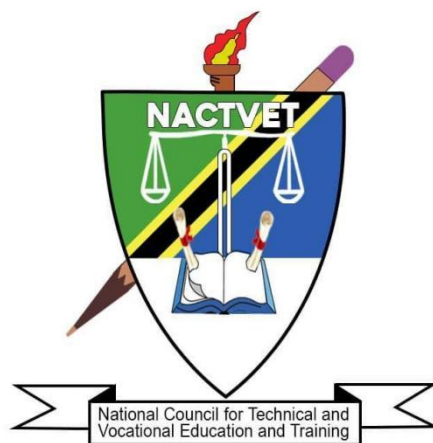


**NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND
TRAINING**



FEBRUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: MECHATRONICS ENGINEER

LEVEL: NTA 8

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ABBREVIATIONS

AS	After-sales Service
CBET	Competency Based Education and Training
MPM	Manufacturing Process Management
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PL	Production Line
SOP	Standard Operating Procedures
TE	Technical Education and Training
TP	Teaching Pendant
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 programme 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 Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
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 a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	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.

Standards:	A set of statements, 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 analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm 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.

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 troubleshooting 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 by 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 the demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (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) programmes. 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 Mechatronics Engineer 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 occupational standards were then developed. Experts in Occupational Analysis and the 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 Mechatronics Engineers were key informants in the survey to discover occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of ... online surveys were completed by experts from the labour market across the country. Apart from the surveys aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, 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 MECHATRONICS ENGINEERS

The standards cover a broad range of duties and tasks that can be performed by a Mechatronics Engineer. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in

specific settings or positions. The Mechatronics Engineer may perform tasks in a number of key areas in the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Mechatronics Engineer can engage in equipment technical transformation and design, project management activities, etc., and complete operations and control of the complete line equipment operation, adjustment and optimization of intelligent line equipment, intelligent production line fault diagnosis, and maintenance and repair work in the workshop. Generally, the Mechatronics Engineer performs the following responsibilities:

- a) Production management
- b) Programming and debugging of industrial robot
- c) Overhaul of electromechanical equipment
- d) Operation and maintenance of equipment and production line (PL)
- e) Aftersales service for electromechanical equipment
- f) Technical transformation of electromechanical equipment
- g) Electromechanical equipment project management
- h) Mechanical design of electromechanical equipment
- i) Electrical design of electromechanical equipment
- j) Electrical debugging of electromechanical equipment
- k) Operation and maintenance of intelligent production line

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA level 7 and 8.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR MECHATRONICS ENGINEERS - NTA 8

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	
DUTY TITLE	TECHNICAL TRANSFORMATION OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	801
TASK TITLE	DEVELOPMENT AND IMPLEMENTATION OF EQUIPMENT TECHNICAL TRANSFORMATION PLANS	TASK NO.	8011
PERFORMANCE CRITERIA	The person performing this task must be able to develop and organize the implementation of the technical transformation plans of electromechanical equipment in accordance with the equipment operation manual and technical requirements.		
RANGE STATEMENT	The task can be performed in the offices and factories under the supervision of a Registered Constructor/Mechatronics Engineer. The tools and equipment to be used include: 1. Computers; 2. Parts measuring tools; 3. Surveying and mapping design software; 4. Safety protection equipment; 5. Equipment technical transformation workshop.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Analyze the project overview, including the current situation of electromechanical equipment, number of employees, professional types of work, and the demand for electromechanical equipment transformation; 2. Analyze the current situation of electromechanical equipment, including the time of putting into use, quantity, structure, performance parameters, floor area, etc.; 3. Analyze the necessity of electromechanical equipment transformation, including the problems existing in the equipment, the causes of the problems, and the solutions to the problems; 4. Analyze the feasibility of electromechanical equipment transformation, including cost, energy		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Implement technical transformation of equipment. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Basic principles of equipment transformation; 2.2 The necessity and feasibility of the equipment technical transformation plans; 2.3 Basic principles of the correct implementation of the equipment technical transformation plans; 2.4 Basic principles of mechanical transmission in electromechanical equipment. 3.0 Theories	

