COMPETENCY STANDARDS

PROGRAMMING (PYTHON) LEVEL III

INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY
TESDA Complex East Service Road, South Luzon Expressway (SLEX),
Fort Bonifacio, Taguig City

Technical Education and Skills Development Act of 1994
(Republic Act No. 7796)

Section 22, “Establishment and Administration of the National Trade Skills Standards” of the RA 7796 known as the TESDA Act mandates TESDA to establish national occupational skills standards. The Authority shall develop and implement a certification and accreditation program in which private industry groups and trade associations are accredited to conduct approved trade tests, and the local government units to promote such trade testing activities in their respective areas in accordance with the guidelines to be set by the Authority.

The Competency Standards (CS) serve as basis for the:
1 Registration and delivery of training programs;
2 Development of curriculum and assessment instruments; and

Each CS has two sections:

Section 1 **Definition of Qualification** describes the qualification and defines the competencies that comprise the qualification.

Section 2 **Competency Standards** gives the specifications of competencies required for effective work performance.

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COMPETENCY STANDARD FOR
PROGRAMMING (PYTHON) LEVEL III

SECTION 1 DEFINITION

The **PROGRAMMING (PYTHON) LEVEL III** qualification consists of competencies that a person must achieve to perform Basic Python Programming, conduct object-oriented analysis and design, craft and refine python applications employing advanced programming techniques.

The units of competency comprising this qualification include the following:

Unit Code	BASIC COMPETENCIES
400311319	Lead workplace communication
400311320	Lead small teams
400311321	Applying critical thinking and problem-solving techniques in the workplace
400311322	Work in a diverse environment
400311323	Propose methods of applying learning and innovation in the organization
400311324	Use information systematically
400311325	Evaluate occupational safety and health work practices
400311326	Evaluate environmental work practices
400311327	Facilitate entrepreneurial skills for micro-small-medium enterprises (MSMES)

Unit Code	COMMON COMPETENCIES
ICT315202	Apply quality standards
ICT315203	Perform computer operations

Unit Code	CORE COMPETENCIES
AB-ICT0601914251301	Perform basic Python programming
AB-ICT0601914251302	Conduct object-oriented analysis and design for Python applications
AB-ICT0601914251303	Craft and refine Python applications employing advanced programming techniques

A person who has achieved this qualification is competent to be:

- Web Developer (Python)
- Software Developer (Python)
- Mobile Developer (Python)

SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the units of competency required in **PROGRAMMING (PYTHON**) **LEVEL III.**

BASIC COMPETENCIES

UNIT OF COMPETENCY : LEAD WORKPLACE COMMUNICATION

UNIT CODE : 400311319

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to lead in the effective dissemination and discussion of ideas, information, and issues in the workplace. This includes preparation of written communication materials.

ELEMENT	**PERFORMANCE CRITERIA** **Italicized terms** are elaborated in the Range of Variables	**REQUIRED KNOWLEDGE**	**REQUIRED SKILLS**
1. Communicate information about workplace processes	1.1 Relevant ***communication method*** is selected based on workplace procedures 1.2 Multiple operations involving several topics/areas are communicated following enterprise requirements 1.3 Questioning is applied to gain extra information 1.4 Relevant sources of information is identified in accordance with workplace/ client requirements 1.5 Information is selected and organized	1.1. Organization requirements for written and electronic communication methods 1.2. Effective verbal communication methods 1.3. Business Writing 1.4. Workplace etiquette	1.1 Organizing Information 1.2 Conveying intended meaning 1.3 Participating in a variety of workplace discussions 1.4 Complying with organization requirements for the use of written and electronic communication methods 1.5 Effective business Writing 1.6 Effective clarifying and probing skills 1.7 Effective questioning

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	following enterprise procedures 1.6 Verbal and written reporting is undertaken when required 1.7 Communication and negotiation skills are applied and maintained in all relevant situations		techniques (clarifying and probing)
2. Lead workplace discussions	2.1 Response to workplace issues are sought following enterprise procedures 2.2 Response to workplace issues are provided immediately 2.3 Constructive contributions are made to workplace discussions on such issues as production, quality and safety 2.4 Goals/ objectives and action plans undertaken in the workplace are communicated promptly	2.2 Organization requirements for written and electronic communication methods 2.3 Effective verbal communication methods 2.4 Workplace etiquette	2.1 Organizing information 2.2 Conveying intended meaning 2.3 Participating in variety of workplace discussions 2.4 Complying with organization requirements for the use of written and electronic communication methods 2.5 Effective clarifying and probing skills
3. Identify and communicate issues arising in the workplace	3.1 Issues and problems are identified as they arise 3.2 Information regarding problems and issues are	3.1 Organization requirements for written and electronic communication methods 3.2 Effective verbal communication	3.1 Organizing information 3.2 Conveying intended meaning 3.3 Participating in a variety of workplace

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	organized coherently to ensure clear and effective communication 3.3 Dialogue is initiated with appropriate personnel 3.4 Communication problems and issues are raised as they arise 3.5 Identify barriers in communication to be addressed	methods 3.3 Workplace etiquette 3.4 Communication problems and issues 3.5 Barriers in communication	discussions 3.4 Complying with organization requirements for the use of written and electronic communication methods 3.5 Effective clarifying and probing skills 3.6 Identifying issues 3.7 Negotiation and communication skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. Methods of communication	May include: 1.1. Non-verbal gestures 1.2. Verbal 1.3. Face-to-face 1.4. Two-way radio 1.5. Speaking to groups 1.6. Using telephone 1.7. Written 1.8. Internet
2. Workplace discussions	May include: 2.1. Coordination meetings 2.2. Toolbox discussion 2.3. Peer-to-peer discussion

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Dealt with a range of communication/information at one time 1.2 Demonstrated leadership skills in workplace communication 1.3 Made constructive contributions in workplace issues 1.4 Sought workplace issues effectively 1.5 Responded to workplace issues promptly 1.6 Presented information clearly and effectively written form 1.7 Used appropriate sources of information 1.8 Asked appropriate questions 1.9 Provided accurate information
2. Resource Implications	The following resources should be provided: 2.1 Variety of Information 2.2 Communication tools 2.3 Simulated workplace
3. Methods of Assessment	Competency in this unit may be assessed through: Case problem 3.1. Third-party report 3.2. Portfolio 3.3. Interview 3.4. Demonstration/Role-playing
4. Context for Assessment	4.1. Competency may be assessed in the workplace or in a simulated workplace environment

UNIT OF COMPETENCY : LEAD SMALL TEAMS

UNIT CODE : 400311320

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes to lead small teams including setting, maintaining and monitoring team and individual performance standards

ELEMENT	**PERFORMANCE CRITERIA** **Italicized terms** are elaborated in the Range of Variables	**REQUIRED KNOWLEDGE**	**REQUIRED SKILLS**
1. Provide team leadership	1.1 Work requirements are identified and presented to team members based on company policies and procedures 1.2 Reasons for instructions and requirements are communicated to team members based on company policies and procedures 1.3 Team members' and leaders' concerns are recognized, discussed and dealt with based on company practices	1.1 Facilitation of Team work 1.2 Company policies and procedures relating to work performance 1.3 Performance standards and expectations 1.4 Monitoring individual's and team's performance vis a vis client's and group's expectations	1.1 Communication skills required for leading teams 1.2 Group facilitation skills 1.3 Negotiating skills 1.4 Setting performance expectation
2. Assign responsibilities	2.1. Responsibilities are allocated having regard to the skills, knowledge and aptitude required to undertake the assigned task based on company policies. 2.2. Duties are allocated having regard to	2.1 Work plan and procedures 2.2 Work requirements and targets 2.2 Individual and group expectations and assignments 2.3 Ways to improve group	2.1 Communication skills 2.2 Management skills 2.3 Negotiating skills 2.4 Evaluation skills 2.5 Identifying team member's strengths and rooms for improvement

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	individual preference, domestic and personal considerations, whenever possible	leadership and membership	
3. Set performance expectations for team members	3.1 Performance expectations are established based on client needs 3.2 Performance expectations are based on individual team member's knowledge, skills and aptitude 3.3 Performance expectations are discussed and disseminated to individual team members	3.1 One's roles and responsibilities in the team 3.2 Feedback giving and receiving 3.3 Performance expectation	3.1Communication skills 3.2 Accurate empathy 3.3 Congruence 3.4 Unconditional positive regard 3.5 Handling of Feedback
4. Supervise team performance	4.1 Performance is monitored based on defined performance criteria and/or assignment instruction 4.2 Team members are provided with feedback, positive support and advice on strategies to overcome any deficiencies based on company practices 4.3 Performance issues which	4.1 Performance Coaching 4.2 Performance management 4.3 Performance Issues	4.1 Communication skills required for leading teams 4.2 Coaching skill

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	cannot be rectified or addressed within the team are referred to appropriate personnel according to employer policy 4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on client/customer needs and satisfaction 4.5 Team operations are monitored to ensure that employer/client needs and requirements are met 4.6 Follow-up communication is provided on all issues affecting the team 4.7 All relevant documentation is completed in accordance with company procedures		

