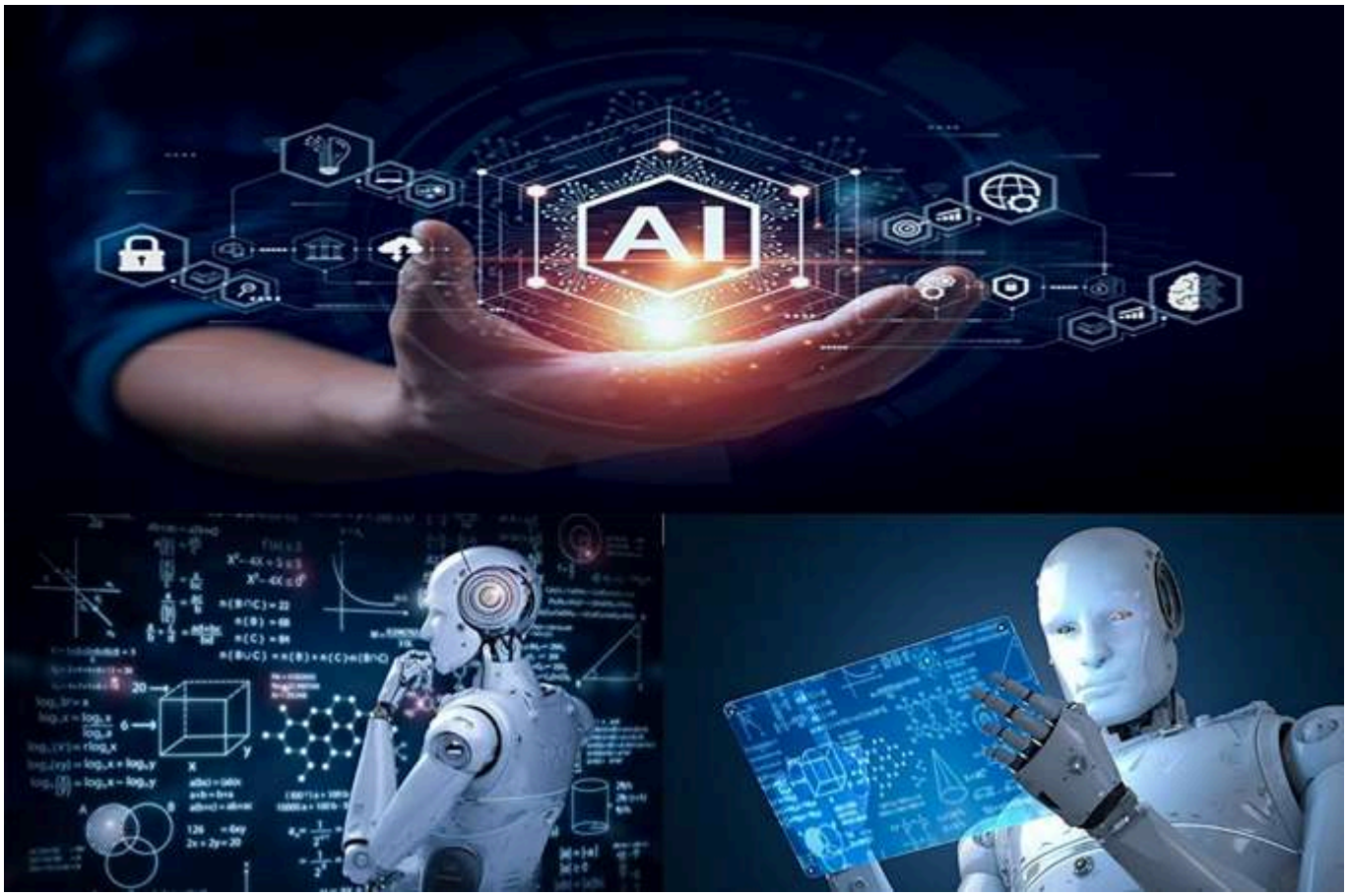
Qualification Pack



A.I (Artificial Intelligence) - Technocrat

Electives: Applications of AI in Electrical Domain

QP Code: ICE/ITS/Q0201 Instantiated QP Code: ICE/ITS/Q0201-SI003

Version: 1.0

NSQF Level: 5

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Qualification Pack

ICE/ITS/Q0201-SI003: A.I (Artificial Intelligence) - Technocrat

Brief Job Description

AI Technocrats design and implement artificial intelligence solutions across diverse engineering disciplines. They optimize systems and processes using intelligent algorithms and automation, enhancing efficiency and innovation. Their work focuses on developing AI-driven tools that address industry challenges while promoting sustainability by reducing waste and energy consumption, ultimately fostering ecological balance and improving operational performance across various Engineering sectors.

Personal Attributes

They are analytical, adaptive collaborative with strong problem-solving skills and a commitment to continuous learning in AI technologies.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ICE/ITS/N0201: Fundamentals of Artificial Intelligence (AI)
2. ICE/ITS/N0202: Python Programming and data science for AI
3. ICE/ITS/N0203: Building Blocks of Artificial Intelligence (A.I)
4. DGT/VSQ/N0102: Employability Skills (60 Hours)

Electives*(mandatory to select at least one):*

Elective : Applications of AI in Electrical Domain

This explores the various applications of artificial intelligence (AI) tools and algorithms within the field of electrical engineering. It covers how AI technologies can enhance electrical systems, improve efficiency, and enable advanced problem-solving techniques in design, analysis, and operation. Through a combination of theoretical concepts and practical examples, participants will gain insights into integrating AI methodologies into electrical engineering practices.

1. ICE/ITS/N0206: Applications of AI tools/algorithms in Electrical Engineering

Qualification Pack (QP) Parameters

Sector	Information Technology Sector

Qualification Pack

Sub-Sector	Future skills
Occupation	Artificial Intelligence
Country	India
NSQF Level	5
Credits	20
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3123.0302 & 3123.0400 & 3122.5600
Minimum Educational Qualification & Experience	Completed 2nd year of UG (UG Diploma) OR Pursuing 2nd year of UG (3 years / 4 years) OR Completed 2nd year diploma after 12th OR Completed 3 year diploma after 10th with 1.5 years of experience relevant stream experience OR Previous relevant Qualification of NSQF Level (4.5) with 1.5 years of experience relevant stream experience
Minimum Level of Education for Training in School	Not Applicable
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	17/12/2024
Next Review Date	17/12/2027
NSQC Approval Date	17/12/2024
Version	1.0
Reference code on NQR	QG-05-IT-03423-2024-V1-TICE
NQR Version	1

Qualification Pack

ICE/ITS/N0201: Fundamentals of Artificial Intelligence (AI)

Description

This unit covers the Fundamental of Artificial Intelligence (AI) exploring the foundational ideas, key techniques and widespread use of A.I across various fields.

Scope

The scope covers the following :

- This introductory unit explores core concepts like machine learning, neural networks, and natural language processing. And on how AI is applied in automation, decision-making, and problem-solving. Furthermore, this also addresses the ethical implications, current limitations, and the exciting future prospects of AI technology.