conservation, environmental protection, etc.; 5. Prepare a feasibility study plan for technical transformation; 6. Prepare technical transformation implementation plans, including main technical schemes, equipment (material) selection plans, and auxiliary engineering plans; 7. Propose a disposal plan for dismantling equipment (materials); 8. Obtain a work permit; 9. Organize the personnel to enter the site; 10. Organize tools, appliances, measuring instruments, machinery and materials to enter the site; 11. Implement equipment transformation according to the division of labor in the transformation drawings; 12. Debug the electromechanical equipment; 13. Conduct construction safety quality control.	The person performing this task must be able to explain the following: 3.1 The basic composition of electromechanical equipment; 3.2 Implementation steps of the electromechanical equipment transformation plan; 3.3 A plan for the electromechanical equipment transformation; 3.4 The issues to be paid attention to in the electromechanical equipment transformation; 3.5 Technical preparation work for electromechanical equipment; 3.6 The using method to ensure the equipment life cycle in the electromechanical equipment transformation; 3.7 The safety operation specifications for the operation of the renovated electromechanical equipment. 4.0 Essential Skills 4.1 Customer service skills; 4.2 Effective communication skills; 4.3 Teamwork skills; 4.4 Tool usage skills; 4.5 Basic skills in computer graphics and drawing; 4.6 Report writing skills; 4.7 Organization and coordination competence; 4.8 Material cost estimate. 5.0 Math Skills 5.1 Geometric skills; 5.2 Statistical skills; 5.3 Surveying calculation.
DESCRIPTION OF THE END PRODUCT / SERVICE	The equipment transformation plan is prepared in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. The use of computer software; 4. Occupational health and safety; 5. Modern enterprise management standards; 6. Emergency disposal measures; 7. Waste disposal methods.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	
DUTY TITLE	TECHNICAL TRANSFORMATION OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	801
TASK TITLE	COMPLETION ACCEPTANCE AND HANDOVER OF EQUIPMENT TECHNICAL TRANSFORMATION PROJECTS	TASK NO.	8012
PERFORMANCE CRITERIA	The person performing this task must be able to conduct completion acceptance and handover of the technical transformation project based on the equipment technical transformation plans.		
RANGE STATEMENT	The task can be performed in the office, factory and equipment manufacturing factory under the supervision of a Registered Constructor/Mechatronics Engineer. The tools and equipment to be used include: 1. Computers; 2. Safety protection equipment; 3. Electromechanical equipment after technical transformation; 4. Workshops for equipment technical transformation projects; 5. As-built drawings for equipment technical transformation projects; 6. Instructions for equipment technical transformation projects; 7. Schemes for equipment technical transformation projects; 8. Monkey wrench/socket wrench/box-end wrench/torque wrench; 9. Testing instruments; 10. Debugging software.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection equipment for tasks; 3. Prepare a completion acceptance plan based on the technical transformation project plan; 4. Prepare a project acceptance task book based on the completion acceptance plan; 5. Organize technical personnel to conduct on-site debugging and acceptance of the technical transformation equipment according to the acceptance task book; 6. Prepare an acceptance report for the technical transformation equipment; 7. Check for rectification of problems;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Conduct completion acceptance for the equipment technical transformation projects; 1.2 Carry out the handover of the equipment technical transformation project. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The evaluation of the effectiveness of equipment technical transformation based on	

