ICTQual AB

Qualification Specification

Level 5 Diploma in Agriculture Engineering
240 Credits – Two Years

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Qualification Specifications about

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About ICTQual AB

ICTQual AB UK Ltd. is a distinguished awarding body based in the United Kingdom, dedicated to fostering excellence in education, training, and skills development. Committed to global standards, ICTQual AB provides internationally recognized qualifications that empower individuals and organizations to thrive in an increasingly competitive world. Their offerings span diverse industries, including technical fields, health and safety, management, and more, ensuring relevance and adaptability to modern workforce needs.

The organization prides itself on delivering high-quality educational solutions through a network of Approved Training Centres worldwide. Their robust curriculum and innovative teaching methodologies are designed to equip learners with practical knowledge and skills for personal and professional growth. With a mission to inspire lifelong learning and drive positive change, ICTQual AB continuously evolves its programs to stay ahead of industry trends and technological advancements.

ICTQual AB's vision is to set benchmarks for educational excellence while promoting inclusivity and integrity. Their unwavering focus on quality and accessibility makes them a trusted partner in shaping future-ready professionals and advancing societal progress globally.

Course Overview

The ICTQual Level 5 Diploma in Agriculture Engineering (240 Credits – Two Years) is a rigorous program designed to provide learners with in-depth knowledge and practical skills essential for advancing agricultural practices through engineering solutions. This qualification focuses on developing expertise in agricultural machinery, soil and crop management, irrigation systems, renewable energy applications, and project management, ensuring a well-rounded understanding of modern agricultural engineering.

Over the two-year period, learners will gain practical experience alongside theoretical insights, preparing them to address real-world challenges in the agricultural sector. The program emphasizes sustainability, innovation, and efficiency, enabling participants to design and implement effective solutions in areas such as irrigation systems, machinery operation, and renewable energy integration. Students will also learn to manage agricultural projects, from planning to execution, while optimizing resource use and promoting environmentally responsible practices.

Graduates of this diploma are well-equipped to pursue further education, such as Level 6 qualifications or Bachelor's degrees in agricultural engineering or related fields. They also gain access to diverse career opportunities, including roles as farm managers, irrigation specialists, and consultants for renewable energy in agriculture. With its combination of advanced learning and practical application, this diploma serves as an essential stepping stone for individuals aiming to excel in agricultural engineering and contribute to the evolution of sustainable farming practices

Certification Framework

Qualification title	ICTQual Level 5 Diploma in Agriculture Engineering 240 Credits – Two Years
Course ID	AGE0002
Qualification Credits	240 Credits
Course Duration	24 Months
Grading Type	Pass / Fail
Competency Evaluation	Coursework / Assignments / Verifiable Experience
Assessment	The assessment and verification process for ICTQual qualifications involves two key stages: **Internal Assessment and Verification:** ✓ Conducted by the staff at the Approved Training Centre (ATC). Ensures learners meet the required standards through continuous assessments. ✓ Internal quality assurance (IQA) is carried out by the centre's IQA staff to validate the assessment processes. **External Quality Assurance:** ✓ Managed by ICTQual AB verifiers, who periodically review the centre's assessment and IQA processes. ✓ Verifies that assessments are conducted to the required standards and ensures consistency across centres

Entry Requirements

To enroll in the ICTQual Level 5 Diploma in Agriculture Engineering 240 Credits – Two Years, candidates must meet the following entry requirements:

- ✓ Applicants must be at least 16 years old.
- ✓ A minimum of a Level 4 qualification (or equivalent) in a related field such as engineering, technology, or a technical discipline. Alternatively, applicants should have A-levels or equivalent qualifications, including Mathematics and English.
- ✓ Applicants should demonstrate a strong interest in agriculture and engineering, and may be required to submit a personal statement or attend an interview to assess their motivation and suitability for the course.
- ✓ While no prior experience in agriculture engineering is mandatory, applicants with experience or a background in mechanics, engineering, or agriculture will be considered favorably.
- ✓ For non-native English speakers, proof of English language proficiency is required to ensure that applicants can fully engage with the course material.

Qualification Structure

This qualification comprises 24 mandatory units, totaling 240 credits. Candidates must successfully complete all mandatory units to achieve the qualification.