RANGE OF VARIABLES

VARIABLE	RANGE
1. Work requirements	May include: 1.1. Client Profile 1.2. Assignment instructions
2. Team member's concerns	May include: 2.1 Roster/shift details
3. Monitor performance	May include: 3.1 Formal process 3.2 Informal process
4. Feedback	May include: 4.1 Formal process 4.2 Informal process
5. Performance issues	May include: 5.1 Work output 5.2 Work quality 5.3 Team participation 5.4 Compliance with workplace protocols 5.5 Safety 5.6 Customer service

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Maintained or improved individuals and/or team performance given a variety of possible scenario 1.2 Assessed and monitored team and individual performance against set criteria 1.3 Represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf 1.4 Allocated duties and responsibilities, having regard to individual's knowledge, skills and aptitude and the needs of the tasks to be performed 1.5 Set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members
2. Resource I	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Materials relevant to the proposed activity or task
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Written Examination 3.2 Oral Questioning 3.3 Portfolio
4. Context for Assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : APPLY CRITICAL THINKING AND SOLVING TECHNIQUES IN THE WORKPLACE

UNIT CODE : 400311321

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to solve problems in the workplace including the application of problem-solving techniques and to determine and resolve the root cause/s of specific problems in the workplace.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Examine specific workplace challenges	1.1 Variances are examined from normal operating **parameters**; and product quality. 1.2 Extent, cause and nature of the specific problem are defined through observation, investigation and ***analytical techniques.*** 1.3 ***Problems*** are clearly stated and specified.	1.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize nonstandard situations. 1.2 Competence to include the ability to apply and explain, enough for the identification of fundamental causes of specific workplace challenges. 1.3 Relevant equipment and operational processes. 1.4 Enterprise goals, targets and measures. 1.5 Enterprise quality OHS and environmental requirement.	1.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 1.2 Identifying extent and causes of specific challenges in the workplace.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		1.6 Enterprise information systems and data collation 1.7 Industry codes and standards.	
2. Analyze the causes of specific workplace challenges	2.1 Possible causes of specific problems are identified based on experience and the use of problem solving tools / analytical techniques. 2.2 Possible cause statements are developed based on findings. 2.3 Fundamental causes are identified per results of investigation conducted.	2.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize nonstandard situations. 2.2 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations. 2.3 Relevant equipment and operational processes. 2.4 Enterprise goals, targets and measures. 2.5 Enterprise quality OSH and environmental requirement. 2.6 Enterprise information systems and data	2.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 2.2 Identifying extent and causes of specific challenges in the workplace. 2.3 Providing clear-cut findings on the nature of each identified workplace challenges.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		collation. 2.7 Industry codes and standards.	
3. Formulate resolutions to specific workplace challenges	3.1 All possible option is considered for resolution of the problem. 3.2 Strengths and weaknesses of possible options are considered. 3.3 Corrective actions are determined to resolve the problem and possible future causes. 3.4 Action plans are developed identifying measurable objectives, resource needs and timelines in accordance with safety and operating procedures	3.1 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations 3.2Relevant equipment and operational processes 3.3 Enterprise goals, targets and measures 3.4 Enterprise quality OSH and environmental requirement 3.5 Principles of decision making strategies and techniques 3.6 Enterprise information systems and data collation 3.7 Industry codes and standards	3.1 Generating insights on how to improve organizational procedures, processes and systems through innovation. 3.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 3.2 Identifying extent and causes of specific challenges in the workplace. 3.3 Providing clearcut findings on the nature of each identified workplace challenges. 3.4 Devising, communicating, implementing and evaluating strategies and techniques in

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
			addressing specific workplace challenges.
4. Implement action plans and communicate results	4.1 Action plans are implemented and evaluated. 4.2 Results of plan implementation and recommendations are prepared. 4.2 Recommendations are presented to appropriate personnel. 4.3 Recommendations are followed-up, if required.	4.1 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations 4.2. Relevant equipment and operational processes 4.3 Enterprise goals, targets and measures 4.4 Enterprise quality, OSH and environmental requirement 4.5 Principles of decision making strategies and techniques 4.6 Enterprise information systems and data collation 4.7 Industry codes and standards	4.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 4.2 Identifying extent and causes of specific challenges in the workplace. 4.3 Providing clearcut findings on the nature of each identified workplace challenges. 4.4 Devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Parameters	May include: 1.1 Processes 1.2 Procedures 1.3 Systems
2. Analytical techniques	May include: 2.1. Brainstorming 2.2. Intuitions/Logic 2.3. Cause and effect diagrams 2.4. Pareto analysis 2.5. SWOT analysis 2.6. Gant chart, Pert CPM and graphs 2.7. Scatter grams
3. Problem	May include: 3.1. Routine, non – routine and complex workplace and quality problems 3.2. Equipment selection, availability and failure 3.3. Teamwork and work allocation problem 3.4. Safety and emergency situations and incidents 3.5. Risk assessment and management
4. Action plans	May include: 4.1. Priority requirements 4.2. Measurable objectives 4.3. Resource requirements 4.4. Timelines 4.5. Co-ordination and feedback requirements 4.6. Safety requirements 4.7. Risk assessment 4.8. Environmental requirements

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1. Examined specific workplace challenges. 1.2. Analyzed the causes of specific workplace challenges. 1.3. Formulated resolutions to specific workplace challenges. 1.4. Implemented action plans and communicated results on specific workplace challenges.
2. Resource Implications	2.1. Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios / case studies / what ifs will be required as well as bank of questions which will be used to probe the reason behind the observable action.
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1. Observation 3.2. Case Formulation 3.3. Life Narrative Inquiry 3.4. Standardized test The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components. These assessment activities should include a range of problems, including new, unusual and improbable situations that may have happened.
4. Context for Assessment	In all workplace, it may be appropriate to assess this unit concurrently with relevant teamwork or operation units.

UNIT OF COMPETENCY : WORK IN A DIVERSE ENVIRONMENT

UNIT CODE : 400311322

UNIT DESCRIPTOR : This unit covers the outcomes required to work effectively in a workplace characterized by diversity in terms of religions, beliefs, races, ethnicities and other differences

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Develop an individual's cultural awareness and sensitivity	1.1 Individual differences with clients, customers and fellow workers are recognized and respected in accordance with enterprise policies and core values. 1.2 Differences are responded to in a sensitive and considerate manner 1.3 Diversity is accommodated using appropriate verbal and nonverbal communication.	1.1 Understanding cultural diversity in the workplace 1.2Norms of behavior for interacting and dialogue with specific groups (e. g., Muslims and other non-Christians, non-Catholics, tribes/ethnic groups, foreigners) 1.3Different methods of verbal and nonverbal communication in a multicultural setting	1.1 Applying crosscultural communication skills (i.e. different business customs, beliefs, communication strategies) 1.2 Showing affective skills – establishing rapport and empathy, understanding, etc. 1.3 Demonstrating openness and flexibility in communication 1.4 Recognizing diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices
2. Work effectively in an environment	2.1 Knowledge, skills and experiences of others are recognized and	2.1 Value of diversity in the economy and society in terms of	2.1 Demonstrating cross-cultural communication

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
that acknowledges and values cultural diversity	documented in relation to team objectives. 2.2 Fellow workers are encouraged to utilize and share their specific qualities, skills or backgrounds with other team members and clients to enhance work outcomes. 2.3 Relations with customers and clients are maintained to show that diversity is valued by the business.	Workforce development 2.2 Importance of inclusiveness in a diverse environment 2.3 Shared vision and understanding of and commitment to team, departmental, and organizational goals and objectives 2.4 Strategies for customer service excellence	skills and active listening 2.2 Recognizing diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices 2.3 Demonstrating collaboration skills 2.4 Exhibiting customer service excellence
3. Identify common issues in a multicultural and diverse environment	3.1 Diversity-related conflicts within the workplace are effectively addressed and resolved. 3.2 Discriminatory behaviors towards customers/ stakeholders are minimized and addressed accordingly. 3.3 Change management policies are in place within the organization.	3.1 Value, and leverage of cultural diversity 3.2 Inclusivity and conflict resolution 3.3 Workplace harassment 3.4 Change management and ways to overcome resistance to change 3.5 Advanced strategies for customer service excellence	3.1 Addressing diversity-related conflicts in the workplace 3.2 Eliminating discriminatory behavior towards customers and coworkers 3.3 Utilizing change management policies in the workplace

RANGE OF VARIABLES

VARIABLE	RANGE
1. Diversity	This refers to diversity in both the workplace and the community and may include divergence in: 1.1 Religion 1.2 Ethnicity, race or nationality 1.3 Culture 1.4 Gender, age or personality 1.5 Educational background
2. Diversity-related conflicts	May include conflicts that result from: 2.1 Discriminatory behaviors 2.2 Differences of cultural practices 2.3 Differences of belief and value systems 2.4 Gender-based violence 2.5 Workplace bullying 2.6 Corporate jealousy 2.7 Language barriers 2.8 Individuals being differently-abled persons 2.9 Ageism (negative attitude and behavior towards old people)