8. Organize the issuance of as-built drawings; 9. Establish an asset ledger; 10. Put into trial operation; 11. Transfer assets; 12. Archive data.	the technical data of the technical transformation project acceptance; 2.2 Planning and principles for the electromechanical equipment transformation; 2.3 Principles for acceptance and handover of electromechanical equipment. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Steps for mechanical and electrical debugging of electromechanical equipment; 3.2 Preparation of completion acceptance materials for the technical transformation of electromechanical equipment; 3.3 Analysis of the technical transformation function of electromechanical equipment; 3.4 Specifications for electromechanical equipment acceptance; 3.5 Handover steps of electromechanical equipment. 4.0 Essential Skills 4.1 Customer service skills; 4.2 Communication skills; 4.3 Teamwork skills. 5.0 Math Skills 5.1 Algebra skills; 5.2 Geometric skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The completion acceptance and handover of the equipment technical transformation project are implemented in accordance with the equipment technical transformation plans.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating machines and tools; 2. Safety operation of measuring instruments; 3. The use of computer software; 4. Occupational health and safety; 5. The completion acceptance and handover process of technical transformation projects; 6. Emergency disposal measures; 7. Management standards for technical transformation projects.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	
DUTY TITLE	TECHNICAL TRANSFORMATION OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	801
TASK TITLE	FILING AND TRACKING OF EQUIPMENT TECHNICAL TRANSFORMATION PROJECTS	TASK NO.	8013
PERFORMANCE CRITERIA	The person performing this task must be able to archive the technical data of the technical transformation project in accordance with the technical transformation project requirements, and track and maintain the operation of the equipment in the later stage.		
RANGE STATEMENT	The task can be performed in the office, factory and equipment manufacturing factory under the supervision of a Registered Constructor/Mechatronics Engineer. The tools, equipment and materials to be used include: 1. Computers and printers; 2. AUTOCAD design software; 3. BIM modeling software; 4. Label making machine/label paper; 5. File boxes/file covers.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Develop a file management system for equipment technical transformation materials; 2. Compile a data directory and search tools for equipment technical transformation file materials; 3. Determine the confidentiality level of file materials for equipment technical transformation; 4. Develop a borrowing system for the file materials of equipment technical transformation; 5. Identify and destroy the technical files of technical transformation equipment as required; 6. Archive equipment acceptance records; 7. Archive equipment supervision reports and factory acceptance reports; 8. Archive drawings, technical data, and debugging and inspection reports; 9. Archive project acceptance reports; 10. Track and manage the technical transformation equipment in the later stage.		Detailed knowledge about: Unified specifications of punctuations 1.0 Methods The person performing this task must be able to explain how to: 1.1 Develop file management standards for equipment technical transformation; 1.2 Track and maintain the later operation of equipment. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 File management principles for equipment technical transformation; 2.2 Tracking principles of technical transformation equipment. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Management standards for technical files; 3.2 The standard for establishing the confidentiality level of technical files; 3.3 The identification process of technical files. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Computer application skills. 5.0 Math Skills 5.1 Basic mathematical skills; 5.2 Algebra skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The equipment technical transformation project is archived, and subsequent operation tracking and maintenance of the equipment are carried out in accordance with the requirements of the equipment technical transformation project.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. The use of computer software; 2. Occupational health and safety; 3. Specifications for the preparation of technical file documents; 4. File management and related laws and regulations.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	PROJECT MANAGEMENT	DUTY NO.	802
TASK TITLE	PROJECT CONSTRUCTION SAFETY AND ENVIRONMENTAL PROTECTION MANAGEMENT	TASK NO.	8021
PERFORMANCE CRITERIA	The person performing this task must be able to focus on project objectives, ensure project construction safety in accordance with project technical requirements and project management standards, and carry out environmental protection management.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of senior project managers. The tools and equipment to be used include: 1. Manager office; 2. Workshop facilities and transportation equipment; 3. Appropriate tools, instruments and safety protection equipment; 4. Project contract.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for safety and environmental during working; 2. Conduct project contract management and risk management; 3. Arrange the construction site and implement the construction scheme based on the project objectives; 4. Select, accept and use commonly-used materials on site; 5. Scientifically organize construction and effectively guide construction operations in accordance with the requirements of engineering safety, environmental protection and occupational health.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Conduct project construction safety and environmental protection management. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Safety principles for on-site construction; 2.2 Environmental protection principles for on-site construction; 2.3 Principles of contract management and risk management for the project; 2.4 Principles of document recording and archiving management for on-site construction. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Basic regulations for project process management; 3.2 The basic content of project safety and environmental protection management; 3.3 Circumstantial knowledge of project construction site layout and construction scheme development; 3.4 Project contract management, security and information management, quality supervision, completion acceptance, and other procedures; 3.5 Material collection and engineering report organization methods. 4.0 Essential Skills 4.1 Communication and coordination skills; 4.2 Project management tools and technical application skills; 4.3 Teamwork skills; 4.4 Risk control skills; 4.5 Project safety management and environmental protection management skills; 4.6 Planning and time management skills; 4.7 Document collection and organization skills. 5.0 Math Skills 5.1 Design calculation; 5.2 Material estimate; 5.3 Data statistics and analysis.
DESCRIPTION OF THE END PRODUCT / SERVICE	Project safety is ensured and environmental protection management is carried out in accordance with project objectives and plans.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational safety and health; 2. Safety operation of tools and facilities; 3. Environmental protection management requirements; 4. Mandatory provisions in laws, regulations and construction standards related to personal safety.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	PROJECT MANAGEMENT	DUTY NO.	802
TASK TITLE	PROJECT QUALITY ASSURANCE AND MONITORING	TASK NO.	8022
PERFORMANCE CRITERIA	The person performing this task must be able to ensure and monitor project quality in accordance with project technical requirements and project management standards based on the project objectives.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of senior project managers. The tools and equipment to be used include: 1. Manager office; 2. Workshop facilities and transportation equipment; 3. Tools and equipment; 4. Construction and financial facilities; 5. Project contract.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for safety and environmental during working; 2. Select, accept and use commonly-used materials on site; 3. Inspect and supervise the construction site layout and construction scheme implementation based on the project objectives; 4. Conduct project organization management and monitoring; 5. Conduct quality acceptance of project engineering; 6. Prepare a quality acceptance report for the project engineering.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Write project quality assurance, monitoring and engineering reports. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Basic requirements of relevant national laws and regulations; 2.2 Quality principles for on-site construction; 2.3 Schedule principles for on-site construction; 2.4 Principles of project engineering bidding and tendering, contract management, and risk management; 2.5 Preparation, review and proofreading of relevant contracts and documents during project implementation; 2.6 Project quality acceptance, monitoring records, and archiving management. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 Basic regulations for project process management; 3.2 Project management theory; 3.3 Project contract management, security and information management, quality supervision, completion acceptance, and other procedures; 3.4 Material collection and engineering report organization methods. 4.0 Essential Skills 4.1 Communication and coordination skills; 4.2 Project management tools and technical application skills; 4.3 Teamwork skills; 4.4 Risk control skills; 4.5 Planning and time management skills; 4.6 Project organization management and monitoring skills; 4.7 Engineering quality acceptance skills; 4.8 Document collection and organization skills. 5.0 Math Skills 5.1 Design calculation; 5.2 Material estimate; 5.3 Data statistics and analysis.
DESCRIPTION OF THE END PRODUCT / SERVICE	Project quality is ensured and monitored, and engineering reports are written based on project objectives and plans.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational safety and health; 2. Safety operation of tools and facilities; 3. Environmental protection management requirements; 4. Mandatory provisions in laws, regulations and construction standards related to personal safety.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	PROJECT MANAGEMENT	DUTY NO.	802
TASK TITLE	PROJECT PLANNING, BUDGETING, AND ENGINEERING REPORTING	TASK NO.	8023
PERFORMANCE CRITERIA	The person performing this task must be able to focus on the project objectives to plan, budget, and complete engineering reports reasonably based on project technical requirements and project management standards.		
RANGE STATEMENT	The task can be performed in the equipment workshop under the supervision of senior project managers. The tools and equipment to be used include: 1. Manager office; 2. Workshop facilities and transportation equipment; 3. Tools and equipment; 4. Construction and financial facilities.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Comply with regulation documents related to health, safety, environmental protection, and hygiene; 2. Plan and initiate projects; 3. Manage project docking and schedule; 4. Inspect and supervise the completion of on-site construction plans; 5. Supervise the technical safety of on-site construction; 6. Evaluate project quality; 7. Review project cost; 8. Control the cost incomings and outgoings; 9. Prepare engineering project budgets; 10. Organize engineering completion acceptance and delivery for use; 11. Prepare engineering reports.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Plans and initiate projects; 1.2 Provide overall control over the construction safety, quality control and cost control of the project; 1.3 Conduct completion acceptance and delivery, and prepare engineering reports. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of unified planning and coordinated promotion; 2.2 Principles of safety construction management; 2.3 Principles of quality control; 2.4 Principles of budget cost control. 3.0 Theories The person performing this task must be able to explain the following:	