Elements and Performance Criteria

Introduction to AI

To be competent, the user/individual on the job must be able to:

PC1. Understand the basic concepts and definitions of Artificial Intelligence and its significance in various technical trades.

PC2. Demonstrate knowledge of AI applications in technical fields, such as predictive maintenance, automation, quality control, and resource optimization.

PC3. Explain the role of machine learning and data analytics in enhancing decision-making processes within technical trades.

PC4. Understand the importance of data collection and management for effective AI implementation including the use of IoT devices and sensors.

PC5. Evaluate the impact of AI on workflow efficiency, cost reduction, and productivity improvement in various technical trades.

The Ethical Landscape of AI and its Societal Impact

To be competent, the user/individual on the job must be able to:

PC6. Understand the core principles of AI ethics, including fairness, accountability, transparency, and the responsible use of AI technologies.

PC7. Describe the impact of AI on privacy and surveillance, discussing the ethical considerations surrounding data collection and user consent.

PC8. Explore the implications of AI on employment and workforce dynamics including the potential for job displacement and the need for workforce reskilling.

PC9. Understand the importance of regulatory frameworks and policies in governing AI technologies to ensure ethical practices and protect societal interests.

PC10. Analyze ethical considerations and challenges associated with the adoption of AI technologies, such as data privacy concerns, potential job displacement, and algorithmic bias

PC11. Discuss the potential societal benefits of AI, such as improved healthcare, enhanced public safety, and advancements in education while recognising the associated ethical challenges.

Aptitude & Mathematics Fundamentals

To be competent, the user/individual on the job must be able to:

PC12. Describe basic mathematical concepts, including algebra, calculus, and statistics, essential for understanding AI algorithms and models.

PC13. Understand the principles of linear algebra, including vectors, matrices, and operations, and their applications in machine learning and data manipulation.

PC14. Discuss probability theory to analyse uncertainty in AI models, including concepts such as conditional probability, Bayes' theorem, and distributions

PC15. Explain statistical methods for data analysis, including hypothesis testing, regression analysis and descriptive statistics.

PC16. Understand the significance of optimization techniques, including gradient descent and convex optimization in training machine learning models.

Data Handling

To be competent, the user/individual on the job must be able to:

PC17. Understand the importance of data quality and data cleaning processes including handling missing values, outliers and duplicates to ensure reliable AI model performance.

PC18. Explain data pre-processing techniques, such as normalization, standardization, and encoding categorical variables, to prepare data for analysis

PC19. Describe data exploration and visualization techniques using tools like Matplotlib and Seaborn to understand data distributions, correlations, and trends.

PC20. Understand the significance of data splitting methods (e.g., training, validation, and test sets) in building robust AI models and preventing overfitting.

PC21. Examine techniques for storing and retrieving data, including databases, data lakes, and data warehouses, for effective data management.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Core definition of Artificial Intelligence and its distinction from traditional computing, including concepts like machine learning, deep learning, and neural networks.

KU2. Historical development of AI, key milestones, and influential figures in the field.

KU3. Different types of AI, including narrow AI (specific tasks) and general AI (human-like capabilities), along with their implications.

KU4. Fundamental concepts of machine learning, including supervised, unsupervised, and reinforcement learning paradigms

KU5. Critical role of data in AI, including data collection, pre-processing, and the significance of high- quality datasets for model training.

KU6. Key algorithms used in AI and machine learning, such as decision trees, support vector machines, and neural networks

KU7. Various applications of AI across industries, including healthcare, finance, transportation, and entertainment, and their societal impact.

KU8. Awareness of emerging trends in AI, such as advancements in natural language processing, computer vision.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Listen and communicate effectively and accurately.
GS2. Apply problem-solving approaches for different situations.
GS3. Work effectively in a team.
GS4. Employ proper time management.
GS5. Plan and organize work.
GS6. Maintain hygiene and sanitation.
GS7. Apply analytical skills for solving problems.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to AI	**10**	**10**	**-**	**2**
PC1. Understand the basic concepts and definitions of Artificial Intelligence and its significance in various technical trades.	-	-	-	-
PC2. Demonstrate knowledge of AI applications in technical fields, such as predictive maintenance, automation, quality control, and resource optimization.	-	-	-	-
PC3. Explain the role of machine learning and data analytics in enhancing decision-making processes within technical trades.	-	-	-	-
PC4. Understand the importance of data collection and management for effective AI implementation including the use of IoT devices and sensors.	-	-	-	-
PC5. Evaluate the impact of AI on workflow efficiency, cost reduction, and productivity improvement in various technical trades.	-	-	-	-
The Ethical Landscape of AI and its Societal Impact	**10**	**10**	**-**	**2**
PC6. Understand the core principles of AI ethics, including fairness, accountability, transparency, and the responsible use of AI technologies.	-	-	-	-
PC7. Describe the impact of AI on privacy and surveillance, discussing the ethical considerations surrounding data collection and user consent.	-	-	-	-
PC8. Explore the implications of AI on employment and workforce dynamics including the potential for job displacement and the need for workforce reskilling.	-	-	-	-
PC9. Understand the importance of regulatory frameworks and policies in governing AI technologies to ensure ethical practices and protect societal interests.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. Analyze ethical considerations and challenges associated with the adoption of AI technologies, such as data privacy concerns, potential job displacement, and algorithmic bias	-	-	-	-
PC11. Discuss the potential societal benefits of AI, such as improved healthcare, enhanced public safety, and advancements in education while recognising the associated ethical challenges.	-	-	-	-
Aptitude & Mathematics Fundamentals	**10**	**15**	**-**	**3**
PC12. Describe basic mathematical concepts, including algebra, calculus, and statistics, essential for understanding AI algorithms and models.	-	-	-	-
PC13. Understand the principles of linear algebra, including vectors, matrices, and operations, and their applications in machine learning and data manipulation.	-	-	-	-
PC14. Discuss probability theory to analyse uncertainty in AI models, including concepts such as conditional probability, Bayes' theorem, and distributions	-	-	-	-
PC15. Explain statistical methods for data analysis, including hypothesis testing, regression analysis and descriptive statistics.	-	-	-	-
PC16. Understand the significance of optimization techniques, including gradient descent and convex optimization in training machine learning models.	-	-	-	-
Data Handling	**10**	**15**	**-**	**3**
PC17. Understand the importance of data quality and data cleaning processes including handling missing values, outliers and duplicates to ensure reliable AI model performance.	-	-	-	-
PC18. Explain data pre-processing techniques, such as normalization, standardization, and encoding categorical variables, to prepare data for analysis	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC19. Describe data exploration and visualization techniques using tools like Matplotlib and Seaborn to understand data distributions, correlations, and trends.	-	-	-	-
PC20. Understand the significance of data splitting methods (e.g., training, validation, and test sets) in building robust AI models and preventing overfitting.	-	-	-	-
PC21. Examine techniques for storing and retrieving data, including databases, data lakes, and data warehouses, for effective data management.	-	-	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/ITS/N0201
NOS Name	Fundamentals of Artificial Intelligence (AI)
Sector	Information Technology Sector
Sub-Sector	
Occupation	Artificial Intelligence
NSQF Level	5
Credits	1.5
Version	1.0
Last Reviewed Date	17/12/2024
Next Review Date	17/12/2027
NSQC Clearance Date	17/12/2024

ICE/ITS/N0202: Python Programming and data science for AI

Description

This module emphasizes the use of Python for developing and applying AI algorithms. It provides a comprehensive overview of how to implement these technologies effectively. Participants will learn to harness Python's capabilities in the field of artificial intelligence.