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Adjusted language and behavior as required by interactions with diversity 1.2 Identified and respected individual differences in colleagues, clients and customers 1.3 Applied relevant regulations, standards and codes of practice
2. Resource Implications	The following resources should be provided: 2.1 Access to workplace and resources 2.2 Manuals and policies on Workplace Diversity
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Demonstration or simulation with oral questioning 3.2 Group discussions and interactive activities 3.3 Case studies/problems involving workplace diversity issues 3.4 Third-party report 3.5 Written examination 3.6 Role Plays
4. Context for Assessment	Competency assessment may occur in workplace or any appropriately simulated environment

UNIT OF COMPETENCY : PROPOSE METHODS OF APPLYING LEARNING AND INNOVATION IN THE ORGANIZATION

UNIT CODE : 400311323

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to assess general obstacles in the application of learning and innovation in the organization and to propose practical methods of such in addressing organizational challenges.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Assess work procedures, processes and systems in terms of innovative practices	1.1 Reasons for innovation are incorporated to work procedures. 1.2 Models of innovation are researched. 1.3 Gaps or barriers to innovation in one's work area are analyzed. 1.4 Staff who can support and foster innovation in the work procedure are identified.	1.1 Seven habits of highly effective people. 1.2 Character strengths that foster innovation and learning (Christopher Peterson and Martin Seligman, 2004) 1.3 Five minds of the future concepts (Gardner, 2007). 1.4 Adaptation concepts in neuroscience (Merzenich, 2013). 1.5 Trans theoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992).	1.1 Demonstrating collaboration and networking skills. 1.2 Applying basic research and evaluation skills 1.3 Generating insights on how to improve organizational procedures, processes and systems through innovation.
2. Generate practical action plans for improving work	2.1 Ideas for innovative work procedure to foster innovation using individual and	2.1 Seven habits of highly effective people. 2.2 Character strengths that foster innovation	2.1 Assessing readiness for change on simple work procedures, processes and systems.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
procedures, processes	group techniques are conceptualized 2.2 Range of ideas with other team members and colleagues are evaluated and discussed 2.3 Work procedures and processes subject to change are selected based on workplace requirements (feasible and innovative). 2.4 Practical action plans are proposed to facilitate simple changes in the work procedures, processes and systems. 2.5 Critical inquiry is applied and used to facilitate discourse on adjustments in the simple work procedures, processes and systems.	and learning (Christopher Peterson and Martin Seligman, 2004) 2.3 Five minds of the future concepts (Gardner, 2007). 2.4 Adaptation concepts in neuroscience (Merzenich, 2013). 2.5 Trans theoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992).	2.2 Generating insights on how to improve organizational procedures, processes and systems through innovation. 2.3 Facilitating action plans on how to apply innovative procedures in the organization.
3. Evaluate the effectiveness of the proposed action plans	3.1 Work structure is analyzed to identify the impact of the new work procedures 3.2 Co-workers/key personnel is consulted to know who will be involved with or affected by the work procedure 3.3 Work instruction operational plan of	3.1 Five minds of the future concepts (Gardner, 2007). 3.2 Adaptation concepts in neuroscience (Merzenich, 2013). 3.3 Trans theoretical model of behavior change (Prochaska,	3.1 Generating insights on how to improve organizational procedures, processes and systems through innovation. 3.2 Facilitating action plans on how to apply innovative procedures in the organization.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	the new work procedure is developed and evaluated. 3.4 Feedback and suggestion are recorded. 3.5 Operational plan is updated. 3.6 Results and impact on the developed work instructions are reviewed 3.7 Results of the new work procedure are evaluated 3.8 Adjustments are recommended based on results gathered	DiClemente, & Norcross, 1992)	3.3 Communicating results of the evaluation of the proposed and implemented changes in the workplace procedures and systems. 3.4 Developing action plans for continuous improvement on the basic systems, processes and procedures in the organization.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Reasons	May include: 1.1 Strengths and weaknesses of the current systems, processes and procedures. 1.2 Opportunities and threats of the current systems, processes and procedures.
2. Models of innovation	May include: 2.1 Seven habits of highly effective people. 2.2 Five minds of the future concepts (Gardner, 2007). 2.3 Neuroplasticity and adaptation strategies.
3. Gaps or barriers	May include: 3.1 Machine 3.2 Manpower 3.3 Methods 3.4 Money
4. Critical Inquiry	May include: 4.1 Preparation. 4.2 Discussion. 4.3 Clarification of goals. 4.4 Negotiate towards a Win-Win outcome. 4.5 Agreement. 4.6 Implementation of a course of action. 4.7 Effective verbal communication. See our pages: Verbal Communication and Effective Speaking. 4.8 Listening. 4.9 Reducing misunderstandings is a key part of effective negotiation. 4.10 Rapport Building. 4.11 Problem Solving. 4.12 Decision Making. 4.13 Assertiveness. 4.14 Dealing with Difficult Situations.

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Established the reasons why innovative systems are required 1.2 Established the goals of a new innovative system 1.3 Analyzed current organizational systems to identify gaps and barriers to innovation. 1.3 Assessed work procedures, processes and systems in terms of innovative practices. 1.4 Generate practical action plans for improving work procedures, and processes. 1.5 Reviewed the trial innovative work system and adjusted reflect evaluation feedback, knowledge management systems and future planning. 1.6 Evaluated the effectiveness of the proposed action plans.
2. Resource Implications	The following resources should be provided: 2.1 Pens, papers and writing implements. 2.2 Cartolina. 2.3 Manila papers
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Psychological and behavioral Interviews. 3.2 Performance Evaluation. 3.3 Life Narrative Inquiry. 3.4 Review of portfolios of evidence and third-party workplace reports of on-the-job performance. 3.5 Sensitivity analysis. 3.6 Organizational analysis. 3.7 Standardized assessment of character strengths and virtues applied.
4. Context for Assessment	4.1. Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions.

UNIT OF COMPETENCY : USE INFORMATION SYSTEMATICALLY

UNIT CODE : 400311324

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to use technical information systems, apply information technology (IT) systems and edit, format & check information.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Use technical information	1.1. Information are collated and organized into a suitable form for reference and use 1.2. Stored information are classified so that it can be quickly identified and retrieved when needed 1.3. Guidance are advised and offered to people who need to find and use information	1.1. Application in collating information 1.2. Procedures for inputting, maintaining and archiving information 1.3. Guidance to people who need to find and use information 1.4. Organize information 1.5. classify stored information for identification and retrieval 1.6. Operate the technical information system by using agreed procedures	1.1. Collating information 1.2. Operating appropriate and valid procedures for inputting, maintaining and archiving information 1.3. Advising and offering guidance to people who need to find and use information 1.4. Organizing information into a suitable form for reference and use 1.5. Classifying stored information for identification and retrieval 1.6. Operating the technical information system by using agreed procedures
2. Apply information technology (IT)	2.1. Technical information system is operated using agreed procedures	2.1. Attributes and limitations of available software tools	2.1. Identifying attributes and limitations of

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.2. Appropriate and valid procedures are operated for inputting, maintaining and archiving information 2.3. Software required are utilized to execute the project activities 2.4. Information and data obtained are handled, edited, formatted and checked from a range of internal and external sources 2.5. Information are extracted, entered, and processed to produce the outputs required by customers 2.6. Own skills and understanding are shared to help others 2.7. Specified security measures are implemented to protect the confidentiality and integrity of project data held in IT systems	2.2. Procedures and work instructions for the use of IT 2.3. Operational requirements for IT systems 2.4. Sources and flow paths of data 2.5. Security systems and measures that can be used 2.6. Extract data and format reports 2.7. Methods of entering and processing information 2.8. WWW enabled applications	available software tools 2.2. Using procedures and work instructions for the use of IT 2.3. Describing operational requirements for IT systems 2.4. Identifying sources and flow paths of data 2.5. Determining security systems and measures that can be used 2.6. Extracting data and format reports 2.7. Describing methods of entering and processing information 2.8. Using WWW applications
3. Edit, format and check information	3.1 Basic editing techniques are used 3.2 Accuracy of documents are checked 3.3 Editing and formatting tools	3.1 Basic file handling Techniques 3.2 Techniques in checking documents 3.3 Techniques in editing and	3.1 Using basic file handling techniques is used for the software 3.2 Using different techniques in

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	and techniques are used for more complex documents 3.4 Proof reading techniques is used to check that documents look professional	formatting 3.4 Proof reading techniques	checking documents 3.3 Applying editing and formatting techniques 3.4 Applying proof reading techniques

RANGE OF VARIABLES

VARIABLE	RANGE
1. Information	May include: 1.1. Property 1.2. Organizational 1.3. Technical reference
2. Technical information	May include: 2.1. paper based 2.2. electronic
3. Software	May include: 3.1. spreadsheets 3.2. databases 3.3. word processing 3.4. presentation
4. Sources	May include: 4.1. other IT systems 4.2. manually created 4.3. within own organization 4.4. outside own organization 4.5. geographically remote
5. Customers	May include: 5.1. colleagues 5.2. company and project management 5.3. clients
6. Security Measures	May include: 6.1. access rights to input; 6.2. passwords; 6.3. access rights to outputs; 6.4. data consistency and back-up; 6.5. recovery plans