	3.1 The main components of project planning; 3.2 Regulations and standards related to project engineering construction; 3.3 The specific content of the project budget (costs, expenses and risks); 3.4 Relevant procedures and requirements for project resource management, technical management, schedule control, quality control, safety management, on-site construction, cost management, trial operation, completion settlement and acceptance; 3.5 Specification requirements for writing engineering reports. 4.0 Essential Skills 4.1 Communication and coordination skills; 4.2 Project management tools and technical application skills; 4.3 Teamwork skills; 4.4 On-site risk control skills; 4.5 Planning and schedule control management skills; 4.6 Cost accounting skills; 4.7 Document collection and organization skills. 5.0 Math Skills 5.1 Design calculation; 5.2 Material estimate; 5.3 Data statistics and analysis.
DESCRIPTION OF THE END PRODUCT / SERVICE	Project planning, financial budgeting, and engineering reports are established in accordance with project objectives and plans.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Regulations and standards related to electromechanical engineering construction; 2. Safety operation of tools and facilities; 3. Relevant regulations on employment and construction; 4. Unified requirements for quality acceptance; 5. Measurement rules.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	SYSTEM DESIGN OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	803
TASK TITLE	MECHANICAL DESIGN OF ELECTROMECHANICAL EQUIPMENT	TASK NO.	8031
PERFORMANCE CRITERIA	The person performing this task must be able to design, modify and repair mechanical equipment in accordance with technical requirements and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in the design workshop under the supervision of mechatronics engineers. The tools and equipment to be used include: 1. Computers and printers; 2. AUTOCAD design software; 3. Solidworks software; 4. Mechanical design handbook.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Use the latest standards for mechanical structure design; 2. Carry out correct force analysis on mechanical parts and structure; 3. Select the correct materials; 4. Verify the strength and cross-sectional dimensions of components; 5. Design and calculate the maximum allowable load of the mechanism or mechanical part; 6. Conduct independent innovative design; 7. Conduct feasibility analysis on multiple schemes; 8. Quickly search for information using library materials, electronic reading materials and the internet, and formulate a work process plan as required.		1.0 Methods The person performing this task must be able to explain how to: 1.1 Design the process of electromechanical equipment; 1.2 Scheme design of electromechanical equipment. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of mechanical design, tolerance and fits, mechanical drawing, etc. 3.0 Theories The person performing this task must be able to explain the following: 3.1 The theory of mechanical design for electromechanical equipment; 3.2 Principles of mechanical control systems. 4.0 Essential Skills The person performing this task must be able to have the following skills: 4.1 Communication skills; 4.2 Management skills;	