Scope

The scope covers the following :

- It covers Python libraries such as NumPy, Pandas, TensorFlow, and PyTorch, which are essential for machine learning and deep learning data processing. This also includes practical programming techniques for building AI models, handling datasets, and creating AI-powered solutions.

Elements and Performance Criteria

Introduction to Python Programming

To be competent, the user/individual on the job must be able to:

PC1. Understand Python syntax, including variables, data types, loops, and conditionals for basic programming tasks.

PC2. Discuss fundamental Python data structures such as lists, dictionaries, tuples, and sets in data manipulation.

PC3. Discuss to utilize Python functions and modules to write reusable and efficient code.

PC4. Understand to use Python for file handling operations such as reading from and writing to files.

PC5. Describe to use of Python libraries like NumPy and Pandas for basic data manipulation and analysis tasks.

PC6. Discuss basic debugging and error-handling techniques to identify and resolve issues in Python programs

Data Structures and Algorithms in Python

To be competent, the user/individual on the job must be able to:

PC7. Understand the fundamentals data structures such as arrays, linked lists, stacks, queues, trees, and graphs in Python.

PC8. Describe to utilize Python's built-in data structures, such as lists, dictionaries, sets, and tuples, to solve problems effectively.

PC9. Discuss common algorithms for sorting (e.g., bubble sort, quicksort, mergesort) and searching (e.g., linear search, binary search) on various data structures.

PC10. Understand the concepts of complexity analysis, including time and space complexity, to evaluate the efficiency of algorithms.

PC11. Describe recursion and its applications in solving problems, including tree traversal and backtracking algorithms.

PC12. Understand to solve practical problems and to utilize data structures to optimize performance in Python applications.

Object-Oriented Programming (OOP) in Python

To be competent, the user/individual on the job must be able to:

PC13. Understand the core principles of Object-Oriented Programming (OOP), including encapsulation, inheritance, and polymorphism.

PC14. Define to use classes and objects in Python to model real-world entities and behaviors.

PC15. Discuss constructor and destructor methods to initialize and clean up object attributes in Python classes.

PC16. Understand to utilize class inheritance to create subclasses to extend or modify the functionality of parent classes.

PC17. Describe method overriding to customize the behavior of inherited methods in derived classes.

PC18. Discuss the concept of abstraction through abstract classes and interfaces to understand the design concept of flexible and modular code.

Libraries for AI and Data Science

To be competent, the user/individual on the job must be able to:

PC19. Understand to use NumPy for numerical computations including array manipulation, mathematical operations and linear algebra.

PC20. Describe Pandas for data manipulation and analysis to utilize dataFrames for data cleaning, transformation and aggregation tasks.

PC21. Understand data visualization techniques using Matplotlib and Seaborn to create informative plots and graphs Seaborn.

PC22. Discuss to utilize Scikit-learn for building and evaluating machine learning models, including data preprocessing, feature selection and model selection techniques.

PC23. Understand to use TensorFlow or PyTorch for developing and training deep learning models, including defining architectures and optimizing performance.

PC24. Discuss Natural Language Toolkit (NLTK) or spaCy for text processing tasks in Natural Language Processing (NLP), including tokenization, stemming and recognition.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Core syntax and fundamental concepts of Python, including variables, data types, control structures, functions, and error handling.

KU2. Python data structures such as lists, tuples, dictionaries, and sets, and their appropriate use cases in programming.

KU3. Key Python libraries used in data science and AI, including NumPy for numerical operations, Pandas for data manipulation, and Matplotlib/Seaborn for data visualization

KU4. Methods for cleaning and preprocessing data, including handling missing values, normalization, standardization, and encoding categorical variables.

KU5. Principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, encapsulation, and polymorphism.

KU6. Ability to create visualizations to interpret data and communicate findings effectively using libraries like Matplotlib and Seaborn.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Listen and communicate effectively and accurately.
GS2. Apply problem-solving approaches for different situations
GS3. Work effectively in a team.
GS4. Employ proper time management.
GS5. Plan and organize work.
GS6. Maintain hygiene and sanitation.
GS7. Analytical skills.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Python Programming	**10**	**10**	**-**	**2**
PC1. Understand Python syntax, including variables, data types, loops, and conditionals for basic programming tasks.	-	-	-	-
PC2. Discuss fundamental Python data structures such as lists, dictionaries, tuples, and sets in data manipulation.	-	-	-	-
PC3. Discuss to utilize Python functions and modules to write reusable and efficient code.	-	-	-	-
PC4. Understand to use Python for file handling operations such as reading from and writing to files.	-	-	-	-
PC5. Describe to use of Python libraries like NumPy and Pandas for basic data manipulation and analysis tasks.	-	-	-	-
PC6. Discuss basic debugging and error-handling techniques to identify and resolve issues in Python programs	-	-	-	-
Data Structures and Algorithms in Python	**10**	**15**	**-**	**3**
PC7. Understand the fundamentals data structures such as arrays, linked lists, stacks, queues, trees, and graphs in Python.	-	-	-	-
PC8. Describe to utilize Python's built-in data structures, such as lists, dictionaries, sets, and tuples, to solve problems effectively.	-	-	-	-
PC9. Discuss common algorithms for sorting (e.g., bubble sort, quicksort, mergesort) and searching (e.g., linear search, binary search) on various data structures.	-	-	-	-
PC10. Understand the concepts of complexity analysis, including time and space complexity, to evaluate the efficiency of algorithms.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. Describe recursion and its applications in solving problems, including tree traversal and backtracking algorithms.	-	-	-	-
PC12. Understand to solve practical problems and to utilize data structures to optimize performance in Python applications.	-	-	-	-
Object-Oriented Programming (OOP) in Python	**10**	**15**	**-**	**3**
PC13. Understand the core principles of Object-Oriented Programming (OOP), including encapsulation, inheritance, and polymorphism.	-	-	-	-
PC14. Define to use classes and objects in Python to model real-world entities and behaviors.	-	-	-	-
PC15. Discuss constructor and destructor methods to initialize and clean up object attributes in Python classes.	-	-	-	-
PC16. Understand to utilize class inheritance to create subclasses to extend or modify the functionality of parent classes.	-	-	-	-
PC17. Describe method overriding to customize the behavior of inherited methods in derived classes.	-	-	-	-
PC18. Discuss the concept of abstraction through abstract classes and interfaces to understand the design concept of flexible and modular code.	-	-	-	-
Libraries for AI and Data Science	**10**	**10**	**-**	**2**
PC19. Understand to use NumPy for numerical computations including array manipulation, mathematical operations and linear algebra.	-	-	-	-
PC20. Describe Pandas for data manipulation and analysis to utilize dataFrames for data cleaning, transformation and aggregation tasks.	-	-	-	-
PC21. Understand data visualization techniques using Matplotlib and Seaborn to create informative plots and graphs Seaborn.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. Discuss to utilize Scikit-learn for building and evaluating machine learning models, including data preprocessing, feature selection and model selection techniques.	-	-	-	-
PC23. Understand to use TensorFlow or PyTorch for developing and training deep learning models, including defining architectures and optimizing performance.	-	-	-	-
PC24. Discuss Natural Language Toolkit (NLTK) or spaCy for text processing tasks in Natural Language Processing (NLP), including tokenization, stemming and recognition.	-	-	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/ITS/N0202
NOS Name	Python Programming and data science for AI
Sector	Information Technology Sector
Sub-Sector	
Occupation	Artificial Intelligence
NSQF Level	5
Credits	3.5
Version	1.0
Last Reviewed Date	17/12/2024
Next Review Date	17/12/2027
NSQC Clearance Date	17/12/2024