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Used technical information systems and information technology 1.2. Applied information technology (IT) systems 1.3. Edited, formatted and checked information
2. Resource Implications	**The following resources should be provided:** 2.1. Computers 2.2. Software and IT system
3. Methods of Assessment	**Competency in this unit should be assessed through:** 3.1. Direct Observation 3.2. Oral interview and written test
4. Context for Assessment	4.1. Competency may be assessed individually in the actual workplace or through accredited institution

UNIT OF COMPETENCY : EVALUATE OCCUPATIONAL SAFETY AND HEALTH WORK PRACTICES

UNIT CODE : 400311325

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to interpret Occupational Safety and Health practices, set OSH work targets, and evaluate effectiveness of Occupational Safety and Health work instructions.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret Occupational Safety and Health practices	1.1 OSH work practices issues are identified relevant to work requirements 1.2 OSH work standards and procedures are determined based on applicability to nature of work 1.3 Gaps in work practices are identified related to relevant OSH work standards	1.1. OSH work practices issues 1.2. OSH work standards 1.3. General OSH principles and legislations 1.4. Company/ workplace policies/ guidelines 1.5. Standards and safety requirements of work process and procedures	1.1. Communication skills 1.2. Interpersonal skills 1.3. Critical thinking skills 1.4. Observation skills
2. Set OSH work targets	2.1 Relevant work information are gathered necessary to determine OSH work targets 2.2 OSH Indicators based on gathered information are agreed upon to measure effectiveness of workplace OSH policies and procedures 2.3 Agreed OSH indicators are	2.1. OSH work targets 2.2. OSH Indicators 2.3. OSH work instructions 2.4. Safety and health requirements of tasks 2.5. Workplace guidelines on providing feedback on OSH and security concerns 2.6. OSH regulations Hazard control procedures	2.1. Communication skills 2.2. Collaborating skills 2.3. Critical thinking skills 2.4. Observation skills

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	endorsed for approval from appropriate personnel 2.4 OSH work instructions are received in accordance with workplace policies and procedures*	2.7. OSH trainings relevant to work	
3. Evaluate effectiveness of Occupational Safety and Health work instructions	3.1 OSH Practices are observed based on workplace standards 3.2 Observed OSH practices are measured against approved OSH metrics 3.3 Findings regarding effectiveness are assessed and gaps identified are implemented based on OSH work standards	3.1. OSH Practices 3.2. OSH metrics 3.3. OSH Evaluation Techniques 3.4. OSH work standards	3.1. Critical thinking skills 3.2. Evaluating skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. OSH Work Practices Issues	May include: 1.1 Workers' experience/observance on presence of work hazards 1.2 Unsafe/unhealthy administrative arrangements (prolonged work hours, no break-time, constant overtime, scheduling of tasks) 1.3 Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/ guidelines
2. OSH Indicators	May include: 2.1 Increased of incidents of accidents, injuries 2.2 Increased occurrence of sickness or health complaints/symptoms 2.3 Common complaints of workers related to OSH 2.4 High absenteeism for work-related reasons
3. OSH Work Instructions	May include: 3.1 Preventive and control measures, and targets 3.2 Eliminate the hazard (i.e., get rid of the dangerous machine 3.3 Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off) 3.4 Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one) 3.5 Use administrative controls to reduce the risk (i.e. give trainings on how to use equipment safely; OSH-related topics, issue warning signage's, rotation/shifting work schedule) 3.6 Use engineering controls to reduce the risk (i.e. use safety guards to machine) 3.7 Use personal protective equipment 3.8 Safety, Health and Work Environment Evaluation 3.9 Periodic and/or special medical examinations of workers
4. OSH metrics	May include: 4.1 Statistics on incidence of accidence and injuries 4.2 Morbidity (Type and Number of Sickness) 4.3 Mortality (Cause and Number of Deaths) 4.4 Accident Rate

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1. Identify OSH work practices issues relevant to work requirements 1.2. Identify gaps in work practices related to relevant OSH work standards 1.3. Agree upon OSH Indicators based on gathered information to measure effectiveness of workplace OSH policies and procedures 1.4. Receive OSH work instructions in accordance with workplace policies and procedures 1.5. Compare Observed OSH practices with against approved OSH work instructions 1.6. Assess findings regarding effectiveness based on OSH work standards
2. Resource Implications	The following resources should be provided: 2.1 Facilities, materials, tools and equipment necessary for the activity
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation/Demonstration with oral questioning 3.2 Third party report 3.3 Written exam
4. Context for Assessment	4.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : EVALUATE ENVIRONMENTAL WORK PRACTICES

UNIT CODE : 400311326

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitude to interpret environmental Issues, establish targets to evaluate environmental practices and evaluate effectiveness of environmental practices

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret environmental practices, policies and procedures	1.1 Environmental work practices issues are identified relevant to work requirements 1.2 Environmental Standards and Procedures nature of work are determined based on Applicability to nature of work 1.3 Gaps in work practices related to Environmental Standards and Procedures are identified	1.1 Environmental Issues 1.2 Environmental Work Procedures 1.3 Environmental Laws 1.4 Environmental Hazardous and Non-Hazardous Materials 1.5 Environmental required license, registration or certification	1.1. Analyzing Environmental Issues and Concerns 1.2. Critical thinking 1.3. Problem Solving 1.4. Observation Skills
2. Establish targets to evaluate environmental practices	2.1. Relevant information is gathered necessary to determine environmental work targets 2.2. Environmental Indicators based on gathered information are set to measure environmental work targets	2.1. Environmental indicators 2.2. Relevant Environment Personnel or expert 2.3. Relevant Environmental Trainings and Seminars	2.1. Investigative Skills 2.2. Critical thinking 2.3. Problem Solving 2.4. Observation Skills

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.3. Indicators are verified with appropriate personnel		
3. Evaluate effectiveness of environmental practices	3.1. Work environmental practices are recorded based on workplace standards 3.2. Recorded work environmental practices are compared against planned indicators 3.3. Findings regarding effectiveness are assessed and gaps identified are implemented based on environment work standards and procedures 3.4. Results of environmental assessment are conveyed to appropriate personnel	3.1 Environmental Practices 3.2 Environmental Standards and Procedures	3.1 Documentation and Record Keeping Skills 3.2 Critical thinking 3.3 Problem Solving 3.4 Observation Skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. Environmental Practices Issues	May include: 1.1 Water Quality 1.2 National and Local Government Issues 1.3 Safety 1.4 Endangered Species 1.5 Noise 1.6 Air Quality 1.7 Historic 1.8 Waste 1.9 Cultural
2. Environmental Indicators	May include: 2.1 Noise level 2.2 Lighting (Lumens) 2.3 Air Quality - Toxicity 2.4 Thermal Comfort 2.5 Vibration 2.6 Radiation 2.7 Quantity of the Resources 2.8 Volume

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1. Identified environmental issues relevant to work requirements 1.2. Identified gaps in work practices related to Environmental Standards and Procedures 1.3. Gathered relevant information necessary to determine environmental work targets 1.4. Set environmental indicators based on gathered information to measure environmental work targets 1.5. Recorded work environmental practices are recorded based on workplace standards 1.6. Conveyed results of environmental assessment to appropriate personnel
2. Resource Implications	The following resources should be provided: 2.1 Workplace/Assessment location 2.2 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection 2.3 Case studies/scenarios relating to environmental protection
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Written/ Oral Examination 3.2 Interview/Third Party Reports 3.3 Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad) 3.4 Simulations and role-plays
4. Context for Assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA center.

UNIT OF COMPETENCY : FACILITATE ENTREPRENEURIAL SKILLS FOR MICRO-SMALL-MEDIUM ENTERPRISES (MSMES)

UNIT CODE : 400311327

UNIT DESCRIPTOR : This unit covers the outcomes required to build, operate and grow a micro/small-scale enterprise.

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Develop and maintain micro-small medium enterprise (MSMEs) skills in the organization	1.1 Appropriate business strategies are determined and set for the enterprise based on current and emerging business environment. 1.2 Business operations are monitored and controlled following established procedures. 1.3 Quality assurance measures are implemented consistently. 1.4 Good relations are maintained with staff/workers. 1.5 Policies and procedures on occupational safety and health and environmental concerns are constantly observed.	1.1 Business models and strategies 1.2 Types and categories of businesses 1.3 Business operation 1.4 Basic Bookkeeping 1.5 Business internal controls 1.6 Basic quality control and assurance concepts 1.7 Government and regulatory processes	1.1 Basic bookkeeping/ accounting skills 1.2 Communication skills 1.3 Building relations with customer and employees 1.4 Building competitive advantage of the enterprise
2. Establish and maintain client-base/ market	2.1 Good customer relations are maintained 2.2 New customers and markets are identified, explored and reached out to.	2.1 Public relations concepts 2.2 Basic product promotion strategies 2.3 Basic market and feasibility studies	2.1 Building customer relations 2.2 Individual marketing skills 2.3 Using basic advertising (posters/

