecturer
7		Chen Yuhui	Assistant Lecturer

Last but not least, I would like to acknowledge the enormous inputs from all stakeholders who were consulted during the validation process to provide their expert views and opinions on the validity of the contents and preparation of this document for customers' consumption.

Dr. A. B. Rutayuga
Executive Secretary

Dar es Salaam
October 2022

ABBREVIATIONS

NACTE	National Accreditation Council of Technical Education
NOS	National Occupational Standards
OS	Occupational Standards
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

GLOSSARY OF TERMS

Circumstantial knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues
Competence:	The ability to use knowledge, understanding, practical and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based education:	An instructional program that derives its content from validated tasks and bases assessment on the learner's performance
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational analysis:	A process used to identify the tasks that are important to employees in any given occupation
Occupational area	This is a broad grouping of related jobs. Example: food service
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as performance tool of assessment of the pre – scribed outcomes.
Occupational/job analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance criteria:	indicate the expected end results or outcome in form of evaluative statements.
Skill:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as

a composite of three completely interdependent components: cognitive, affective, and psychomotor.

Standard: it is a set of statement, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance

Task analysis: The process of analyzing each task to determine the steps, related knowledge, attitudes, performance standards, tools and materials needed, and safety concerns required of employees performing it.

Task: A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to a product, service, or decision.

Underpinning Knowledge: This is crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.

Verification: The process of having experts review and conform the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

Occupational Competence The application of knowledge and skills to perform consistently to the standards required in the work context.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's Development Vision 2025 intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical Education has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupation Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs trouble shooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed in a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the occupational standards and the training standards to respond to demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programs. TET institutions will be required to benchmark their curricula with relevant occupational standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Computer Engineering technician occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational standards development process began with an examination of major documents that guide Tanzanian skill development. The 10-year National Skills Development Strategy (2016-2026) was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes. These sectors include: Transport and logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of expert workers and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The workshop thereafter continued with the development of occupational standards. Experts in Occupational Analysis and development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the occupational standards. Engineers, supervisory technicians on the job, and experienced Computer Maintenance technicians were key informants in the survey to establish occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are equipped for working in the occupation. A total of online surveys were completed by experts from the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they served to engage a wide cross-section of experts in the occupation. The stakeholders' forum was attended by participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR COMPUTER ENGINEERING TECHNICIAN

These standards cover a broad range of duties and tasks that can be performed by a Computer Engineering Technician. However, the occupational standards are not meant to replace individual job descriptions, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Computer Engineering Technician may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. The most common job titles in this cadre include (i) Programmer/Analyst, (ii) System/Network Administrator, (iii) System Security expert, (iv) System Testing Technician, etc.

Computer engineering technicians assist engineers in the design of computer hardware and software, as well as apply science and engineering principles in the implementation of designs. Generally, computer engineering technicians apply knowledge of computer principles to implement the designs of hardware and software engineers. Technicians perform calculations and projections to help create designs, build and test prototypes to improve their designs and conduct quality control in production environments. On the other hand, computer technicians, also known as computer support specialists, don't only design, build, or improve computer parts or systems, but troubleshoot and repair those already in place as well.

These occupational standards cover the following main duties for a Computer Engineering Technician:

1. Maintain computer hardware and accessories in a business environment
2. Maintain software in standalone computers
3. Provide user technical support
4. Build prototypes of planned ICT systems
5. Maintain electronic circuits of computer devices
6. Manage computer networks in a business with a single office environment
7. Improve data processing and management
8. Participate in preparation of procurement plan of ICT systems and services
9. Manage computer users in a business environment
10. Maintain network-based services (e.g. network file sharing, network printing and data backup)
11. Prepare records of daily operations

4.0. VALIDITY PERIOD

The occupational standards will be valid for 3-5 years due to the fast-changing nature of technology. The review will proceed in the same manner as the previous one, with new occupational standards being developed based on current labor market Information.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR COMPUTER ENGINEERING

TECHNICIAN NTA – 4

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN COMPUTER HARDWARE AND ACCESSORIES IN A BUSINESS ENVIRONMENT	DUTY NO	401
TASK TITLE	ASSEMBLE COMPUTER HARDWARE AND ACCESSORIES	TASK NO	4011
Performance Criteria:	A person carrying out this task must be able to assemble computer hardware and accessories as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer components and parts 3. Relevant software tools 4. Relevant measuring equipment 5. Accessories of computer This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify computer hardware and accessories 2. Identify computer hardware manuals 3. Locate computer hardware interfaces 4. Interpret instructions 5. Assemble computer hardware 6. Test assembled hardware 7. Clean workplace and tools 8. Store tools, equipment and safety gear		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Verify computer parts and components 1.2. Identify electricity of computer components and parts 1.3. Test assembled computer 2.0. Principles The person must be able to explain the principles of: 2.1. Designing computer system 2.2. Computer assembling 2.3. Connecting Electricity of computer components 3.0. Theories The person must be able to explain: 3.1. Types of computer 3.2. Computer components and their functions 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills	