	4.3 Teamwork skills; 4.4 Scheme design skills; 4.5 Document writing skills; 4.6 Data retrieval skills. 5.0 Math Skills 5.1 Geometric skills; 5.2 Statistical skills; 5.3 Surveying calculation.
DESCRIPTION OF THE END PRODUCT / SERVICE	Mechanical equipment is designed, modified and repaired in accordance with technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Machine function analysis; 2. Scheme design; 3. Overall design of sketches, and drawing of part drawings, component drawings and final assembly drawings; 4. Preparation of technical documents.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	SYSTEM DESIGN OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	803
TASK TITLE	HYDRAULIC AND PNEUMATIC SYSTEM DESIGN OF ELECTROMECHANICAL EQUIPMENT	TASK NO.	8032
PERFORMANCE CRITERIA	The person performing this task must be able to design, modify and repair the hydraulic and pneumatic systems of mechanical equipment in accordance with technical requirements and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in the production workshop under the supervision of mechatronics engineers. The tools and equipment to be used include: 1. Computers and printers; 2. AUTOCAD design software; 3. Hydraulic design software Fluid SIM; 4. Mechanical design handbook.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Design hydraulic and pneumatic circuits and control systems according to the requirements of hydraulic and pneumatic systems; 2. Select hydraulic and pneumatic standard components; 3. Properly assemble hydraulic and pneumatic systems; 4. Deal with common faults of hydraulic and pneumatic systems; 5. Prepare technical documents for hydraulic and pneumatic systems of electromechanical equipment.		1.0 Methods The person performing this task must be able to explain how to: 1.1 Design the process of hydraulic and pneumatic systems; 1.2 Scheme design for hydraulic and pneumatic systems; 1.3 Explain the debugging of hydraulic and pneumatic systems. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Working principle of mechanical design, tolerance and fits, mechanical drawing, hydraulic system work, etc. 3.0 Theories The person performing this task must be able to explain the following: 3.1 The design theory of hydraulic and pneumatic systems for electromechanical equipment; 3.2 The control theory of hydraulic and pneumatic systems for electromechanical equipment.	

	4.0 Essential Skills 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Scheme design skills; 4.5 Document writing skills; 4.6 Data retrieval skills. 5.0 Math Skills 5.1 Geometric skills; 5.2 Statistical skills; 5.3 Surveying calculation.
DESCRIPTION OF THE END PRODUCT / SERVICE	Hydraulic and pneumatic systems of mechanical equipment are designed, modified and repaired in accordance with technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Basic hydraulic and pneumatic components; 2. Elementary circuit of hydraulic and pneumatic systems; 3. The composition and working principle of the control system of hydraulic and pneumatic systems; 4. Installation, debugging, use and maintenance of hydraulic and pneumatic systems; 5. Preparation of technical documents.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	SYSTEM DESIGN OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	803
TASK TITLE	SPECIAL PROCESSING TECHNOLOGY	TASK NO.	8033
PERFORMANCE CRITERIA	The person performing this task must be able to correctly select special processing methods based on the machining surface accuracy requirements, structural characteristics of parts, and material properties in the part drawing, and develop special processing technology.		
RANGE STATEMENT	The task can be performed in an office, machine room or factory site under the supervision of mechatronics engineers. The tools and equipment to be used include: 1. Part drawings; 2. Relevant standard design manuals or design materials; 3. Pens and paper process cards; 4. Computers; 5. Other related equipment.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Obtain the drawings required for the task; 2. Obtain the machining surface accuracy requirements, structural characteristics of parts, and material properties in the part drawing; 3. Select the categories of special processing methods (electroplating, surface spraying, sand blasting, polishing, laser processing, electric spark machining, plasma arc processing, etc.) according to the requirements; 4. Determine each processing step; 5. Select the equipment; 6. Select the positioning for clamping; 7. Prepare the special processing technology.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Quickly and accurately understand the requirements of drawings; 1.2 Select the category of special processing methods; 1.3 Select the appropriate equipment; 1.4 Select the method of clamping and positioning; 1.5 Prepare the special processing technology. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of operational safety; 2.2 The principle of ensuring quality; 2.3 The principle of economic processing; 2.4 The principle of matching the processing technology with the accuracy requirements of the parts.	