Mandatory Units		
Unit Ref#	**Unit Title**	**Credits**
Year 1		
AGE0002-1	Introduction to Agricultural Engineering Principles	10
AGE0002-2	Applied Mechanics in Agriculture	10
AGE0002-3	Agricultural Machinery and Equipment	10
AGE0002-4	Hydraulics and Pneumatics in Agriculture	10
AGE0002-5	Soil and Water Management Systems	10
AGE0002-6	Electrical and Electronic Systems in Agriculture	10
AGE0002-7	Introduction to Agricultural Structures	10
AGE0002-8	Sustainable Farming Technologies	10
AGE0002-9	Basic Agricultural Safety Practices	10
AGE0002-10	Crop and Livestock Machinery	10
AGE0002-11	Mechanical Design and CAD for Agricultural Engineering	10
AGE0002-12	Introduction to Farm Management	10
Year 2		
AGE0002-13	Advanced Agricultural Engineering Principles	10
AGE0002-14	Renewable Energy Applications in Agriculture	10
AGE0002-15	Advanced Irrigation and Water Management Systems	10
AGE0002-16	Precision Agriculture Technologies	10
AGE0002-17	Farm Mechanization and Automation	10
AGE0002-18	Agricultural Environmental Engineering	10
AGE0002-19	Maintenance and Repair of Agricultural Machinery	10
AGE0002-20	Agricultural Engineering Project Management	10
AGE0002-21	Agricultural Engineering Systems Integration	10
AGE0002-22	Sustainable Farm Design and Layout	10
AGE0002-23	Business and Entrepreneurship in Agricultural Engineering	10
AGE0002-24	Research and Development in Agricultural Engineering	10

Centre Requirements

Even if a centre is already registered with ICTQual AB, it must meet specific requirements to deliver the ICTQual Level 5 Diploma in Agriculture Engineering 240 Credits – Two Years. These standards ensure the quality and consistency of training, assessment, and learner support.

1. Approval to Deliver the Qualification

- ✓ Centres must obtain formal approval from ICTQual AB to deliver this specific qualification, even if they are already registered.
- ✓ The approval process includes a review of resources, staff qualifications, and policies relevant to the program.

2. Qualified Staff

- ✓ **Tutors:** Must have relevant qualifications in Agriculture Engineering at Level 6 or higher, alongside teaching/training experience.

- ✓ **Assessors:** Must hold a recognized assessor qualification and demonstrate expertise in Agriculture Engineering.
- ✓ **Internal Quality Assurers (IQAs):** Must be appropriately qualified and experienced to monitor the quality of assessments.

3. Learning Facilities

Centres must have access to appropriate learning facilities, which include:

- ✓ **Classrooms:** Modern classrooms equipped with multimedia tools to deliver comprehensive theoretical instruction on agricultural systems, sustainable practices, and modern farming technologies.
- ✓ **Practical Areas:** Hands-on training areas featuring advanced agricultural machinery, irrigation systems, soil testing kits, and greenhouse facilities to provide practical experience in real-world farming and engineering techniques.
- ✓ **Technology Access:** High-performance computers with industry-standard software (e.g., GIS for land management, precision farming tools, and crop modelling software) and internet connectivity for research, simulations, and project development.

4. Health and Safety Compliance

- ✓ Centres must ensure that practical training environments comply with relevant health and safety regulations.
- ✓ Risk assessments must be conducted regularly to maintain a safe learning environment.

5. Resource Requirements

- ✓ **Learning Materials**: Approved course manuals, textbooks, and study guides aligned with the curriculum.
- ✓ **Assessment Tools:** Templates, guidelines, and resources for conducting and recording assessments.
- ✓ **E-Learning Systems:** If offering online or hybrid learning, centres must provide a robust Learning Management System (LMS) to facilitate remote delivery.

6. Assessment and Quality Assurance

- ✓ Centres must adhere to ICTQual's assessment standards, ensuring that all assessments are fair, valid, and reliable.
- ✓ Internal quality assurance (IQA) processes must be in place to monitor assessments and provide feedback to assessors.
- ✓ External verification visits from ICTQual will ensure compliance with awarding body standards.