ICE/ITS/N0203: Building Blocks of Artificial Intelligence (A.I)

Description

The Build Blocks of A.I. Specializations provide essential knowledge in AI concepts, algorithms, and methodologies across various domains, including machine learning and natural language processing, computer vision, Internet of things and Robotics.

Scope

The scope covers the following :

- Practical applications in diverse industries.
- Addresses ethical implications and responsible AI use.
- Fosters innovation to solve real-world problems with AI technologies.

Elements and Performance Criteria

Fundamentals of Machine Learning (ML)

To be competent, the user/individual on the job must be able to:

PC1. Explain the core concepts of supervised, unsupervised, and reinforcement learning.

PC2. Understand regression and classification models.

PC3. Discuss data preprocessing techniques, such as normalization and feature extraction to prepare data for ML models.

PC4. Explain key ML algorithms, such as decision trees, support vector machines, and k-means clustering.

PC5. Describe model performance using metrics like accuracy, precision, recall, F1-score, and ROC curves.

PC6. Understand model optimization techniques, including hyperparameter tuning and cross-validation.

Basics of Deep Learning

To be competent, the user/individual on the job must be able to:

PC7. Understand the core architecture of artificial neural networks (ANNs), including layers, nodes, and activation functions.

PC8. Discuss building and training feedforward neural networks using deep learning frameworks (e.g., TensorFlow, PyTorch).

PC9. Explain the concept of backpropagation and its role in optimizing neural networks.

PC10. Describe convolutional neural networks (CNNs) for image-related tasks such as classification and object detection.

PC11. Understand the basics of recurrent neural networks (RNNs) and their applications in sequence data like time series and natural language.

PC12. Understand to utilize regularization techniques to prevent overfitting in deep learning models.

Fundamentals of Natural Language Processing (NLP)

To be competent, the user/individual on the job must be able to:

PC13. Understand the basic concepts of tokenization, stemming, and lemmatization for text preprocessing.

PC14. Explain building and applying language models for text prediction and generation.

PC15. Explain the use of word embeddings (e.g., Word2Vec, GloVe) to represent text data as vectors in NLP tasks.

PC16. Describe NLP techniques for tasks such as sentiment analysis, text classification and named entity recognition (NER).

PC17. Understand sequence-to-sequence models for machine translation, summarization and other text-based tasks.

PC18. Understand to evaluate metrics like BLEU, ROUGE to assess the performance of NLP models.

Basics of Computer Vision

To be competent, the user/individual on the job must be able to:

PC19. Understand the key concepts of image processing such as filtering, edge detection and image enhancement.

PC20. Discuss building and applying Convolutional Neural Networks (CNNs) for tasks like image classification and object detection.

PC21. Describe techniques for image segmentation to separate objects or regions within an image.

PC22. Discuss image augmentation techniques to improve model generalization and performance on visual tasks.

PC23. Explain the principles of object tracking and motion detection in video processing.

PC24. Understand feature extraction methods like SIFT, SURF, and ORB for object recognition and computer vision applications.

Fundamentals of Internet of Things (IoT)

To be competent, the user/individual on the job must be able to:

PC25. Understand the basic architecture of IoT systems, including sensors, actuators, and communication protocols.

PC26. Explain to connect and configure IoT devices for data collection and monitoring.

PC27. Explain the role of edge computing and its integration with IoT to process data locally for faster responses.

PC28. Understand the principles of IoT communication protocols such as MQTT, CoAP, and HTTP, and their applications.

PC29. Describe data security and privacy concerns in IoT systems, including encryption and authentication techniques.

PC30. Describe IoT for smart systems design, such as smart homes, industrial automation, or environmental monitoring.

Basics of Robotics

To be competent, the user/individual on the job must be able to:

PC31. Explain the fundamental concepts of robot kinematics, including forward and inverse kinematics for robot movement and positioning.

PC32. Understand the programming robot control systems for tasks such as navigation, manipulation, and automation.

PC33. Discuss sensor integration (e.g., cameras, LIDAR, ultrasonic sensors) for robot perception and environment interaction.

PC34. Understand the basics of robot dynamics and forces and torques affect robot motion and stability.

PC35. Understand ability to implement robot path planning algorithms to enable autonomous navigation in dynamic environments.

PC36. Discuss robotic learning techniques, such as reinforcement learning, to improve robot decision-making and task execution.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Basic concepts of machine learning, including different types of learning (supervised, unsupervised, and reinforcement) and their applications in various domains.

KU2. Deep learning architectures, including neural networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs), and their role in AI advancements.

KU3. Fundamental techniques and tools used in NLP, such as tokenization, stemming, and sentiment analysis, and their applications in text and speech processing.

KU4. Principles of computer vision, including image processing techniques, feature extraction, and object detection, along with their applications in industries like healthcare and automotive.

KU5. IoT concepts, including sensor integration, data collection, and the use of AI in smart devices for automation and enhanced decision-making.

KU6. Principles of robotics, including perception, decision-making, and control systems, and AI technologies are integrated to improve robot functionalities.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Listen and communicate effectively and accurately.

GS2. Apply problem-solving approaches for different situations.

GS3. Work effectively in a team.

GS4. Employ proper time management.

GS5. Plan and organize work.

GS6. Maintain hygiene and sanitation.