	3.0 Theories The person performing this task must be able to explain the following: 3.1 The application of relevant software when using computer program processing technology; 3.2 The dimensional accuracy, shape accuracy, and surface roughness accuracy of the parts; 3.3 Calculation of dimensions; 3.4 Special processing technology; 3.5 Prepare the processing technology. 4.0 Essential Skills 4.1 Communication skills; 4.2 Drawing reading skills; 4.3 Design skills; 4.4 Teamwork skills; 4.5 Process planning skills; 4.6 Computer application skills. 5.0 Math Skills 5.1 Numerical calculation skills; 5.2 Trigonometric function skills (if necessary).
DESCRIPTION OF THE END PRODUCT / SERVICE	The special processing technology is developed according to the requirements of the part drawings to comply with relevant regulations and standards related to mechanical design and manufacturing in the field of electromechanical equipment.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Mechanical drawing; 2. Tolerance fit; 3. Mechanical design; 4. Mechanical manufacturing; 5. The technology and safety of processing and clamping; 6. The use of computer software; 7. Operating procedures for relevant electromechanical equipment; 8. Occupational health and safety.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	SYSTEM DESIGN OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	803
TASK TITLE	ELECTRICAL CONTROL SYSTEM DESIGN	TASK NO.	8034
PERFORMANCE CRITERIA	The person performing this task must be able to design and modify the electrical control system according to control requirements.		
RANGE STATEMENT	The task can be performed in a safe environment (workshop or production site, etc.) under the supervision of mechatronics engineers. The tools and equipment to be used include: 1. Electrical design drawings; 2. General electrical installation tools; 3. Special distribution box; 4. Computer.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: Standardize the format and refer to other levels of positions 1. Develop electrical control design schemes; 2. Draw the general assembly drawing and wiring diagram of the electrical control system; 3. Develop optimal control scheme analysis; 4. Determine the I/O points of PLC and allocate the I/O address of PLC according to the needs on the production equipment site; 5. Draw the PLC external I/O wiring diagram; 6. Develop programs and run them online; 7. Arrange technical documents.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.0 Design electrical control schemes, electrical control principles, and programs. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of designing electrical control circuits; 2.2 The principle of selecting various control apparatuses. 3.0 Theories The person performing this task must be able to explain the following: 3.1 The dragging scheme of electrical equipment and the method of selecting motors; 3.2 The method of designing electrical control circuits; 3.3 The methods and parameters of selecting various control apparatuses. 4.0 Essential Skills	

	4.1 Communication and coordination skills; 4.2 Teamwork skills; 4.3 Computer application skills; 4.4 Programming skills; 4.5 Document collection and organization skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The electrical control system is designed in accordance with control and technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational safety and specification; 2. Safety operation of tools and facilities; 3. Mandatory provisions in laws, regulations and standards related to personal safety; 4. "6S" managerial knowledge.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	
DUTY TITLE	SYSTEM DESIGN OF ELECTROMECHANICAL EQUIPMENT	DUTY NO.	803
TASK TITLE	DEBUGGING OF ELECTRICAL CONTROL SYSTEM	TASK NO.	8035
PERFORMANCE CRITERIA	The person performing this task must be able to debug the electrical control system in accordance with technical requirements and manufacturer's manual specifications.		
RANGE STATEMENT	The task can be performed in a safe environment under the supervision of mechatronics engineers. Tools and equipment required: 1. General electrical installation tools; 2. General electrical testing tools; 3. Computer.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to follow health and safety precautions to ensure the safety of oneself, others and equipment, and do the following: 1. Choose correct tools, equipment and safety protection equipment; 2. Check the insulation between phases; 3. Check the power supply configuration; 4. Check the grounding protection system; 5. Check the electrical transmission system; 6. Check the PLC and control system; 7. Carry out test run and no-load linkage trial operation.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.0 Conduct debugging work on the electrical control system. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Safety operation principles; 2.2 Principles of energy saving and environmental protection; 2.3 The principle of collaboration and cooperation. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Operation of safety inspection before power on; 3.2 Power supply configuration standards; 3.3 Grounding protection system standards; 3.4 Electrical transmission principles; 3.5 PLC work and inspection principles. 4.0 Essential Skills	

	4.1 Communication skills; 4.2 Management skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Fault analysis skills; 4.6 Computer application skills; 4.7 Report writing skills; 4.8 Data recording skills. 5.0 Math Skills 5.1 Data statistics skills; 5.2 Data processing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The electrical control system is debugged in accordance with technical requirements and manufacturer's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of electrical work; 2. Safety operation of electrical instrument; 3. Occupational health and safety; 4. "6S" managerial knowledge.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	OPERATION AND MAINTENANCE OF INTELLIGENT PRODUCTION LINE	DUTY NO.	804
TASK TITLE	OPERATION AND CONTROL OF THE COMPLETE LINE EQUIPMENT	TASK NO.	8041
PERFORMANCE CRITERIA	The person performing this task must be able to operate the intelligent production line equipment in accordance with technical requirements and manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the intelligent production line workshop under the supervision of mechatronics engineers. The tools and equipment to be used include: 1. Safety protection equipment; 2. Intelligent production lines; 3. Workshop facilities; 4. The operation and maintenance management system for intelligent production lines.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection equipment; 3. Stop and resume operation of the power supply system; 4. Stop and resume operation of the PLC control system; 5. Stop and resume operation of the RFID system; 6. Stop and resume operation of the MES system and order; 7. Stop and resume operation of the complete intelligent line; 8. Analyze the operation status of the equipment, and check, analyze and dismiss alarms to restore normal operation of the equipment.		1.0 Methods The person performing this task must be able to explain how to: 1.1 Operate the intelligent production line. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of operating the intelligent production line. 3.0 Theories The person performing this task must be able to explain the following: 3.1 The composition of intelligent production lines; 3.2 Underpinning knowledge of control of sensors, motors, frequency converters, PLCs, robots and other equipment in intelligent production lines; 3.3 Underpinning knowledge of MES task lead-in and production scheduling and order placement; 3.4 The operation process of intelligent lines; 3.5 Safety operation specifications for intelligent production lines.	