7. Learner Support

- ✓ Centres must provide learners with access to guidance and support throughout the program, including:
- ✓ Academic support for coursework.
- ✓ Career guidance for future progression.
- ✓ Additional support for learners with specific needs (e.g., disabilities or language barriers).

8. Policies and Procedures

Centres must maintain and implement the following policies, as required by ICTQual:

- ✓ Equal Opportunities Policy.
- ✓ Health and Safety Policy.
- ✓ Safeguarding Policies and Procedures.
- ✓ Complaints and Appeals Procedure.

- ✓ Data Protection and Confidentiality Policy.

9. Regular Reporting to ICTQual

- ✓ Centres must provide regular updates to ICTQual AB on learner enrolment, progress, and completion rates.
- ✓ Centres are required to maintain records of assessments and learner achievements for external auditing purposes.

Support for Candidates

Centres should ensure that materials developed to support candidates:

- ✓ Facilitate tracking of achievements as candidate's progress through the learning outcomes and assessment criteria.
- ✓ Include information on how and where ICTQual's policies and procedures can be accessed.
- ✓ Provide mechanisms for Internal and External Quality Assurance staff to verify and authenticate evidence effectively.

This approach ensures transparency, supports candidates' learning journeys, and upholds quality assurance standards.

Assessment

This qualification is competence-based, requiring candidates to demonstrate proficiency as defined in the qualification units. The assessment evaluates the candidate's skills, knowledge, and understanding against the set standards. Key details include:

1. **Assessment Process:**

    - ✓ Must be conducted by an experienced and qualified assessor.
    - ✓ Candidates compile a portfolio of evidence that satisfies all learning outcomes and assessment criteria for each unit.

2. **Types of Evidence:**

    - ✓ Observation reports by the assessor.
    - ✓ Assignments, projects, or reports.
    - ✓ Professional discussions.
    - ✓ Witness testimonies.
    - ✓ Candidate-produced work.
    - ✓ Worksheets.
    - ✓ Records of oral and written questioning.
    - ✓ Recognition of Prior Learning (RPL).

3. **Learning Outcomes and Assessment Criteria:**

- ✓ **Learning Outcomes:** Define what candidates should know, understand, or accomplish upon completing the unit.
- ✓ **Assessment Criteria:** Detail the standards candidates must meet to demonstrate that the learning outcomes have been achieved.

This framework ensures rigorous and consistent evaluation of candidates' competence in line with the qualification's objectives.

Unit Descriptors

AGE0002-1: Introduction to Agricultural Engineering Principles

This unit aims to provide learners with a foundational understanding of the core principles of agricultural engineering and their significance in modern farming practices. Students will explore the role of engineering in enhancing agricultural systems and improving farm productivity. The unit will also enable learners to apply fundamental engineering concepts to agricultural systems, equipping them with the skills necessary to address challenges and optimize processes within the agricultural sector.

Learning Outcome:	Assessment Criteria:
1. Understand the core principles of agricultural engineering.	1.1. Demonstrate comprehensive knowledge of the fundamental principles that underpin agricultural engineering. 1.2. Explain the role of agricultural engineering in enhancing agricultural productivity and sustainability. 1.3. Assess the impact of agricultural engineering innovations on modern farming practices. 1.4. Evaluate the key technologies and equipment used in agricultural engineering. 1.5. Analyse the interrelationship between agricultural engineering and environmental factors. 1.6. Apply the core principles of agricultural engineering to real-world agricultural challenges.
2. Recognize the importance of engineering in modern farming practices.	2.1. Identify the key contributions of engineering to the advancement of modern farming techniques. 2.2. Demonstrate an understanding of how engineering innovations improve farming efficiency and productivity. 2.3. Assess the role of engineering in enhancing sustainability within the agricultural sector. 2.4. Evaluate the impact of engineering solutions on crop yield and livestock management. 2.5. Explain how engineering technology addresses challenges in modern farming practices. 2.6. Relate the importance of engineering in the integration of automation and precision agriculture.
3. Apply fundamental engineering concepts to agricultural systems.	3.1. Demonstrate the ability to apply basic engineering principles to the design and operation of agricultural systems. 3.2. Assess the integration of engineering concepts

	in enhancing agricultural machinery and equipment efficiency. 3.3. Analyse the use of engineering solutions in improving irrigation, drainage, and water management systems. 3.4. Apply engineering knowledge to optimise soil and crop management practices. 3.5. Evaluate the effectiveness of engineering approaches in the design of sustainable agricultural infrastructure. 3.6. Solve agricultural problems by incorporating fundamental engineering concepts into system design and implementation.