GS7. Analytical Skills.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Fundamentals of Machine Learning (ML)	**7**	**9**	**-**	**2**
PC1. Explain the core concepts of supervised, unsupervised, and reinforcement learning.	-	-	-	-
PC2. Understand regression and classification models.	-	-	-	-
PC3. Discuss data preprocessing techniques, such as normalization and feature extraction to prepare data for ML models.	-	-	-	-
PC4. Explain key ML algorithms, such as decision trees, support vector machines, and k-means clustering.	-	-	-	-
PC5. Describe model performance using metrics like accuracy, precision, recall, F1-score, and ROC curves.	-	-	-	-
PC6. Understand model optimization techniques, including hyperparameter tuning and cross-validation.	-	-	-	-
Basics of Deep Learning	**7**	**9**	**-**	**2**
PC7. Understand the core architecture of artificial neural networks (ANNs), including layers, nodes, and activation functions.	-	-	-	-
PC8. Discuss building and training feedforward neural networks using deep learning frameworks (e.g., TensorFlow, PyTorch).	-	-	-	-
PC9. Explain the concept of backpropagation and its role in optimizing neural networks.	-	-	-	-
PC10. Describe convolutional neural networks (CNNs) for image-related tasks such as classification and object detection.	-	-	-	-
PC11. Understand the basics of recurrent neural networks (RNNs) and their applications in sequence data like time series and natural language.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. Understand to utilize regularization techniques to prevent overfitting in deep learning models.	-	-	-	-
Fundamentals of Natural Language Processing (NLP)	**7**	**8**	**-**	**2**
PC13. Understand the basic concepts of tokenization, stemming, and lemmatization for text preprocessing.	-	-	-	-
PC14. Explain building and applying language models for text prediction and generation.	-	-	-	-
PC15. Explain the use of word embeddings (e.g., Word2Vec, GloVe) to represent text data as vectors in NLP tasks.	-	-	-	-
PC16. Describe NLP techniques for tasks such as sentiment analysis, text classification and named entity recognition (NER).	-	-	-	-
PC17. Understand sequence-to-sequence models for machine translation, summarization and other text-based tasks.	-	-	-	-
PC18. Understand to evaluate metrics like BLEU, ROUGE to assess the performance of NLP models.	-	-	-	-
Basics of Computer Vision	**6**	**8**	**-**	**1**
PC19. Understand the key concepts of image processing such as filtering, edge detection and image enhancement.	-	-	-	-
PC20. Discuss building and applying Convolutional Neural Networks (CNNs) for tasks like image classification and object detection.	-	-	-	-
PC21. Describe techniques for image segmentation to separate objects or regions within an image.	-	-	-	-
PC22. Discuss image augmentation techniques to improve model generalization and performance on visual tasks.	-	-	-	-
PC23. Explain the principles of object tracking and motion detection in video processing.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC24. Understand feature extraction methods like SIFT, SURF, and ORB for object recognition and computer vision applications.	-	-	-	-
Fundamentals of Internet of Things (IoT)	**6**	**8**	**-**	**1**
PC25. Understand the basic architecture of IoT systems, including sensors, actuators, and communication protocols.	-	-	-	-
PC26. Explain to connect and configure IoT devices for data collection and monitoring.	-	-	-	-
PC27. Explain the role of edge computing and its integration with IoT to process data locally for faster responses.	-	-	-	-
PC28. Understand the principles of IoT communication protocols such as MQTT, CoAP, and HTTP, and their applications.	-	-	-	-
PC29. Describe data security and privacy concerns in IoT systems, including encryption and authentication techniques.	-	-	-	-
PC30. Describe IoT for smart systems design, such as smart homes, industrial automation, or environmental monitoring.	-	-	-	-
Basics of Robotics	**7**	**8**	**-**	**2**
PC31. Explain the fundamental concepts of robot kinematics, including forward and inverse kinematics for robot movement and positioning.	-	-	-	-
PC32. Understand the programming robot control systems for tasks such as navigation, manipulation, and automation.	-	-	-	-
PC33. Discuss sensor integration (e.g., cameras, LIDAR, ultrasonic sensors) for robot perception and environment interaction.	-	-	-	-
PC34. Understand the basics of robot dynamics and forces and torques affect robot motion and stability.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC35. Understand ability to implement robot path planning algorithms to enable autonomous navigation in dynamic environments.	-	-	-	-
PC36. Discuss robotic learning techniques, such as reinforcement learning, to improve robot decision-making and task execution.	-	-	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/ITS/N0203
NOS Name	Building Blocks of Artificial Intelligence (A.I)
Sector	Information Technology Sector
Sub-Sector	
Occupation	Artificial Intelligence
NSQF Level	5
Credits	3
Version	1.0
Last Reviewed Date	17/12/2024
Next Review Date	17/12/2027
NSQC Clearance Date	17/12/2024

Qualification Pack

DGT/VSQ/N0102: Employability Skills (60 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. identify employability skills required for jobs in various industries

PC2. identify and explore learning and employability portals

Constitutional values – Citizenship

To be competent, the user/individual on the job must be able to:

PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.

PC4. follow environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC5. recognize the significance of 21st Century Skills for employment

PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC7. use basic English for everyday conversation in different contexts, in person and over the telephone

PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English

PC9. write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

To be competent, the user/individual on the job must be able to:

PC10. understand the difference between job and career

PC11. prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

To be competent, the user/individual on the job must be able to:

PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings

PC13. work collaboratively with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC14. communicate and behave appropriately with all genders and PwD

PC15. escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC16. select financial institutions, products and services as per requirement

PC17. carry out offline and online financial transactions, safely and securely

PC18. identify common components of salary and compute income, expenses, taxes, investments etc

PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC20. operate digital devices and carry out basic internet operations securely and safely

PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively

PC22. use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research

PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion

PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

To be competent, the user/individual on the job must be able to:

PC26. identify different types of customers

PC27. identify and respond to customer requests and needs in a professional manner.

PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC29. create a professional Curriculum vitae (Résumé)

PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

PC31. apply to identified job openings using offline /online methods as per requirement

PC32. answer questions politely, with clarity and confidence, during recruitment and selection

PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills and different learning and employability related portals

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

KU6. importance of career development and setting long- and short-term goals

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

KU10. different types of financial institutes, products, and services

KU11. how to compute income and expenditure

KU12. importance of maintaining safety and security in offline and online financial transactions

KU13. different legal rights and laws

KU14. different types of digital devices and the procedure to operate them safely and securely

KU15. how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

KU16. how to identify business opportunities

KU17. types and needs of customers

KU18. how to apply for a job and prepare for an interview

KU19. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and write different types of documents/instructions/correspondence

GS2. communicate effectively using appropriate language in formal and informal settings

GS3. behave politely and appropriately with all
GS4. how to work in a virtual mode
GS5. perform calculations efficiently
GS6. solve problems effectively
GS7. pay attention to details
GS8. manage time efficiently
GS9. maintain hygiene and sanitization to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	**1**	**1**	**-**	**-**
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
Constitutional values – Citizenship	**1**	**1**	**-**	**-**
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	**2**	**4**	**-**	**-**
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
Basic English Skills	**2**	**3**	**-**	**-**
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
Career Development & Goal Setting	**1**	**2**	**-**	**-**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
Communication Skills	**2**	**2**	**-**	**-**
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
Diversity & Inclusion	**1**	**2**	**-**	**-**
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
Financial and Legal Literacy	**2**	**3**	**-**	**-**
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
Essential Digital Skills	**3**	**4**	**-**	**-**
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Entrepreneurship	**2**	**3**	**-**	**-**
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
Customer Service	**1**	**2**	**-**	**-**
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	**2**	**3**	**-**	**-**
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	22/07/2026
Next Review Date	22/07/2029
NSQC Clearance Date	22/07/2026

ICE/ITS/N0206: Applications of AI tools/algorithms in Electrical Engineering

Description

This module will equip learners with the application of AI tools and algorithms in Electrical Engineering to improve the design, efficiency, and reliability of systems across various domains, such as power generation, control systems, and smart grids.