	4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Computer application skills; 4.4 Teamwork skills; 4.5 Identification skills for various components and equipment in intelligent lines; 4.6 Manual operation skills for the single station equipment in intelligent lines; 4.7 Operational skills for stopping and resuming in intelligent lines; 4.8 Data analysis competence; 4.9 Document archive management competence; 4.10 Digital technology and information technology application competence.
DESCRIPTION OF THE END PRODUCT / SERVICE	The intelligent production line equipment is operated in accordance with technical requirements and manufacturer's manual specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. The safety operation of intelligent production lines; 2. Occupational health and safety; 3. Strategies and processes for the operation of intelligent production lines; 4. Modern enterprise management standards.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	OPERATION AND MAINTENANCE OF INTELLIGENT PRODUCTION LINE	DUTY NO.	804
TASK TITLE	ADJUSTMENT AND OPTIMIZATION OF INTELLIGENT LINE EQUIPMENT	TASK NO.	8042
PERFORMANCE CRITERIA	The person performing this task must be able to diagnose, maintain and repair intelligent line faults in accordance with technical requirements, manufacturer's manual, task requirements, and operating conditions.		
RANGE STATEMENT	The task can be performed in the intelligent production line workshop under the supervision of mechatronics engineers. The tools and equipment to be used include: 1. Safety protection equipment; 2. A complete set of intelligent line equipment disassembling toolbox; 3. Digital multimeter and other instruments; 4. Computers equipped with software such as PLC programming, configuration, and industrial robot programming; 5. Intelligent production lines; 6. Workshop facilities.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection equipment for tasks; 3. Adjust the equipment machinery according to the task requirements and working conditions; 4. Adjust the gas circuit according to the production process requirements; 5. Adjust the control system and communication circuits according to the requirements of intelligent lines; 6. Optimize the parameters of the sensor detection system, visual system, transmission system, etc. according to the working conditions and process changes; 7. Optimize the mechanical components, industrial robot work paths, detection system performance, and intelligent line operation processes according to working conditions and process changes;		1.0 Methods The person performing this task must be able to explain how to: 1.1 Adjust the intelligent line equipment according to the task requirements and working conditions; 1.2 Optimize the parameters and performance of the intelligent line according to the working conditions and process changes. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of intelligent line equipment adjustment and optimization. 3.0 Theories The person performing this task must be able to explain the following:	

8. Develop PLC basic program, RFID program, human-machine interface configuration, and typical industrial robot program according to intelligent line control requirements.	3.1 Underpinning knowledge of mechanical, pneumatic and circuit adjustment for intelligent line equipment; 3.2 Underpinning knowledge of intelligent line parameters and performance optimization; 3.3 Underpinning knowledge of PLC, RFID and industrial robot application and programming; 3.4 Underpinning knowledge of motion control. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Computer application skills; 4.4 Teamwork skills; 4.5 Data analysis competence; 4.6 Digital technology and information technology application competence.
DESCRIPTION OF THE END PRODUCT / SERVICE	The intelligent line equipment is adjusted and optimized to meet the task requirements in accordance with technical requirements and manufacturer's manual specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating tools and measuring instruments; 2. Occupational health and safety; 3. Adjustment and optimization strategies and processes for intelligent lines; 4. Modern enterprise management standards.

OCCUPATION	MECHATRONICS ENGINEER	OCCUPATION CODE	800
DUTY TITLE	OPERATION AND MAINTENANCE OF INTELLIGENT PRODUCTION LINE	DUTY NO.	804
TASK TITLE	FAULT DIAGNOSIS, MAINTENANCE AND REPAIR OF INTELLIGENT PRODUCTION LINES	TASK NO.	8043
PERFORMANCE CRITERIA	The person performing this task must be able to diagnose, maintain and repair intelligent production line faults in accordance with technical requirements and manufacturer's manual.		
RANGE STATEMENT	The task can be performed in the intelligent production line workshop under the supervision of mechatronics engineers. The tools and equipment to be used include: 1. Safety protection equipment; 2. A complete set of intelligent line maintenance toolbox; 3. Digital multimeter and other instruments; 4. Equipment management APP; 5. Intelligent production line; 6. Workshop facilities.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Observe the preventive measures for health and safety during working; 2. Choose correct tools, equipment and safety protection equipment for tasks; 3. Develop maintenance management systems; 4. Conduct preventive maintenance of equipment; 5. Develop an intelligent line overhaul plan; 6. Analyze the fault cause and conduct fault diagnosis; 7. Develop safety specifications for intelligent line overhaul; 8. Adjust, maintain and repair the software and hardware of the intelligent line based on the fault situation; 9. Write overhaul reports; 10. Archive maintenance management and technical data.		1.0 Methods The person performing this task must be able to explain how to: 1.0 Diagnose, maintain and repair intelligent line faults. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of intelligent line fault diagnosis and processing. 3.0 Theories 3.1 Underpinning knowledge of equipment preventive maintenance and repair; 3.2 Safety specifications for intelligent line overhaul; 3.3 Diagnostic methods for intelligent line faults. 4.0 Essential Skills	

	4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Digital technology and information technology application competence.
DESCRIPTION OF THE END PRODUCT / SERVICE	Intelligent line faults are diagnosed, maintained and repaired to meet normal production requirements in accordance with technical requirements and manufacturer's manual specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of operating tools and measuring instruments; 2. Occupational health and safety; 3. Operation specifications for intelligent line maintenance; 4. Intelligent line overhaul plan and process.