AGE0002-2: Applied Mechanics in Agriculture

This unit aims to provide learners with a solid understanding of mechanical principles and their application in agriculture. Students will explore the concepts of force, motion, and mechanics, and how these principles are applied to agricultural machinery. The unit will also focus on developing problem-solving skills, enabling learners to address basic mechanical issues related to farming equipment and optimize the performance of agricultural systems.

Learning Outcome:	Assessment Criteria:
1. Demonstrate knowledge of mechanical principles in agriculture.	1.1. Identify key mechanical principles used in agricultural machinery and equipment. 1.2. Explain the application of mechanical principles in the design and operation of agricultural systems. 1.3. Assess the role of mechanical engineering in enhancing the performance and efficiency of farming tools. 1.4. Analyse the impact of mechanical systems on the automation of agricultural processes. 1.5. Evaluate the importance of mechanical principles in the maintenance and repair of agricultural machinery. 1.6. Apply mechanical engineering concepts to solve practical problems in modern farming.
2. Apply concepts of force, motion, and mechanics to agricultural machinery.	2.1. Demonstrate the ability to calculate and apply forces involved in the operation of agricultural machinery. 2.2. Analyse the effect of motion on the performance and efficiency of agricultural equipment. 2.3. Evaluate how mechanical principles of force and motion optimise machinery design for specific agricultural tasks. 2.4. Apply the principles of mechanics to troubleshoot and improve machinery functionality. 2.5. Assess the role of force and motion in the safe operation and handling of agricultural machinery. 2.6. Solve practical problems by using concepts of force, motion, and mechanics to enhance agricultural machinery performance.
3. Solve basic mechanical problems related to farming equipment.	3.1. Identify common mechanical issues in farming equipment and determine their causes.

	3.2. Apply basic mechanical principles to diagnose faults in agricultural machinery. 3.3. Demonstrate the ability to select and implement appropriate solutions to mechanical problems in farming equipment. 3.4. Evaluate the effectiveness of different repair techniques in restoring equipment functionality. 3.5. Apply fundamental mechanical knowledge to optimise the performance of farming machinery. 3.6. Ensure that solutions to mechanical problems adhere to safety standards and operational efficiency requirements.

AGE0002-3: Agricultural Machinery and Equipment

This unit aims to provide learners with a comprehensive understanding of various types of agricultural machinery and their specific functions. Students will gain practical knowledge in the operation, maintenance, and troubleshooting of farming equipment, ensuring optimal performance. The unit will also equip learners with the skills to select the most suitable machinery for specific agricultural tasks, enhancing efficiency and productivity in agricultural operations.

Learning Outcome:	Assessment Criteria:
1. Identify and describe various types of agricultural machinery.	1.1. Accurately classify and define different types of agricultural machinery based on their function and application. 1.2. Demonstrate a comprehensive understanding of the operational principles and technical specifications of various agricultural machines. 1.3. Evaluate the efficiency and suitability of different machinery types for specific agricultural processes. 1.4. Analyse advancements in agricultural machinery and their impact on modern farming practices. 1.5. Compare and contrast traditional and modern agricultural equipment in terms of performance, sustainability, and cost-effectiveness. 1.6. Interpret manufacturer guidelines and industry standards related to the selection and use of agricultural machinery.
2. Understand the operation, maintenance, and troubleshooting of farming equipment.	2.1. Explain the fundamental operating principles of various types of farming equipment with precision and clarity. 2.2. Demonstrate knowledge of routine maintenance procedures to ensure optimal performance and longevity of farming machinery. 2.3. Identify common mechanical and technical issues in farming equipment and propose effective troubleshooting methods. 2.4. Evaluate the impact of proper maintenance practices on equipment efficiency, safety, and environmental sustainability. 2.5. Analyse manufacturer recommendations and industry best practices for equipment operation and servicing. 2.6. Apply diagnostic techniques to assess