ELEMENT	PERFORMANCE CRITERIA **Italicized terms** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.3 Promotions/ Incentives are offered to loyal customers 2.4 Additional products and services are evaluated and tried where feasible. 2.5 Promotional/ advertising initiatives are carried out where necessary and feasible.	2.4 Basic business ethics	tarpaulins, flyers, social media, etc.)
3. Apply budgeting and financial management skills	3.1 Enterprise is built up and sustained through judicious control of cash flows. 3.2 Profitability of enterprise is ensured though appropriate internal controls. 3.3 Unnecessary or lower-priority expenses and purchases are avoided.	3.1 Cash flow management 3.1 Basic financial management 3.2 Basic financial accounting 3.3 Business Internal controls	3.1 Setting business priorities and strategies 3.2 Interpreting basic financial statements 3.3 Preparing business plans

RANGE OF VARIABLES

VARIABLE	RANGE
1. Business strategies	May include: 1.1. Developing/Maintaining niche market 1.2. Use of organic/healthy ingredients 1.3. Environment-friendly and sustainable practices 1.4. Offering both affordable and high-quality products and services 1.5. Promotion and marketing strategies (e. g., online marketing)
2. Business operations	May include: 2.1 Purchasing 2.2 Accounting/Administrative work 2.3 Production/Operations/Sales
3. Internal controls	May include: 3.1 Accounting systems 3.2 Financial statements/reports 3.3 Cash management
4. Promotional/ Advertising initiatives	May include: 4.1 Use of tarpaulins, brochures, and/or flyers 4.2 Sales, discounts and easy payment terms 4.3 Use of social media/Internet 4.4 “Service with a smile” 4.5 Extra attention to regular customers

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Demonstrated basic entrepreneurial skills 1.2 Demonstrated ability to conceptualize and plan a micro/small enterprise 1.3 Demonstrated ability to manage/operate a micro/small-scale business
2. Resource Implications	**The following resources should be provided:** 2.1 Simulated or actual workplace 2.2 Tools, materials and supplies needed to demonstrate the required tasks 2.3 References and manuals
3. Methods of Assessment	**Competency in this unit should be assessed through:** 3.1 Written examination 3.2 Demonstration/observation with oral questioning 3.3 Portfolio assessment with interview 3.4 Case problems
4. Context for Assessment	4.1 Competency may be assessed in workplace or in a simulated workplace setting 4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group

COMMON COMPETENCIES

UNIT OF COMPETENCY : APPLY QUALITY STANDARDS

UNIT CODE : ICT315202

UNIT DESCRIPTOR : This unit covers the knowledge, skills, attitudes and values needed to apply quality standards in the workplace. The unit also includes the application of relevant safety procedures and regulations, organization procedures and customer requirements.

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Assess quality of received materials	1.1. Work instructions are obtained and work is carried out in accordance with standard operating procedures 1.2. Received materials or component parts are checked against workplace standards and specifications 1.3. Faulty material or components related to work are identified and isolated 1.4. Faults and any identified causes are recorded and/or reported to the supervisor concerned in accordance with workplace procedures 1.5. Faulty materials or components are replaced in accordance with workplace procedures	1.1. Relevant production processes, materials and products 1.2. Characteristics of materials, software and hardware used in production processes 1.3. Quality checking procedures 1.4. Quality Workplace procedures 1.5. Identification of faulty materials related to work	1.1. Reading skills required to interpret work instruction 1.2. Critical thinking 1.3. Interpreting Work instructions

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Assess own work	2.1. Documentation relative to quality within the company is identified and used 2.2. Completed work is checked against workplace standards relevant to the task undertaken 2.3. Faulty pieces are identified and isolated 2.4. Information on the quality and other indicators of production performance is recorded in accordance with workplace procedures 2.5. Deviations from specified quality standards, causes are documented and reported in accordance with the workplace' standards operating procedures	2.1. Safety and environmental aspects of production processes 2.2. Fault identification and reporting 2.3. Workplace procedure in documenting completed work 2.4. Workplace Quality Indicators	2.1. Carry out work in accordance with OHS policies and procedures

ELEMENT	PERFORMANCE CRITERIA Italicized terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Engage in quality improvement	3.1. Process improvement procedures are participated in relation to workplace assignment 3.2. Work is carried out in accordance with process improvement procedures 3.3. Performance of operation or quality of product or service to ensure customer satisfaction is monitored	3.1. Quality improvement processes 3.2. Company customers defined	3.1. Solution providing and decision-making 3.2. Practice company process improvement procedure

RANGE OF VARIABLES

VARIABLE	RANGE
1 Materials	1.1 Materials may include but not limited to: 1.1.1. Manuals 1.1.2. Job orders 1.1.3. Instructional videos
2 Faults	2.1 Faults may include but not limited to: 2.1.1. Materials not to specification 2.1.2. Materials contain incorrect/outdated information 2.1.3. Hardware defects 2.1.4. Materials that do not conform with any regulatory agencies
3 Documentation	3.1 Organization work procedures 3.2 Manufacturer's instruction manual 3.3 Customer requirements 3.4 Forms
4 Errors	4.1 Errors may be related but not limited to the following: 4.1.1. Deviation from the requirements of the Client 4.1.2. Deviation from the requirement of the organization
5 Quality standards	5.1 Quality standards may be related but not limited to the following: 5.1.1. Materials 5.1.2. Hardware 5.1.3. Final product 5.1.4. Production processes 5.1.5. Customer service
6 Customer	6.1 Co-worker 6.2 Supplier/Vendor 6.3 Client 6.4 Organization receiving the product or service

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1. Carried out work in accordance with the company's standard operating procedures 1.2. Performed task according to specifications 1.3. Reported defects detected in accordance with standard operating procedures 1.4. Carried out work in accordance with the process improvement procedures
2. Resource Implications	Competency in this unit must be assessed through: 2.1 Observation 2.2 Oral Questioning 2.3 Practical demonstration
3. Methods of Assessment	3.1. Materials and component parts and equipment to be used in a real or simulated electronic production situation
4. Context for Assessment	4.1. Assessment may be conducted in the workplace or in a simulated work environment.

UNIT COMPETENCY : **PERFORM COMPUTER OPERATIONS**

UNIT CODE : **ICT315203**

UNIT DESCRIPTOR : This unit covers the knowledge, skills, attitudes and values needed to perform computer operations which include inputting, accessing, producing and transferring data using the appropriate hardware and software.

ELEMENT	PERFORMANCE CRITERIA **Italicized** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Plan and prepare for task to be undertaken	1.1. Requirements of task are determined according to specifications 1.2. Appropriate hardware and software are selected according to task assigned and required outcome 1.3. Task is planned to ensure OH & S guidelines and procedures are followed 1.4. Client -specific guidelines and procedures are followed. 1.5. Required data security guidelines are applied in accordance with existing procedures.	1.1. Main types of computers and basic features of different operating systems 1.2. Main parts of a computer 1.3. Information on hardware and software 1.4. Data security guidelines	1.1. Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals. 1.2. Communication skills to identify lines of communication, request advice, follow instructions and receive feedback. 1.3. Interpreting user manuals and security guidelines

ELEMENT	PERFORMANCE CRITERIA **Italicized** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Input data into computer	2.1. Data are entered into the computer using appropriate program/application in accordance with company procedures 2.2. Accuracy of information is checked and information is saved in accordance with standard operating procedures 2.3. Inputted data are stored in storage media according to requirements 2.4. Work is performed within ergonomic guidelines	2.1. Basic ergonomics of keyboard and computer user 2.2. Storage devices and basic categories of memory 2.3. Relevant types software	2.1. Technology skills to use equipment safely including keyboard skills. 2.2. Entering data
3. Access information using computer	3.1. Correct program/application is selected based on job requirements 3.2. Program/application containing the information required is accessed according to company procedures 3.3. Desktop icons are correctly selected, opened and closed for navigation purposes 3.4. Keyboard techniques are carried out in line with OH&S requirements for safe use of keyboards	3.1. General security, privacy legislation and copyright 3.2. Productivity Application 3.3. Business Application	3.1. Accessing information 3.2. Searching and browsing files and data

RANGE OF VARIABLES

VARIABLE	RANGE
1. Hardware and peripheral devices	1.1 Personal computers 1.2 Networked systems 1.3 Communication equipment 1.4 Printers 1.5 Scanners 1.6 Keyboard 1.7 Mouse 1.8 Voice/Data logger
2. Software	Software includes the following but not limited to: 2.1 Word processing packages 2.2 Database packages 2.3 Internet 2.4 Spreadsheets 2.5 Client Specific Software
3. Maintenance	3.1 Creating and managing more space in the hard disk and other peripherals 3.2 Reviewing programs 3.3 Deleting unwanted files 3.4 Backing up files 3.5 Checking hard drive for errors 3.6 Using up to date anti-virus programs 3.7 Cleaning dust from internal and external surfaces

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment must show that the candidate: 1.1 Selected and used hardware components correctly and according to the task requirement 1.2 used basic software applications to create new files and documents 1.3 Produced accurate and complete data in accordance with the requirements 1.4 Used appropriate devices and procedures to transfer files/data accurately 1.5 Used basic functions of a www-browser to locate information.
2. Underpinning knowledge	2.1 Basic ergonomics of keyboard and computer user 2.2 Main types of computers and basic features of different operating systems 2.3 Main parts of a computer 2.4 Storage devices and basic categories of memory 2.5 Relevant types of software 2.6 General security, privacy legislation and copyright 2.7 Viruses 2.8 OH & S principles and responsibilities 2.9 Calculating computer capacity 2.10 Productivity Application 2.11 Business Application 2.12 System Software
3. Underpinning skills	3.1 Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals. 3.2 Communication skills to identify lines of communication, request advice, follow instructions and receive feedback. 3.3 Technology skills to use equipment safely including keyboard skills.
4. Method of assessment	The assessor may select two of the following assessment methods to objectively assess the candidate: 4.1 Direct Observation and Oral Questioning 4.2 Practical demonstration
5. Resource implication	5.1 Computer hardware with peripherals 5.2 Appropriate software
6. Context of Assessment	6.1 Assessment may be conducted in the workplace or in a simulated environment