Scope

The scope covers the following :

- Encompasses renewable energy systems and their optimization.
- Focuses on automation and control in electrical circuits.
- Involves predictive maintenance to prevent equipment failures.
- Aims to develop intelligent devices that adapt to user needs.
- Promotes increased efficiency and sustainability in electrical engineering practices.

Elements and Performance Criteria

Utilize AI tools /algorithms in Power Systems and Smart Grids

To be competent, the user/individual on the job must be able to:

PC1. Understand AI algorithms for accurate real-time load forecasting in power systems, enabling better demand response and resource allocation to enhance grid reliability and efficiency.

PC2. Discuss AI-driven techniques for automated fault detection and diagnosis in power systems, improving the speed and accuracy of identifying issues and minimizing downtime.

PC3. Describe machine learning models to optimize the operation of smart grids, enhancing energy distribution, reducing losses, and integrating renewable energy sources effectively.

PC4. Explore AI tools in energy management systems to analyze consumption patterns, optimize energy usage and implement demand-side management strategies for residential and industrial application.

PC5. Understand AI algorithms for predictive maintenance of power system components to utilize historical data and real-time monitoring to predict failures and schedule maintenance.

PC6. Discuss AI techniques for analyzing data from smart meters, providing insights into consumer behavior, enhancing billing accuracy and supporting dynamic pricing model.

Use AI tools /algorithms in Control Systems and Automation

To be competent, the user/individual on the job must be able to:

PC7. Discuss AI algorithms to develop adaptive control strategies that adjust system parameters in real-time based on changing conditions, improving system performance and stability.

PC8. Discuss machine learning techniques to enhance model Predictive Control, allowing for better prediction of future system behavior and optimal control actions in dynamic environments.

PC9. Understand AI-driven fault detection and isolation algorithms to develop fault-tolerant control systems, ensuring continued operation and performance in the presence of faults or disturbances.

PC10. Describe AI tools to automate industrial processes through intelligent control systems, optimizing production efficiency, reducing downtime and enhancing safety in manufacturing environments.

PC11. Understand AI techniques to design robust control systems that handle uncertainties and variations in system dynamics, ensuring reliable performance under different operating conditions.

PC12. Discuss data-driven approaches in control systems by utilizing AI algorithms to analyze historical data for improving control strategies and system designs based on performance feedback.

Utilize AI tools /algorithms in Signal Processing and Communication Systems

To be competent, the user/individual on the job must be able to:

PC13. Understand AI algorithms to develop advanced filtering techniques that effectively remove noise and interference from signals, improving the quality and clarity of communication systems.

PC14. Decribe machine learning models for automatic modulation classification, enabling the system to identify and adapt to different modulation schemes used in communication channels.

PC15. Discuss AI techniques for adaptive equalization in communication systems, allowing for real-time adjustments to counteract channel distortions and maintain signal integrity.

PC16. Understand AI-driven methods for speech recognition and audio processing, enhancing applications such as voice communication systems, noise cellation, and audio enhancement.

PC17. Discuss deep learning algorithms in image and video signal processing to improve compression, enhance resolution, and enable real-time analysis in applications like video conferencing and broadcasting.

PC18. Explain AI-based algorithms for cognitive radio networks that dynamically allocate spectrum resources, optimizing communication efficiency and reducing interference among users.

Use AI tools /algorithms in Electronics and Embedded Systems

To be competent, the user/individual on the job must be able to:

PC19. Explain AI algorithms in embedded systems to enable smart sensors capable of real-time data processing and decision-making, enhancing the functionality of applications such as environmental monitoring and healthcare devices.

PC20. Understand AI techniques in electronics design to optimize power consumption in embedded systems, enabling energy-efficient operations in battery-powered devices and IoT applications.

PC21. Discuss machine learning models to predict failures and maintenance needs in embedded systems, ensuring reliability and minimizing downtime in critical applications like industrial automation.

PC22. Describe AI tools for real-time data processing in embedded systems, allowing for immediate response and control in applications such as robotics, automotive systems, and home automation.

PC23. Discuss AI-driven algorithms to automate the configuration and tuning of embedded systems, improving performance while reducing the time and expertise required for manual setup.

PC24. Understand adaptive control algorithms for embedded systems that learn and adjust their operations based on environmental changes or user interactions, enhancing flexibility and user experience.

Utilize AI tools /algorithms in Renewable Energy Systems

To be competent, the user/individual on the job must be able to:

PC25. Discuss AI algorithms to forecast renewable energy generation such as solar and wind based on weather patterns and historical data, optimizing energy dispatch and storage strategies.

PC26. Understand AI tools to facilitate the integration of renewable energy sources into smart grids, enabling dynamic load balancing, improved reliability, and efficient distribution of generated energy.

PC27. Discuss machine learning models to optimize the management and operation of energy storage systems like batteries, ensuring efficient energy use and maximizing the lifespan of storage components.

PC28. Describe AI-driven strategies for demand response programs that adjust consumer energy usage in real-time, aligning with renewable energy supply and enhancing grid stability.

PC29. Understand AI techniques for predictive maintenance in renewable energy systems (e.g., wind turbines and solar panels), enabling early fault detection and reducing operational downtime.

PC30. Explain AI algorithms to optimize the performance of hybrid renewable energy systems (combining solar, wind, and storage), ensuring efficient energy production and consumption while minimizing costs.

Use AI tools /algorithms in Robotics and Autonomous Systems

To be competent, the user/individual on the job must be able to:

PC31. Understand AI algorithms for real-time path planning and obstacle avoidance in autonomous vehicles and robotic systems, enhancing their ability to navigate complex environments safely and efficiently.

PC32. Discuss computer vision techniques powered by AI to enable robots to perceive and interpret their surroundings, facilitating tasks such as object recognition, classification, and manipulation.

PC33. Describe AI to integrate data from multiple sensors (like LiDAR, cameras, and IMUs) in robotic systems, improving accuracy and reliability in environmental perception and decision- making.

PC34. Understand machine learning algorithms for adaptive control in robotics, allowing systems to learn and optimize their performance based on changing conditions and user interactions.

PC35. Describe AI tools to enhance human-robot interaction through natural language processing and gesture recognition, enabling more intuitive communication and collaboration between humans and robots.

PC36. Discuss AI-driven strategies for coordinating multiple robotic units in swarm robotics applications, optimizing task distribution and improving efficiency in collective operations.

Utilize AI tools /algorithms for Electric Vehicles

To be competent, the user/individual on the job must be able to:

PC37. Understand AI algorithms to optimize battery performance in electric vehicles by improving charge/discharge cycles, extending battery life and enhancing overall energy efficiency.