	equipment faults and implement corrective actions in compliance with safety standards.
3. Select the appropriate machinery for specific agricultural tasks.	3.1. Assess the requirements of various agricultural tasks and determine the most suitable machinery based on functionality and efficiency. 3.2. Compare different types of agricultural equipment in terms of performance, cost-effectiveness, and environmental impact. 3.3. Analyse soil conditions, crop types, and operational demands to justify machinery selection. 3.4. Evaluate manufacturer specifications and industry guidelines to ensure compliance with best practices. 3.5. Demonstrate the ability to match machinery capabilities with specific farming operations for optimal productivity. 3.6. Identify potential limitations and advantages of selected machinery in relation to task-specific requirements.

AGE0002-4: Hydraulics and Pneumatics in Agriculture

This unit aims to provide learners with a thorough understanding of the principles of hydraulics and pneumatics as applied to agricultural systems. Students will explore the design and function of hydraulic and pneumatic systems in agricultural machinery, gaining the skills to apply these systems effectively in farming operations. The unit will also focus on troubleshooting common issues in hydraulic and pneumatic systems, preparing learners to ensure the reliability and efficiency of equipment in agricultural environments.

Learning Outcome:	Assessment Criteria:
1. Understand the principles of hydraulics and pneumatics in agricultural systems.	1.1. Explain the fundamental principles of hydraulics and pneumatics as applied to agricultural machinery and systems. 1.2. Analyse the role of hydraulic and pneumatic components in enhancing the efficiency and functionality of farming equipment. 1.3. Evaluate the operational differences between hydraulic and pneumatic systems in agricultural applications. 1.4. Demonstrate knowledge of pressure, flow, and control mechanisms in hydraulic and pneumatic circuits. 1.5. Identify common faults in hydraulic and pneumatic systems and recommend appropriate troubleshooting techniques. 1.6. Assess safety regulations and best practices for maintaining and operating hydraulic and pneumatic systems in agriculture.
2. Apply hydraulic and pneumatic systems in agricultural machinery.	2.1. Demonstrate the correct application of hydraulic and pneumatic systems in various agricultural machinery. 2.2. Analyse the functionality and efficiency of hydraulic and pneumatic components in improving machine performance. 2.3. Integrate hydraulic and pneumatic circuits into agricultural equipment following industry standards and best practices. 2.4. Diagnose system malfunctions and apply appropriate troubleshooting techniques to restore operational efficiency. 2.5. Evaluate the impact of hydraulic and pneumatic systems on productivity, safety, and energy consumption in agricultural operations. 2.6. Ensure compliance with safety protocols and maintenance procedures when working with hydraulic and pneumatic systems in farming

	equipment.
3. Troubleshoot common issues in hydraulic and pneumatic systems.	3.1. Identify and diagnose common faults in hydraulic and pneumatic systems used in agricultural machinery. 3.2. Apply systematic troubleshooting techniques to locate issues related to pressure, flow, leaks, and component failures. 3.3. Interpret technical manuals, schematics, and diagnostic tools to analyse system malfunctions accurately. 3.4. Recommend and implement effective solutions to restore hydraulic and pneumatic system functionality while ensuring minimal downtime. 3.5. Assess the impact of faulty components on overall system performance and propose appropriate preventive maintenance strategies. 3.6. Adhere to industry safety standards and best practices when inspecting, repairing, and testing hydraulic and pneumatic systems.

AGE0002-5: Soil and Water Management Systems

This unit aims to provide learners with a deep understanding of the relationship between soil, water, and agricultural productivity. Students will explore efficient soil and water management practices to optimize crop growth and sustainability. The unit will also equip learners with the skills to design simple irrigation and drainage systems, promoting sustainable farming practices and ensuring the efficient use of water resources in agricultural operations.