CORE COMPETENCIES

UNIT OF COMPETENCY : PERFORM BASIC PYTHON PROGRAMMING

UNIT CODE : AB-ICT0601914251301

UNIT DESCRIPTOR : This unit encompasses the foundational knowledge, skills, and attitudes required to attain proficiency in basic Python programming. Learners will master setting up a development environment, applying fundamental Python concepts, implementing effective control structures, manipulating data with diverse structures, and leveraging functions and modules for modular code.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Set up working development environment	1.1 ***Python Interpreter*** is installed in accordance with system requirements. 1.2 ***Integrated Development Environment (IDE)*** is installed in accordance with system requirements. 1.3 Integrated Development Environment (IDE) is configured in accordance with system requirements. 1.4 Project folder is created based on industry practices	**Technology** 1.1 Python interpreter installation. 1.2 Integrated Development Environment (IDE) installation and configuration. 1.3 Industry best practices for organizing project folders.	1.1 Installing and configuration of Python interpreter. 1.2 Installing and configuration of an Integrated Development Environment (IDE). 1.3 Creating project folder following industry standards.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Apply Python basics and syntax	2.1 Input/output statement is utilized in accordance with Python syntax 2.2 ***Data types and variables*** are utilized in accordance with Python syntax. 2.3 ***Expressions, statements, and operators*** are utilized in accordance with Python syntax. 2.4 Receiving input from users and displaying output using arithmetic operations is performed in accordance with python syntax	**Technology** 2.1 Python syntax for Input/output statements, data types, variables, expressions, statements, and operators. **Mathematics** 2.2 Arithmetic operations in Python.	2.1 Utilizing Python syntax for Input/output statements, data types, variables, expressions, statements, and operators. 2.2 Performing arithmetic operations and displaying output using Python syntax.
3. Apply Python control structures and flow	3.1 ***Relational and logical operators*** are utilized in accordance with python syntax. 3.2 If, Elif, and else statements are utilized for conditional execution based on program behavior. 3.3 Switch-like behavior is demonstrated using ***dictionaries and functions.*** 3.4 ***Iterations*** are utilized in accordance with python syntax.	**Technology** 3.1 Relational and logical operators in Python. 3.2 Conditional statements (If, Elif, Else) and their usage. 3.3 Dictionaries and functions for switch-like behavior. 3.4 Iteration in Python.	3.1 Utilizing relational and logical operators in Python. 3.2 Applying conditional statements for program flow. 3.3 Demonstrating switch-like behavior using dictionaries and functions. 3.4 Implementing iterations in Python.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Utilize Python data structures	4.1 ***Data structures*** to manage and manipulate data are utilized in accordance to python syntax. 4.2 Different data structure methods to modify data are utilized accordance to python syntax. 4.3 Different data structures and methods are utilized in a use-case scenario in accordance with python syntax.	**Technology** 4.1 List, Tuple, Dictionaries, and Sets as Python data structures and its methods. 4.2 Methods to manipulate data in different data structures.	4.1 Utilizing Python data structures. 4.2 Applying data structure methods to modify data.
5. Utilize Python functions, modules and libraries	5.1 Functions with parameters and return values are utilized in accordance to python syntax. 5.2 ***Concept of scope*** to variables within functions and modules are applied in accordance to python syntax. 5.3 Operations and conditionals within the function and return value are performed in accordance to python syntax.	**Technology** 5.1 Functions with parameters and return values 5.2 Concept of scope 5.3 Operations and conditionals within functions and return values.	5.1 Utilizing functions with parameters and return values. 5.2 Applying variable scope within functions and modules. 5.3 Implementing operations and conditionals within functions and return values.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Python Interpreter	May include: 1.1 Installation of Python Interpreter. 1.2 Version compatibility 1.3 Configuration settings and environment 1.4 Troubleshooting common issues
2. Integrated Development Environment (IDE)	May include: 2.1 Visual Studio Code (VSCode) as the preferred IDE. 2.2 Configuration settings 2.3 Integration of VSCode with Python Interpreter. 2.4 Usage of extensions and plugins 2.5 Customization of VSCode 2.6 Troubleshooting common IDE-related issues.
3. Data types and variables	May include: 4.1 Declaration and initialization 4.2 Differentiation between various data types (int, float, str, bool). 4.3 Typecasting and conversion between data types. 4.4 Variable naming conventions and best practices. 4.5 Global vs local scope of variables. 4.6 Dynamic typing in Python.
4. Expression, statement and operators	May include: 4.1 Usage of expressions and statements in Python. 4.2 Arithmetic operators (+, -, *, /, %, //, **). 4.3 Bitwise operators (&, |, ^, ~, <<, >>). 4.4 Identity operators (is, is not). 4.5 Membership operators (in, not in). 4.6 Range
5. Relational and logical operators	May include: 5.1 Comparison operators (==, !=, <, >, <=, >=). 5.2 Logical operators (and, or, not). 5.3 Application of relational operators in conditional statements. 5.4 Usage of logical operators 5.5 Short-circuit evaluation in logical expressions.

VARIABLE	RANGE
	5.6 Operators in decision-making constructs.
6. Dictionaries and functions	May include: 6.1 Dictionary Keys 6.2 Arguments and Parameters 6.3 Nested Dictionaries 6.4 Return Values 6.5 Function Calls
7. Iterations	May include: 7.1 While loops 7.2 For loops, range() and In keyword 7.3 do-while loops 7.4 Nested loops 7.5 Beak and continue
8. Data Structures	May include: 8.1 List 8.2 Tuple 8.3 Set 8.4 Dictionaries
9. Concept of Scope	May include: 9.1 Local Variable Scope 9.2 Global Scope Rules 9.3 Scope Hierarchy 9.4 Modifying Global Variables 9.5 Libraries

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: a. set-up working development environment b. Applied python basics and syntax c. Applied python control structures and flow d. Utilized python data structures e. Utilized python functions, modules and libraries
2. Resource Implication	2.1 Computer with: ● any Integrated Development Environment (IDE) suitable for Python. ● Access to the internet for research and updates. 2.2 Conducive testing environment for practical coding exercises. 2.3 Supplementary reading materials
3. Method of Assessment	Competency in this unit may be assessed through: a. Demonstration/observation with oral questioning b. Written exam c. Interview
4. Context of Assessment	Competency may be assessed individually in the actual workplace or simulation environment by the institution with TESDA registered program.

UNIT OF COMPETENCY : **CONDUCT OBJECT-ORIENTED ANALYSIS AND DESIGN FOR PYTHON APPLICATIONS**

UNIT CODE : **AB-ICT0601914251302**

UNIT DESCRIPTOR : This unit guides learners in applying Object-Oriented Analysis and Design (OOAD) principles to Python programming. Learners explore Object-Oriented Concepts, delve into SOLID principles integration in Python for code robustness, and learn to systematically identify and validate system requirements. The unit also covers the development of system designs and architectures in Python, providing learners with a comprehensive skill set for crafting scalable and efficient solutions.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Examine Object-Oriented Concepts for Python Applications	1.1 Fundamental ***principles of object-oriented programming (OOP)*** are identified in accordance with python syntax. 1.2 Concepts of classes and objects are explained in accordance with python syntax. 1.3 Attributes and methods associated with classes are defined in accordance with python syntax. 1.4 Access modifier are defined in accordance with python syntax.	**Technology** 1.1 Principles of object-oriented programming. 1.2 Class and object concepts in Python. 1.3 Attributes and methods in Python classes. 1.4 Implementation of OOP Principles in Python. 1.5 Access modifiers	1.1 Analyzing OOP principles for Python. 1.2 Interpreting concepts of classes and objects in Python. 1.3 Defining attributes and methods for classes in Python. 1.4 Defining access modifier in Python.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Examine SOLID Principles in Python	2.1 ***Single Responsibility Principle (SRP)*** is identified based on industry practices. 2.2 ***Open-closed principle (OCP)*** is identified by allowing extension without modifying existing code based on industry practices. 2.3 ***Liskov Substitution Principle (LSP)*** is utilized using proper inheritance and polymorphism. 2.4 ***Interface Segregation Principle (ISP)*** is utilized to create focused and specific interfaces based on industry practices. 2.5 ***Dependency Inversion Principle (DIP)*** is demonstrated through inversion of control or dependency injection based on industry practices. 2.6 SOLID principles through code reviews and static analysis tools are validated in accordance to industry practices.	**Technology** 2.1 Single Responsibility Principle (SRP) 2.2 Open-Closed Principle (OCP) 2.3 Liskov Substitution Principle (LSP) 2.4 Interface Segregation Principle (ISP) 2.5 Dependency Inversion Principle (DIP) 2.6 Code review and static analysis tools	2.1 Designing classes and modules adhering to SRP 2.2 Ensuring OCP through extension without modifying existing code 2.3 Analyzing LSP through proper inheritance and polymorphism 2.4 Analyzing ISP to create focused and specific interfaces 2.5 Demonstrating DIP through inversion of control or dependency injection 2.6 Performing validation of SOLID principles through code reviews and static analysis tools
3. Identify system requirements	3.1 ***System requirements*** are identified and documented based on stakeholder needs. 3.2 ***Modeling techniques*** such as use case and activity diagrams are utilized to represent system functionality based on	**Technology** 3.1 Techniques for gathering and documenting system requirements. 3.2 Modeling techniques 3.3 Principles of generalization and specialization	3.1 Identifying stakeholder needs 3.2 Utilizing modeling techniques 3.3 Applying principles of generalization and specialization