PC38. Describe machine learning models to predict failures or maintenance needs in critical EV components such as the motor, battery, and drive train, reducing downtime and operational costs.

PC39. Discuss AI tools to optimize energy consumption in real-time based on driving conditions, route planning, and user preferences, maximizing the driving range of electric vehicles.

PC40. Understand AI algorithms in the development of autonomous driving features for electric vehicles, enabling functionalities like lane-keeping, collision avoidance and automated parking.

PC41. Explain AI-driven solutions to optimize the placement, availability, and utilization of EV charging stations, enhancing accessibility and minimizing waiting times for users.

PC42. Discuss AI tools to improve regenerative braking efficiency by adapting the system to different driving styles and conditions, recovering more energy during deceleration.

Advancement in AI for Electrical Engineering

To be competent, the user/individual on the job must be able to:

PC43. Understand advanced AI algorithms to improve real-time monitoring, control, and optimization of smart grids, enabling more efficient power distribution and integration of renewable energy sources.

PC44. Discuss AI tools to predict and manage voltage and frequency fluctuations in power systems, enhancing grid stability and preventing blackouts.

PC45. Understand AI-driven solutions to optimize the integration of renewable energy sources like solar and wind into the electrical grid, managing variability and improving energy storage efficiency.

PC46. Describe AI-based adaptive systems that dynamically adjust energy consumption and distribution based on real-time data from electrical networks and smart devices, improving overall energy efficiency.

PC47. Discuss AI tools to analyze large datasets from electrical grids to predict potential faults or cyber threats, improving grid resilience and safeguarding infrastructure from disruptions.

PC48. Understand AI algorithms to manage and optimize electric vehicle charging networks, ensuring efficient load balancing, reduced charging times, and enhanced user experience.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. AI algorithms enhance smart grids by improving real-time power distribution, load balancing, and fault detection, leading to more efficient and reliable power systems.

KU2. AI-based models for accurate load forecasting, which helps utilities predict electricity demand and optimize power generation and distribution.

KU3. AI applications in predictive maintenance of electrical equipment, such as transformers and motors, to detect faults early and minimize downtime.

KU4. AI techniques used to manage and integrate renewable energy sources like solar and wind into the grid, balancing intermittent power supply with demand.

KU5. AI-driven energy management systems (EMS) optimize consumption patterns in industrial, commercial, and residential settings, reducing overall energy usage.

KU6. AI algorithms that automate fault detection and diagnostics in electrical circuits, improving system reliability and reducing manual intervention.

KU7. Role of AI in maintaining voltage and frequency stability in power systems by monitoring and dynamically adjusting system parameters.

KU8. AI tools are used in designing and optimizing power electronic devices, such as converters and inverters, improving their efficiency and performance.

KU9. AI enhances cybersecurity in electrical grids by detecting and mitigating cyber threats, ensuring the integrity of critical infrastructure.

KU10. AI applications in optimizing electric vehicle (EV) charging networks, including smart charging, load management and integration with renewable energy sources.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Listen and communicate effectively and accurately.

GS2. Apply problem-solving approaches for different situations.

GS3. Work effectively in a team.

GS4. Employ proper time management.

GS5. Plan and organize work.

GS6. Maintain hygiene and sanitation.