	4.4. Analytical skills 4.5. Interpersonal skills 4.6 Teamwork 5.0. Math skills 5.1. Algebra
Description of end Product or Service:	Computer system is assembled and functioning as per industry standards and instruction manuals
Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer components 2. Safe handling of computer system 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN COMPUTER HARDWARE AND ACCESSORIES IN A BUSINESS ENVIRONMENT	DUTY NO	401
TASK TITLE	REPAIR COMPUTER HARDWARE AND ACCESSORIES	TASK NO	4012
Performance Criteria:	A person carrying out this task must be able to repair computer hardware and accessories as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer components and parts 3. Relevant software tools 4. Relevant measuring equipment 5. Accessories of computer 6. Computer parts 7. Computer technician’s tool kit This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify tools, equipment and safety gear 2. Disassemble computer hardware and accessories 3. Identify fault computer hardware and accessories 4. Examine fault items 5. Identify required parts for replacement 6. Replace fault items 7. Assemble computer hardware 8. Test computer system 9. Clean workplace and tools 10. Store tools, equipment and safety gear		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Verify functional computer parts and components 1.2. Identify electricity of computer components and parts 1.3. Test repaired computer 2.0. Principles The person must be able to explain the principles of: 2.1. Repairing computer parts 2.2. Computer repairing 2.3. Connecting Electricity of computer components 3.0. Theories The person must be able to explain: 3.1. Types of computer 3.2. Computer components and their functions 4.0. Essential skills 4.1. Problem solving skills	

	4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.6. Interpersonal skills 4.7. Teamwork 5.0. Math skills 5.1. Algebra
Description of end Product or Service:	Computer system is repaired and functioning as per industry standards and instruction manuals
Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer components and parts 2. Safe handling of computer system 3. Extent of responsibilities

OCCUPATION	Computer Engineering Technician	OCCUPATION CODE	
DUTY TITLE	Maintain computer hardware and accessories in a business environment	DUTY NO	401
TASK TITLE	Upgrade computer hardware and accessories	TASK NO	4013
Performance Criteria:	A person carrying out this task must be able to upgrade computer hardware and accessories as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer components and parts 3. Relevant software tools 4. Relevant measuring equipment 5. Accessories of computer 6. Computer parts 7. Computer technician’s tool kit This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select tools, equipment and safety gear 2. Identify hardware upgrade requirements 3. Identify hardware required to be upgraded 4. Upgrade the hardware; Replace hardware and accessories 5. Test the upgraded hardware and accessories 6. Clean the workplace 7. Store tools equipment and safety gear		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Upgrade computer parts and components 1.2. Identify electricity of the upgraded computer components and parts 1.3. Test upgraded computer 2.0. Principles The person must be able to explain the principles of: 2.1. Upgrading computer parts 2.2. Computer upgrading 2.3. Electricity of computer components 3.0. Theories The person must be able to explain: 3.1. Types of computer upgrading 3.2. Computer components 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills	

	4.5. Interpersonal skills 4.6. Teamwork 5.0. Math skills 5.1. Algebra
Description of end Product or Service:	Computer system is upgraded and functioning as per industry standards and instruction manuals
Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer components and parts 2. Safe handling of computer system 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN SOFTWARE IN STANDALONE COMPUTERS	DUTY NO	402
TASK TITLE	INSTALL SOFTWARE	TASK NO	4021
Performance Criteria:	A person carrying out this task must be able to install software as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer drivers 3. Relevant software tools 4. Computer technician’s tool kit This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify software 2. Install operating systems 3. Install application software 4. Test installed software 5. Clean the workplace		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Configure software 1.2. Identify libraries of configured software 1.3. Test the configuration of the software 2.0. Principles The person must be able to explain the principles of: 2.1. Configuration of software 2.2. Software libraries 2.3. Testing configured software 3.0. Theories The person must be able to explain: 3.1. Types of configuration of software 3.2. Software libraries 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.6. Interpersonal skills 4.7. Teamwork 5.0. Math skills: 5.1. Algebra	

Description of end Product or Service:	Computer software is installed and functioning as per industry standards and instruction manuals
Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN SOFTWARE IN STANDALONE COMPUTERS	DUTY NO	402
TASK TITLE	CONFIGURE SOFTWARE	TASK NO	4022
Performance Criteria:	A person carrying out this task must be able to configure software as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer drivers 3. Relevant software tools 4. Computer technician’s tool kit This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify settings/features 2. Customize settings/features 3. Verify customized settings/features		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Install software 1.2. Identify drivers of hardware 1.3. Test the installation of the software 2.0. Principles The person must be able to explain the principles of: 2.0. Installation of software 2.1. Hardware drivers 2.2. Testing software 3.0. Theories The person must be able to explain: 3.1. Types of installation of software 3.2. Hardware drivers 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 5.0. Math skills: 5.1. algebra	
Description of end Product or Service:		Software is configured and functioning as per industry standards and instruction manuals	

Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN SOFTWARE IN STANDALONE COMPUTERS	DUTY NO	402
TASK TITLE	UPGRADE SOFTWARE	TASK NO	4023
Performance Criteria:	A person carrying out this task must be able to upgrade software as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer software and drivers 3. Relevant software tools This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE		
The person performing this task must be able to do the following: 1. Identify upgrade requirements 2. Install upgraded software 3. Verify upgraded software	Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Upgrade software 1.2. Identify drivers of hardware 1.3. Test the upgraded software 2.0. Principles The person must be able to explain the principles of: 2.0. Upgrading of software 2.1. Hardware drivers 2.2. Testing upgraded software 3.0. Theories The person must be able to explain: 3.1. Types of software upgrade 3.2. Hardware drivers 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork Math skills 5.1. Algebra		
Description of end Product or Service:	Software is upgraded and functioning as per industry standards and instruction manuals		

Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities
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OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN SOFTWARE IN STANDALONE COMPUTERS	DUTY NO	402
TASK TITLE	UNINSTALL SOFTWARE	TASK NO	4024
Performance Criteria:	A person carrying out this task must be able to uninstall software as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer software and drivers 3. Relevant software tools This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify software to be uninstalled 2. Create backup of user data 3. Set restoration point 4. Identify uninstallation tools 5. Remove installed software 6. Verify uninstallation		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Uninstall software 1.2. Uninstall drivers of software 1.3. Clean the registry 2.0. Principles The person must be able to explain the principles of: 2.1. Uninstallation of software 2.2. Software drivers 2.3. Cleaning registry 3.0. Theories The person must be able to explain: 3.1. Types of uninstallation of software 3.2. Software drivers 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 5.0. Math skills 5.1. Algebra	
Description of End Product or Service:		Software is uninstalled as per industry standards and instruction manuals	

Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities
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OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN SOFTWARE IN STANDALONE COMPUTERS	DUTY NO	402
TASK TITLE	UPDATE SOFTWARE	TASK NO	4025
Performance Criteria:	A person carrying out this task must be able to update software as per industry standards and instruction manuals		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Instruction manuals 2. Computer software and drivers 3. Relevant software tools This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify required updates 2. Install software updates (e.g. security patches) 3. List installed updates		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Update software 1.2. Identify drivers of hardware 1.3. Test the updated software 2.0. Principles The person must be able to explain the principles of: 2.1. Updating of software 2.2. Hardware drivers 2.3. Testing updated software 3.0. Theories The person must be able to explain: 3.1. Types of software update 3.2. Hardware drivers 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 5.0. Math skills 5.1. Algebra	
Description of End Product or Service:		Software is updated and functioning as per industry standards and instruction manuals	

Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities
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OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PROVIDE USER TECHNICAL SUPPORT	DUTY NO	403
TASK TITLE	ASSESS USER PROBLEM	TASK NO	4031
Performance Criteria:	A person performing this task must be able to assess user problem as per industry standards and technical support guideline.		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Technical support guideline 2. Computer software 3. Relevant technical supporting tools This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify user problem 2. Isolate user problem 3. Diagnose the problem		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Assess user problem 1.2. Identify hardware problems 1.3. Identify software problems 2.0. Principles The person must be able to explain the principles of: 2.1. Identification of software problems 2.2. Identification of hardware problems 2.3. Assessment of user problem 3.0. Theories The person must be able to explain: 3.1. Types of user problems 3.2. User problem assessment 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6 Teamwork 5.0. Math skills 5.1. Algebra	
Description of End Product or Service:		User problem are assessed as per industry standards and technical support guideline.	

Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities
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OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PROVIDE USER TECHNICAL SUPPORT	DUTY NO	403
TASK TITLE	RESOLVE USER PROBLEM	TASK NO	4032
Performance Criteria:	A person performing this task must be able to resolve user problem as per industry standards and technical support guideline.		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools must be available: 1. Technical support guideline 2. Computer software 3. Relevant technical supporting tools This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Gather technical information 2. Determine possible solutions 3. Fix the problem 4. Verify solution		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Resolve user problem 1.2. Identify steps to resolve hardware problems 1.3. Identify steps to resolve software problems 2.0. Principles The person must be able to explain the principles of: 2.1. Resolving of software problems 2.2. Resolving of hardware problems 2.3. Escalation of user problem 3.0. Theories The person must be able to explain: 3.1. Types of escalation of user problems 3.2. Resolving User problem assessment 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.6. Interpersonal skills 4.7. Teamwork 5.0. Math skills 5.1. Algebra	
Description of End Product or		User problem is assessed as per industry standards and	