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	user interactions, system processes, and workflows. 3.3 Class diagrams are developed to depict the static structure of the system based on the identified system requirements. 3.4 Sequence diagrams are created to illustrate the dynamic interactions among objects based on the identified system requirements. 3.5 ***Principles of generalization and specialization*** are applied in creating class hierarchies based on common attributes and behaviors of classes.		
4. Develop System design and architecture	4.1 System requirements and analysis models are translated into ***design specifications*** based on best practices. 4.2 ***Design principles*** are applied to enhance the modularity and maintainability of the system based on design patterns such as SOLID principles. 4.3 ***Architectural design*** is developed based on design specifications. 4.4 ***System design*** is developed in accordance to system requirement.	**Communication** 4.1Translating system requirements into design specifications. 4.2 Effective Documentation Practices for Design Decision Management **Technology** 4.3 Class specifications including attributes and methods 4.4 System Design and Architecture	4.1 Translating requirements into detailed design specifications. 4.2 Creating design specifications. 4.3 Implementing design principles. 4.4 Developing system design and architecture.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Principles of object-oriented programming (OOP)	May include: 1.1 Concepts of classes and objects 1.2 Define attributes and methods 1.3 Encapsulation, inheritance, and polymorphism in Python OOP. 1.4 Access modifiers
2. Single Responsibility Principle (SRP)	May include: 2.1 Design classes and modules 2.2 Provide examples of classes 2.3 Code organization and maintainability. 2.4 Validate adherence to SRP
3. Open-closed principle (OCP)	May include: 3.1 Design and implement classes and modules 3.2 Examples of extending functionality 3.3 Provide evidence of code flexibility 3.4 Validate OCP
4. Liskov Substitution Principle (LSP)	May include: 4.1 Inheritance and polymorphism 4.2 Derived classes 4.3 Adherence to LSP in class hierarchies 4.4 Validate LSP
5. Interface Segregation Principle (ISP)	May include: 5.1 Create focused and specific interfaces 5.2 Design interfaces 5.3 Validate ISP
6. Dependency Inversion Principle (DIP)	May include: 6.1 Inversion technique 6.2 Dependency injection 6.3 High and Low-level modules 6.4 Evidence of decoupling and flexibility 6.5 Validate DIP
7. System Requirements	May include: 7.1 Functional Requirements 7.2 Non-functional Requirements 7.3 Technical Requirements 7.4 User Requirements 7.5 Data Requirements 7.6 Operational Requirements
8. Modeling Techniques	May include: 8.1 Use case diagram 8.2 Activity Diagram 8.3 Sequence Diagram

VARIABLE	RANGE
	8.4 Class Diagram
9. Principles of Generalization and Specialization	May include: 9.1 Identifying common attributes and behaviors 9.2 Creating superclass and subclass hierarchies 9.3 Abstracting general features into a base class 9.4 Defining specific features in derived classes 9.5 Promoting reusability and code inheritance 9.5 Enhancing maintainability and extensibility
10. Design specifications	May include: 8.1 Analysis model 8.2 Class specifications 8.3 Specify relationships and associations 8.4 Design principles Document design decisions and justifications
11. Design Principles	May include: 10.1 Single Responsibility Principle (SRP) 10.2 Open/Closed Principle (OCP) 10.3 Liskov Substitution Principle (LSP) 10.4 Interface Segregation Principle (ISP) 10.5 Dependency Inversion Principle (DIP)
12. Architectural Design	May include: 9.1 Component Interaction 9.2 System Modularity 9.3 Design Patterns 9.4 Abstraction Layers 9.5 Dependency Management 9.6 Scalability Considerations
13. System Design	May include: 13.1 Class Hierarchies 13.2 Inheritance Structures 13.3 Interaction Modeling 13.4 Design Patterns 13.5 Object Collaboration 10.6 Component Composition

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Examined Object-Oriented Concepts for Python Applications. 1.2 Examined SOLID Principles in python 1.3 Identified System Requirements a. Developed System design and architecture
2. Resource Implication	2.1 Computer with: ● any Integrated Development Environment (IDE) suitable for Python. ● any diagraming tools. ● Access to the internet for research and updates. 2.2 Conducive testing environment for practical coding exercises. 2.3 Supplementary reading materials
3. Method of Assessment	Competency in this unit may be assessed through: a. Demonstration/observation with oral questioning b. Written exam c. Interview
4. Context of Assessment	Competency may be assessed individually in the actual workplace or simulation environment by the institution with TESDA registered program.

UNIT OF COMPETENCY : **CRAFT AND REFINE PYTHON APPLICATIONS EMPLOYING ADVANCED PROGRAMMING TECHNIQUES**

UNIT CODE : **AB-ICT0601914251303**

UNIT DESCRIPTOR : This unit equips learners with advanced software development skills encompassing the application of sophisticated Object-Oriented Programming (OOP) principles, creation and management of databases, implementation of algorithms and advanced data structures, utilization of Flask in web development, proficiency in asynchronous programming in Python, and optimization of application performance.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Develop application using OOP Principles	1.1 Classes that showcase OOP concepts are implemented in accordance to python syntax. 1.2 Appropriate design patterns such as Singleton, Factory, or Observer is applied in real-world applications in accordance with python syntax. 1.3 ***Error handling mechanisms*** within the OOP framework for robust applications are implemented according to Python Syntax. 1.4 ***Modularization strategies*** to enhance code readability and maintainability are utilized based on industry practices. 1.5 Adherence to OOP best practices for practical and scalable application development are implemented based on industry practices.	**Technology** 1.1 OOP Concepts 1.2 Design Patterns in Real-world Applications 1.3 Error Handling Mechanisms in OOP 1.4 Modularization Strategies 1.5 OOP Best Practices	1.1 Demonstrating OOP concepts. 1.2 Applying appropriate design patterns in use case scenario. 1.3 Implementing robust error handling mechanisms within the OOP framework. 1.4 Employing modularization strategies effectively to enhance code readability and maintainability. 1.5 Applying OOP best practices.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Create database	2.1 Appropriate ***database schemas*** are created in accordance to industry practices. 2.2 ***SQL database*** is designed and implemented for the application using Python, incorporating best practices in database management. 2.3 CRUD (Create, Read, Update, Delete) operations with SQL is implemented in accordance to python syntax. 2.4 ***Advance database queries*** are utilized for efficiency according to industry practices. 2.5 ***Transactions*** are implemented to maintain data consistency in accordance to industry practices. 2.6 Data integrity is maintained in accordance to industry practices. 2.7 Encryption of sensitive data is utilized in accordance to industry practices.	**Technology** 2.1 Database schema design 2.2 SQL databases creation and management 2.3 CRUD operations with SQL 2.4 Advance database query **Laws and standards** 2.6 Data Privacy Act of 2012 2.7 ISO 27001/27701	2.1 Designing database schemas 2.2 Creating SQL databases 2.3 Performing database management 2.4 Implementing CRUD operations 2.5 Utilizing advance database queries 2.6 Utilizing encryption techniques for sensitive data
3. Apply algorithm and advance data structures	3.1 Efficient algorithms are utilized to optimized in accordance to industry practices. 3.2 Time and space complexity analysis is applied based on industry practices. 3.3 ***Algorithm Design paradigm*** are implemented based on python syntax 3.4 Appropriate data structures for specific ***use cases*** are utilized according to industry practices.	**Technology** 3.1 Efficiency of algorithms 3.2 Time and space complexity analysis 3.3 Concept of algorithm design paradigm 3.4 Selection of appropriate data structures 3.5 Data structures for caching, indexing, and optimization	3.1 Measuring the efficiency of algorithms 3.2 Calculating time and space complexity 3.3 Selecting appropriate algorithm design paradigm 3.4 Utilizing appropriate data structures