GS7. Analytical Skills.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Utilize AI tools /algorithms in Power Systems and Smart Grids	**5**	**7**	**-**	**2**
PC1. Understand AI algorithms for accurate real-time load forecasting in power systems, enabling better demand response and resource allocation to enhance grid reliability and efficiency.	-	-	-	-
PC2. Discuss AI-driven techniques for automated fault detection and diagnosis in power systems, improving the speed and accuracy of identifying issues and minimizing downtime.	-	-	-	-
PC3. Describe machine learning models to optimize the operation of smart grids, enhancing energy distribution, reducing losses, and integrating renewable energy sources effectively.	-	-	-	-
PC4. Explore AI tools in energy management systems to analyze consumption patterns, optimize energy usage and implement demand-side management strategies for residential and industrial application.	-	-	-	-
PC5. Understand AI algorithms for predictive maintenance of power system components to utilize historical data and real-time monitoring to predict failures and schedule maintenance.	-	-	-	-
PC6. Discuss AI techniques for analyzing data from smart meters, providing insights into consumer behavior, enhancing billing accuracy and supporting dynamic pricing model.	-	-	-	-
Use AI tools /algorithms in Control Systems and Automation	**5**	**7**	**-**	**2**
PC7. Discuss AI algorithms to develop adaptive control strategies that adjust system parameters in real-time based on changing conditions, improving system performance and stability.	-	-	-	-
PC8. Discuss machine learning techniques to enhance model Predictive Control, allowing for better prediction of future system behavior and optimal control actions in dynamic environments.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. Understand AI-driven fault detection and isolation algorithms to develop fault-tolerant control systems, ensuring continued operation and performance in the presence of faults or disturbances.	-	-	-	-
PC10. Describe AI tools to automate industrial processes through intelligent control systems, optimizing production efficiency, reducing downtime and enhancing safety in manufacturing environments.	-	-	-	-
PC11. Understand AI techniques to design robust control systems that handle uncertainties and variations in system dynamics, ensuring reliable performance under different operating conditions.	-	-	-	-
PC12. Discuss data-driven approaches in control systems by utilizing AI algorithms to analyze historical data for improving control strategies and system designs based on performance feedback.	-	-	-	-
Utilize AI tools /algorithms in Signal Processing and Communication Systems	**5**	**6**	**-**	**1**
PC13. Understand AI algorithms to develop advanced filtering techniques that effectively remove noise and interference from signals, improving the quality and clarity of communication systems.	-	-	-	-
PC14. Decribe machine learning models for automatic modulation classification, enabling the system to identify and adapt to different modulation schemes used in communication channels.	-	-	-	-
PC15. Discuss AI techniques for adaptive equalization in communication systems, allowing for real- time adjustments to counteract channel distortions and maintain signal integrity.	-	-	-	-
PC16. Understand AI-driven methods for speech recognition and audio processing, enhancing applications such as voice communication systems, noise cellation, and audio enhancement.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC17. Discuss deep learning algorithms in image and video signal processing to improve compression, enhance resolution, and enable real-time analysis in applications like video conferencing and broadcasting.	-	-	-	-
PC18. Explain AI-based algorithms for cognitive radio networks that dynamically allocate spectrum resources, optimizing communication efficiency and reducing interference among users.	-	-	-	-
Use AI tools /algorithms in Electronics and Embedded Systems	**5**	**6**	**-**	**1**
PC19. Explain AI algorithms in embedded systems to enable smart sensors capable of real-time data processing and decision-making, enhancing the functionality of applications such as environmental monitoring and healthcare devices.	-	-	-	-
PC20. Understand AI techniques in electronics design to optimize power consumption in embedded systems, enabling energy-efficient operations in battery-powered devices and IoT applications.	-	-	-	-
PC21. Discuss machine learning models to predict failures and maintenance needs in embedded systems, ensuring reliability and minimizing downtime in critical applications like industrial automation.	-	-	-	-
PC22. Describe AI tools for real-time data processing in embedded systems, allowing for immediate response and control in applications such as robotics, automotive systems, and home automation.	-	-	-	-
PC23. Discuss AI-driven algorithms to automate the configuration and tuning of embedded systems, improving performance while reducing the time and expertise required for manual setup.	-	-	-	-
PC24. Understand adaptive control algorithms for embedded systems that learn and adjust their operations based on environmental changes or user interactions, enhancing flexibility and user experience.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Utilize AI tools /algorithms in Renewable Energy Systems	**5**	**6**	**-**	**1**
PC25. Discuss AI algorithms to forecast renewable energy generation such as solar and wind based on weather patterns and historical data, optimizing energy dispatch and storage strategies.	-	-	-	-
PC26. Understand AI tools to facilitate the integration of renewable energy sources into smart grids, enabling dynamic load balancing, improved reliability, and efficient distribution of generated energy.	-	-	-	-
PC27. Discuss machine learning models to optimize the management and operation of energy storage systems like batteries, ensuring efficient energy use and maximizing the lifespan of storage components.	-	-	-	-
PC28. Describe AI-driven strategies for demand response programs that adjust consumer energy usage in real-time, aligning with renewable energy supply and enhancing grid stability.	-	-	-	-
PC29. Understand AI techniques for predictive maintenance in renewable energy systems (e.g., wind turbines and solar panels), enabling early fault detection and reducing operational downtime.	-	-	-	-
PC30. Explain AI algorithms to optimize the performance of hybrid renewable energy systems (combining solar, wind, and storage), ensuring efficient energy production and consumption while minimizing costs.	-	-	-	-
Use AI tools /algorithms in Robotics and Autonomous Systems	**5**	**6**	**-**	**1**
PC31. Understand AI algorithms for real-time path planning and obstacle avoidance in autonomous vehicles and robotic systems, enhancing their ability to navigate complex environments safely and efficiently.	-	-	-	-
PC32. Discuss computer vision techniques powered by AI to enable robots to perceive and interpret their surroundings, facilitating tasks such as object recognition, classification, and manipulation.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC33. Describe AI to integrate data from multiple sensors (like LiDAR, cameras, and IMUs) in robotic systems, improving accuracy and reliability in environmental perception and decision- making.	-	-	-	-
PC34. Understand machine learning algorithms for adaptive control in robotics, allowing systems to learn and optimize their performance based on changing conditions and user interactions.	-	-	-	-
PC35. Describe AI tools to enhance human-robot interaction through natural language processing and gesture recognition, enabling more intuitive communication and collaboration between humans and robots.	-	-	-	-
PC36. Discuss AI-driven strategies for coordinating multiple robotic units in swarm robotics applications, optimizing task distribution and improving efficiency in collective operations.	-	-	-	-
Utilize AI tools /algorithms for Electric Vehicles	**5**	**6**	**-**	**1**
PC37. Understand AI algorithms to optimize battery performance in electric vehicles by improving charge/discharge cycles, extending battery life and enhancing overall energy efficiency.	-	-	-	-
PC38. Describe machine learning models to predict failures or maintenance needs in critical EV components such as the motor, battery, and drive train, reducing downtime and operational costs.	-	-	-	-
PC39. Discuss AI tools to optimize energy consumption in real-time based on driving conditions, route planning, and user preferences, maximizing the driving range of electric vehicles.	-	-	-	-
PC40. Understand AI algorithms in the development of autonomous driving features for electric vehicles, enabling functionalities like lane-keeping, collision avoidance and automated parking.	-	-	-	-
PC41. Explain AI-driven solutions to optimize the placement, availability, and utilization of EV charging stations, enhancing accessibility and minimizing waiting times for users.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC42. Discuss AI tools to improve regenerative braking efficiency by adapting the system to different driving styles and conditions, recovering more energy during deceleration.	-	-	-	-
Advancement in AI for Electrical Engineering	**5**	**6**	**-**	**1**
PC43. Understand advanced AI algorithms to improve real-time monitoring, control, and optimization of smart grids, enabling more efficient power distribution and integration of renewable energy sources.	-	-	-	-
PC44. Discuss AI tools to predict and manage voltage and frequency fluctuations in power systems, enhancing grid stability and preventing blackouts.	-	-	-	-
PC45. Understand AI-driven solutions to optimize the integration of renewable energy sources like solar and wind into the electrical grid, managing variability and improving energy storage efficiency.	-	-	-	-
PC46. Describe AI-based adaptive systems that dynamically adjust energy consumption and distribution based on real-time data from electrical networks and smart devices, improving overall energy efficiency.	-	-	-	-
PC47. Discuss AI tools to analyze large datasets from electrical grids to predict potential faults or cyber threats, improving grid resilience and safeguarding infrastructure from disruptions.	-	-	-	-
PC48. Understand AI algorithms to manage and optimize electric vehicle charging networks, ensuring efficient load balancing, reduced charging times, and enhanced user experience.	-	-	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/ITS/N0206
NOS Name	Applications of AI tools/algorithms in Electrical Engineering
Sector	Information Technology Sector
Sub-Sector	
Occupation	Artificial Intelligence
NSQF Level	5
Credits	10
Version	1.0
Last Reviewed Date	17/12/2024
Next Review Date	17/12/2027
NSQC Clearance Date	17/12/2024

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

Criteria for assessment for each Qualification Pack will be created by the Awarding Body. Each Performance Criteria (PC)/ Element will be assigned marks proportional to its importance in NOS. AB will also lay down proportion of marks for Theory and Skills Practical for each PC/ Element.

2. The assessment for the knowledge part will be based on knowledge bank of questions created by Assessment Bodies subject to approval by AB

3. Individual assessment agencies will create unique question papers for knowledge/theory part for assessment of candidates as per assessment criteria given below

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on assessment criteria.

5. The passing percentage for each QP will be 70%. To pass the Qualification Pack, every trainee should score a minimum of 70% individually in each NOS.

6. The Assessor shall check the final outcome of the practices while evaluating the steps performed to achieve the final outcome.

7. The trainee shall be provided with a chance to repeat the test to correct his procedures in case of improper performance, with a deduction of marks for each iteration.

8. After the certain number of iterations as decided by AB the trainee is marked as fail, scoring zero marks for the procedure for the practical activity.

9. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack within the specified time frame set by AB.

10. Minimum duration of Assessment of each QP shall be of 4hrs/trainee

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ICE/ITS/N0201.Fundamentals of Artificial Intelligence (AI)	40	50	0	10	100	15
ICE/ITS/N0202.Python Programming and data science for AI	40	50	0	10	100	30
ICE/ITS/N0203.Building Blocks of Artificial Intelligence (A.I)	40	50	-	10	100	15
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	10
Total	**140**	**180**	**-**	**30**	**350**	**70**

Elective: 1 Applications of AI in Electrical Domain

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ICE/ITS/N0206.Applications of AI tools/algorithms in Electrical Engineering	40	50	0	10	100	30

Qualification Pack

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
Total	**40**	**50**	**-**	**10**	**100**	**30**