TABLE 1: DACUM CHARTS FOR MECHATRONICS ENGINEER - NTA 8

DUTIES	TASKS	ENABLERS
1.0 Technical transformation of electromechanical equipment	1.1 Development and implementation of equipment technical transformation plans.	General skills and knowledge • Cooperation with others using communication skills and conveying of messages to the subordinates • Computer graphics and drawing • Knowledge of work safety in workshops • Compilation and interpretation of technical drawings • Use of the equipment technical manual • Operation of operation machines and tools • Operation of measuring instruments • Electromechanical equipment performance testing • Accounting and control of production costs • Basic materials science • Occupational health and safety Tools and equipment • Printer • Computer • Commonly-used measuring instruments • Technical and process drawings • Commonly-used operation machines and tools • Lifting equipment • Testing tools • Personal protective equipment Materials • Steel, iron wire, wire materials, bolts Requirements for employees • Teamwork spirit • Safety consciousness • Quality consciousness • Service consciousness
	1.2 Completion acceptance and handover of equipment technical transformation projects.	
	1.3 Filing and tracking of equipment technical transformation projects.	

DUTIES	TASKS	ENABLERS
2.0 Project management	2.1 Project construction safety and environmental protection management.	General skills and knowledge • Cooperation with others using communication skills and submission of reports to the superiors • Safety operation of tools and facilities • Environmental protection management requirements • Risk control skills • Planning and time management • Document collection and organization • Design calculation • Material estimate • Data statistics and analysis • Occupational safety and health Tools and equipment • Manager office • Workshop facilities and transportation equipment • Tools, equipment and safety protection equipment • Construction and financial facilities Materials • Computer • Printer • Mapping software Requirements for employees • Teamwork spirit • Honesty and trustworthiness • Time management • Safe operation awareness • Energy saving and environmental protection awareness
	2.2 Project quality assurance and monitoring.	
	2.3 Project planning, budgeting, and engineering reporting.	
3.0 System design of	3.1 Mechanical design of electromechanical equipment.	General skills and knowledge

DUTIES	TASKS	ENABLERS
electromechanical equipment	3.2 Hydraulic and pneumatic system design of electromechanical equipment.	• Cooperation with others using communication skills and submission of reports to the superiors • Safety, health and environmental knowledge • Use of the manufacturer's manual • Commonly-used measurement methods • Use of instruments and apparatus • Computer programming languages • Use of simulation software • Electromechanical equipment components • Special processing technology • Interpretation of technical drawings • Basic materials • Basic electrotechnics Tools and equipment • Personal protective equipment (PPE), such as safety shoes, goggles, gloves, hearing protection device and helmet • Measuring equipment and instruments • Toolbox • Fire extinguisher • Lifting equipment • Air compressor • Computer • Binding machine Materials • Hydraulic components, pneumatic components, metal materials, hydraulic oil, handheld programmers Requirements for employees • Teamwork spirit • Time management • Service consciousness
	3.3 Special processing technology.	
	3.4 Electrical control system design.	
	3.5 Debugging of electrical control system.	
4.0 Operation and maintenance of intelligent	4.1 Operation and control of the complete line equipment.	General skills and knowledge

DUTIES	TASKS	ENABLERS
production line	4.2 Adjustment and optimization of intelligent line equipment.	• Communication and teamwork skills • Customer service skills • Use of the manufacturer's manual • Computer application skills and knowledge • Digital information technology applications • Identification and detection skills and knowledge of components and equipment • Operational skills and knowledge for stopping and resuming in intelligent lines • Operational skills and knowledge for adjustment and optimization of intelligent line equipment • Skills and knowledge for intelligent line fault diagnosis, maintenance and repair • Data acquisition and analysis • Technical data interpretation • Document archiving management Tools and equipment • Safety protection equipment for workers • A complete set of intelligent line equipment disassembly and maintenance toolbox; • Digital multimeter and other instruments • Intelligent production line • Workshop facilities Materials • conductors, cables, wiring terminals, and other maintenance consumables • Sensors, RFID readers, and other operation and maintenance components • Control module • Laptops • Programming software
	4.3 Fault diagnosis, maintenance and repair of intelligent lines.	

DUTIES	TASKS	ENABLERS
		Requirements for employees • Professional responsibility • Honest and efficient service consciousness • Teamwork spirit • Dedication to work • Safety consciousness • Emphasis on commitment