Learning Outcome:	Assessment Criteria:
1. Explain the relationship between soil, water, and agricultural productivity.	1.1. Analyse the interdependence of soil composition, water availability, and crop yield in agricultural systems. 1.2. Evaluate the impact of soil properties such as texture, structure, and nutrient content on water retention and plant growth. 1.3. Assess the role of irrigation and drainage systems in optimising water management for sustainable agricultural productivity. 1.4. Explain how soil erosion, salinity, and waterlogging affect long-term soil fertility and farm output. 1.5. Interpret scientific data on soil moisture levels and water usage to recommend best practices for efficient resource management. 1.6. Examine the influence of climate, land management techniques, and conservation strategies on soil-water dynamics and agricultural sustainability.
2. Apply efficient soil and water management practices.	2.1. Implement soil conservation techniques to minimise erosion, enhance fertility, and maintain long-term agricultural productivity. 2.2. Utilise advanced irrigation methods to optimise water distribution while reducing wastage and environmental impact. 2.3. Assess soil moisture levels and drainage conditions to develop sustainable water management strategies. 2.4. Apply precision agriculture technologies to monitor and improve soil and water resource efficiency. 2.5. Evaluate the effectiveness of different soil conditioning and water retention practices in enhancing crop yield. 2.6. Ensure compliance with environmental regulations and industry standards in soil and

	water management applications.
3. Design simple irrigation and drainage systems for sustainable farming.	3.1. Develop irrigation and drainage layouts that optimise water use while minimising environmental impact. 3.2. Select appropriate materials and components for constructing efficient and cost-effective irrigation and drainage systems. 3.3. Calculate water flow requirements based on soil type, crop needs, and climatic conditions. 3.4. Integrate water conservation techniques into system design to enhance sustainability and resource efficiency. 3.5. Assess the effectiveness of designed systems in maintaining soil moisture balance and preventing waterlogging or drought stress. 3.6. Ensure compliance with agricultural best practices and environmental regulations in irrigation and drainage system design.

AGE0002-6: Electrical and Electronic Systems in Agriculture

This unit aims to provide learners with a comprehensive understanding of the role of electrical and electronic systems in modern agriculture. Students will explore the application of basic electrical principles to agricultural equipment, enabling them to operate and maintain systems effectively. The unit will also focus on troubleshooting common electrical issues in farming machinery, equipping learners with the skills to ensure the reliability and efficiency of electrical systems in agricultural operations.

Learning Outcome:	Assessment Criteria:
1. Understand the role of electrical and electronic systems in agriculture.	1.1. Explain the function and significance of electrical and electronic systems in modern agricultural operations. 1.2. Analyse the impact of automation, sensors, and control systems on agricultural productivity and efficiency. 1.3. Evaluate the integration of renewable energy sources in agricultural electrical systems to enhance sustainability. 1.4. Identify common electrical and electronic components used in farming equipment and their specific applications. 1.5. Assess safety regulations and industry standards for the installation and maintenance of electrical systems in agriculture. 1.6. Examine advancements in precision agriculture and smart farming technologies that rely on electrical and electronic systems.
2. Apply basic electrical principles to agricultural equipment.	2.1. Apply Ohm's law and basic circuit theory to troubleshoot and maintain electrical systems in agricultural machinery. 2.2. Demonstrate the correct use of electrical components such as resistors, capacitors, and switches in agricultural equipment. 2.3. Implement basic wiring and circuit design techniques for agricultural machinery, ensuring compliance with safety standards. 2.4. Evaluate the performance of electrical systems in farming equipment by measuring voltage, current, and resistance. 2.5. Identify and resolve electrical faults using basic diagnostic tools and techniques appropriate for agricultural applications. 2.6. Ensure proper grounding and protection mechanisms are in place to safeguard both equipment and personnel during operation

	and maintenance.
3. Troubleshoot common electrical issues in farming machinery.	3.1. Identify and diagnose common electrical faults in farming machinery, including power failures, short circuits, and component malfunctions. 3.2. Use diagnostic tools such as multimeters and oscilloscopes to assess electrical system performance and locate faults. 3.3. Apply troubleshooting techniques to test wiring, fuses, switches, and electrical connections for functionality. 3.4. Interpret circuit diagrams and technical manuals to guide the diagnosis and repair of electrical issues. 3.5. Implement effective solutions to restore proper operation of electrical systems while ensuring safety and compliance with industry standards. 3.6. Prevent future electrical issues by recommending and applying routine maintenance practices for agricultural machinery.