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Utilize Python Framework in system development	4.1 Appropriate ***python framework*** is determined based on system requirements. 4.2 Python framework is installed based on framework's requirements. 4.3 Python framework is configured based on framework's requirements 4.4 Python framework components are utilized into the system. 4.5 Error handling is implemented within the Python framework based on best practices and standard error handling techniques.	**Technology** 4.1 Python frameworks and its components 4.2 System requirements analysis 4.3 Installation procedure 4.4 Error handling techniques	4.1 Determining appropriate python framework 4.2 Performing python framework installation 4.3 Performing python framework configuration
5. Optimize application performance	5.1 ***Performance bottlenecks*** in the application are minimized in accordance to industry practices. 5.2 ***Caching mechanisms*** are implemented to reduce data retrieval latency according to industry practices. 5.3 ***Profiling tools*** are utilized to analyze and enhance code performance according to industry practices. 5.4 ***Code optimization techniques*** are applied without sacrificing readability to industry practices.	**Technology** 5.1 Identification and optimization of performance bottlenecks 5.2 Caching mechanisms 5.3 Profiling tools for code analysis 5.4 Code optimization techniques	5.1 Identifying and optimizing performance bottlenecks 5.2 Implementing caching mechanisms for reduced latency 5.3 Utilizing profiling tools for code analysis and enhancement 5.4 Applying code optimization techniques without sacrificing readability

RANGE OF VARIABLES

VARIABLE	RANGE
1. Error handling mechanisms	May include: 1.1 Try-Except Blocks 1.2 Custom Exception Classes 1.3 Logging Errors 1.4 Graceful Degradation 1.5 Resource Cleanup 1.6 User-Friendly Error Messages 1.7 Exception Propagation 1.8 Assertions 1.9 Fallback Procedures 1.10 Context Managers
2. Modularization strategies	May include: 2.1 Component Decomposition 2.2 Dependency Management 2.3 Encapsulation Techniques 2.4 Code Organization 2.5 Reusable Modules 2.6 Interface Design
3. Database schemas	May include: 3.1 Table Structures 3.2 Relationships (One-to-One, One-to-Many, Many-to-Many) 3.3 Primary Keys 3.4 Foreign Keys 3.5 Indexing 3.6 Normalization 3.7 Denormalization 3.8 Constraints (Unique, Not Null, Check) 3.9 Data Types 3.10 Schema Versioning
4. SQL database	May include: 4.1 Indexing Strategies 4.2 Query Optimization 4.3 Data Modeling 4.4 Transaction Management 4.5 Security Measures 2.6 Joins and Relations
5. Advance Database queries	May include: 5.1 Query Optimization

VARIABLE	RANGE
	5.2 Indexing Strategies 5.3 Join Techniques 5.4 Aggregate Functions 5.5 Subquery Usage 5.6 Data Retrieval
6. Transactions	May include: 6.1 Transaction Isolation 6.2 ACID Properties 6.3 Database Locking 6.4 Rollback Mechanism 6.5 Two-Phase Commit 6.6 Concurrent Transactions
7. Algorithm Design paradigms	May include: 7.1 Dynamic Programming 7.2 Graph Algorithms 7.3 Divide and Conquer 7.4 Greedy Algorithms 7.5 Search Algorithms 7.6 Sorting Techniques
8. Use case	May include: 8.1 User Authentication and Authorization 8.2 Data Entry and Validation 8.3 Report Generation 8.4 Data Retrieval and Search 8.5 Workflow Automation 8.6 System Monitoring and Logging 8.7 Error Handling and Recovery 8.8 Integration with External Systems
9. Python Framework	May include: 9.1 Fundamentals 9.2 Advanced Concepts 9.3 Django Framework 9.4 Flask Framework 9.5 Data Structures 9.6 Algorithm Design 9.7 Debugging Techniques

10. Performance bottlenecks	May include: 10.1 CPU Overutilization 10.2 Memory Leaks 10.3 Disk I/O Bottlenecks 10.4 Network Latency 10.5 Database Query Performance 10.6 Contention for Shared Resources 10.7 Inefficient Algorithms 10.8 Poorly Designed Data Structures
11. Caching mechanisms	May include: 11.1 In-Memory Caching 11.2 Distributed Caching 11.3 Cache Invalidation 11.4 Cache Coherence 11.5 Write-Through Caching 11.6 Write-Back Caching 11.7 Cache Eviction Policies
12. Profiling tools	May include: 12.1 CPU Profilers 12.2 Memory Profilers 12.3 Disk I/O Profilers 12.4 Network Profilers 12.5 Database Profilers 12.6 Application Performance Monitoring (APM) Tools 12.7 Code Coverage Tools 12.8 Runtime Analysis Tools
13. Core optimization	May include: 13.1 Code Refactoring 13.2 Algorithm Optimization 13.3 Data Structure Optimization 13.4 Parallel Processing 13.5 Load Balancing 13.6 Query Optimization 13.7 Memory Management 13.8 Caching Strategies 13.9 Asynchronous Processing 13.10 Resource Pooling

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Developed application using OOP Principles 1.2 Created database 1.3 Applied algorithm and advance data structures 1.4 Used python framework in system development 1.5 Optimized application performance
2. Resource Implication	2.1 Computer with: ● any Integrated Development Environment (IDE) suitable for Python. ● Access to the internet for research and updates. 2.2 Conducive testing environment for practical coding exercises. 2.3 Supplementary reading materials
3. Method of Assessment	Competency in this unit may be assessed through: a. Demonstration/observation with oral questioning b. Written exam c. Interview
4. Context of Assessment	Competency may be assessed individually in the actual workplace or simulation environment by the institution with TESDA registered program.

GLOSSARY OF TERMS

ACCESS MODIFIERS	various object-oriented languages like C++, Java, Python control access modifications which are used to restrict access to the variables and methods of the class.
ALGORITHM	is a set of commands that must be followed for a computer to perform calculations or other problem-solving operations
ARITHMETIC OPERATIONS	are symbols in Python programming that represent basic mathematical operations performed on numeric data types such as integers, floating-point numbers, and complex numbers
ATTRIBUTES	are variables associated with an object and are used to store data related to the object
CLASSES	The class creates a user-defined data structure, which holds its own data members and member functions, which can be accessed and used by creating an instance of that class
CONDITIONALS	Conditional statements evaluate a specific condition or expression. If the condition is true, a certain block of code is executed. If the condition is false, the code block is skipped, and the program moves on to the next part of the code. In Python, the primary conditional statements are if , elif , and else
CRUD	In software development, CRUD (Create, Read, Update, and Delete) operations refer to the four basic functions that are usually used in data management systems
DATABASE	is a file that is organized for storing data
ENCRYPTION	is a process of converting information into some form of a code to hide its true content
EXPRESSIONS	is a combination of values, variables, and operators that evaluates to a single value
FRAMEWORKS	automate the implementation of several tasks and give developers a structure for application development
FUNCTIONS	is defined as a relation between a set of inputs having one output each
IDE	An integrated development environment (IDE) is a software application that helps programmers develop software code efficiently. It increases developer productivity by combining capabilities such as software editing, building, testing, and packaging in an easy-to-use application
ISO	"ISO" typically refers to the International Organization for Standardization, which is responsible for developing and publishing international standards across various industries.

ITERATIONS	refers to the process of repeatedly executing a block of code, typically a loop, until a certain condition is met. It allows you to perform repetitive tasks efficiently and is a fundamental concept in programming
LIBRARIES	is a collection of code that makes everyday tasks more efficient
METHODS	Is a function that is associated with an object. Methods are essential for encapsulating behavior within objects and enabling object-oriented programming (OOP) principles such as abstraction, encapsulation, inheritance, and polymorphism
MODULES	is a file containing Python code
OBJECTS	are variables that contain data and functions that can be used to manipulate the data
OOP	Object-oriented programming is a programming paradigm that is based on the concept of "objects", which can contain data and code that manipulates that data
ORM	Object-relational mapping (ORM) is a design pattern that helps streamline communication between relational databases and object-oriented programming languages like Java or Python
PYTHON	is a computer programming language often used to build websites and software, automate tasks, and analyze data
QUERIES	refer to requests for information or data retrieval from various sources such as databases, APIs, or data structures
SPACE COMPLEXITY	refers to the amount of memory or space required by an algorithm to solve a computational problem as a function of the size of the input data
SQL	(Structured Query Language) is a domain-specific language used for managing and querying relational databases
SRP	refers to the Single Responsibility Principle, which is one of the five SOLID principles of object-oriented programming. The Single Responsibility Principle states that a class should have only one reason to change, meaning it should have only one responsibility or purpose.
STATEMENTS	is a syntactic unit of code that performs a specific action. Python statements are instructions that the Python interpreter can execute to carry out tasks such as assigning values to variables, performing computations, controlling the flow of program execution, and defining functions and classes.
SYNTAX	refers to the rules and conventions governing the structure and formatting of code written in the Python programming language.
TIME COMPLEXITY	refers to the computational complexity that measures the amount of time an algorithm takes to execute as a function of the size of its input.
USE CASE	is a methodology used in system analysis to identify, clarify and organize system requirements.
VARIABLES	is a named reference to a value stored in the computer's memory

SOLID PRINCIPLES	are a set of five design principles in object-oriented programming intended to make software designs more understandable, flexible, and maintainable.
CLASS DIAGRAMS	are a type of static structure diagram in UML (Unified Modeling Language) that describe the structure of a system by showing its classes, attributes, methods, and the relationships among objects.
SEQUENCE DIAGRAMS	is a type of interaction diagram in UML (Unified Modeling Language) that shows how objects interact in a particular sequence of time.
DATA INTEGRITY	refers to the accuracy, consistency, and reliability of data throughout its lifecycle.

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