Service:	technical support guideline.
Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	Provide user technical support	DUTY NO	403
TASK TITLE	Obtain feedback from user	TASK NO	4033
Performance Criteria:	A person performing this task must be able to obtain feedback from user as per industry standards and technical support guideline.		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools should be available: 1. Technical support guideline 2. Computer software 3. Relevant technical supporting tools This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Keep track of users 2. Inquire feedback from users 3. Compile feedback		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Obtain user feedback 1.2. Track user feedback 1.3. Identify steps to track user feedback 2.0. Principles The person must be able to explain the principles of: 2.1. Tracking user feedback 2.2. Obtaining user feedback 3.0. Theories The person must be able to explain: 3.1. Types of user feedback 3.2. Obtaining User feedback 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 5.0. Math skills: 5.1. Algebra	
Description of End Product or Service:		User feedback is obtained as per industry standards and technical support guideline.	
Circumstantial Knowledge:		Detailed knowledge about: 1. Safe handling of computer	

	2. Safe handling of software 3. Extent of responsibilities
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OCCUPATION	COMPUTER ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PROVIDE USER TECHNICAL SUPPORT	DUTY NO	403
TASK TITLE	DOCUMENT FINAL RESULTS OF USER PROBLEM	TASK NO	4034
Performance Criteria:	A person performing this task must be able to document final results of user problem as per industry standards and technical support guideline.		
Range Statements:	This task can be performed in a workshop or in a client’s office. The following equipment and tools should be available: 1. Technical support guideline 2. Computer software 3. Relevant technical supporting tools This person will work under minimum supervision.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify reported problems 2. List reported problems 3. Compile report on reported problems		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Document results of user problem 1.2. Categorize results of user problem 1.3. Identify steps to document the results of user problem 2.0. Principles The person must be able to explain the principles of: 2.1. Documenting results of user problem 2.2. Categorizing results of user problem 3.0. Theories The person must be able to explain: 3.1. Types of results of user problem 3.2. Documenting results of user problem 4.0. Essential skills 4.1. Problem solving skills 4.2. Communication skills 4.3. Report writing skills 4.4. Analytical skills 4.5. Interpersonal skills 4.6. Teamwork 5.0. Math skills: 5.1. Algebra	

Description of End Product or Service:	Final results of user problem are documented as per industry standards and technical support guideline.
Circumstantial Knowledge:	Detailed knowledge about: 1. Safe handling of computer 2. Safe handling of software 3. Extent of responsibilities

**TABLE 1: DACUM CHARTS FOR COMPUTER ENGINEERING TECHNICIAN
LEVEL 4**

DUTIES	TASKS	ENABLERS
1.0. Maintain software in standalone computers	1.1. Install software 1.2. Configure software	<u>Generic Skills and Knowledge</u> • Basic computer skills - on hardware and software installation • Knowledge on computer file systems, data backup and recovery options • Knowledge on computer drivers and supported systems <u>Tools and Equipment</u> • Windows resource monitor • Online support systems • Safety gears <u>Materials</u> • Software updates <u>Work Behaviors</u> • Team work • Time management
2.0. Maintain computer hardware and accessories in a business environment	2.1. Assemble computer hardware and accessories 2.2. Repair computer hardware and accessories 2.3. Upgrade computer hardware and accessories	<u>Generic Skills and Knowledge</u> • Basic skills on computer hardware and accessories • Knowledge on computer file systems, data backup and recovery options • Knowledge on computer drivers and supported systems • Basic electronics skills • Communication and report writing skills • Analytical skills • Problem solving skills <u>Tools and Equipment</u> • Operating Systems

DUTIES	TASKS	ENABLERS
		resource monitors • Safety gears • Computer Technician toolbox <u>Materials</u> • Software drivers • Software updates • Systems manuals <u>Work Behaviors</u> • Team work • Time management
3.0. Provide user technical support	3.1. Assess user problem 3.2. Execute user problem 3.3. Obtain feedback from user 3.4. Document final results	<u>Generic Skills and Knowledge</u> • Skills on database technologies • Skills on computer networks • Skills on hardware • Basic skills on Operating Systems • Basic skills on Cyber Security • Basic skills on scripting languages • Communication and report writing skills • Analytical skills • Problem solving skills • Ethical skills <u>Tools and Equipment</u> • Diagnostic tools • Technician toolbox • MySQL. • SQL Server Management Studio. • DevOpsTools • Visual Studio Code • Enterprise Service Management (ESM) Tools. • PhpMyAdmin Tool. • Computer

DUTIES	TASKS	ENABLERS
		<u>Materials</u> • Data <u>Work Behaviors</u> • Patience • Meticulous attention to detail • A logical approach to work