AGE0002-7: Introduction to Agricultural Structures

This unit aims to provide learners with a foundational understanding of the principles behind the design and construction of agricultural buildings. Students will explore various types of agricultural structures, such as storage facilities, livestock housing, and machinery sheds, and understand their specific uses in farming operations. The unit will also cover the basics of structural safety and sustainability, equipping learners with the knowledge to design and assess agricultural structures that support safe, efficient, and environmentally responsible farming practices.

Learning Outcome:	Assessment Criteria:
1. Understand the principles behind the design and construction of agricultural buildings.	1.1. Demonstrate a clear understanding of the fundamental principles involved in the design and construction of agricultural buildings. 1.2. Identify the key factors that influence the planning and construction processes, including environmental, structural, and economic considerations. 1.3. Analyse the various building materials and technologies used in agricultural construction, assessing their suitability for different agricultural purposes. 1.4. Evaluate the impact of local regulations, safety standards, and sustainability practices on the design and construction of agricultural buildings. 1.5. Explain the role of site analysis and environmental considerations in determining appropriate designs for agricultural structures. 1.6. Apply knowledge of agricultural building design to propose solutions that optimise functionality, efficiency, and cost-effectiveness.
2. Identify different types of agricultural structures and their uses.	2.1. Identify and describe various types of agricultural structures, including barns, silos, greenhouses, and livestock housing. 2.2. Explain the specific functions and purposes of each type of agricultural structure in relation to farming operations. 2.3. Analyse the factors that determine the selection of specific agricultural structures based on farming needs and environmental conditions. 2.4. Evaluate the structural requirements and materials suitable for different types of agricultural buildings.

	2.5. Discuss the impact of modern farming practices on the design and use of agricultural structures. 2.6. Demonstrate an understanding of how the design of agricultural buildings can optimise productivity and support sustainable farming practices.
3. Learn the basics of structural safety and sustainability in farming environments.	3.1. Demonstrate an understanding of key structural safety principles relevant to farming environments, including load-bearing capacities and structural stability. 3.2. Identify the critical factors that impact the safety of agricultural structures, such as environmental conditions, soil types, and local weather patterns. 3.3. Evaluate sustainable building materials and construction methods that contribute to the durability and environmental performance of farming structures. 3.4. Explain the importance of regular maintenance and inspections to ensure the ongoing safety and longevity of agricultural buildings. 3.5. Analyse the role of energy efficiency and waste reduction in promoting sustainability within agricultural construction. 3.6. Apply knowledge of structural safety and sustainability to propose design solutions that minimise risk and environmental impact.

AGE0002-8: Sustainable Farming Technologies

This unit aims to equip learners with an understanding of the importance of sustainability in agriculture and its role in modern farming practices. Students will explore engineering solutions that enhance resource efficiency and reduce the environmental impact of agricultural operations. The unit will also introduce renewable energy technologies used in farming, providing learners with the knowledge to implement sustainable farming practices that contribute to long-term environmental and economic sustainability.

Learning Outcome:	Assessment Criteria:
1. Recognize the importance of sustainability in agriculture.	1.1. Explain the key principles of sustainability and their relevance to agricultural practices. 1.2. Identify the environmental, social, and economic impacts of unsustainable farming practices and the importance of adopting sustainable alternatives. 1.3. Evaluate sustainable farming techniques, such as crop rotation, agroforestry, and conservation tillage, in enhancing long-term agricultural productivity. 1.4. Analyse the role of resource management, including water, soil, and energy, in promoting sustainable agriculture. 1.5. Discuss the integration of sustainable practices into agricultural policies and how they contribute to food security and environmental conservation. 1.6. Assess the benefits of sustainability in agriculture for farmers, communities, and the global ecosystem.
2. Apply engineering solutions that improve resource efficiency and reduce environmental impact.	2.1. Identify engineering solutions that enhance resource efficiency in agricultural systems, such as water and energy conservation technologies. 2.2. Analyse the application of renewable energy sources, like solar and wind, in reducing environmental impact on farms. 2.3. Evaluate the use of precision agriculture techniques, such as GPS-guided machinery and sensors, to optimise resource use and minimise waste. 2.4. Assess the role of waste management systems, including composting and recycling, in reducing the environmental footprint of agricultural practices. 2.5. Design and implement engineering systems that optimise the use of natural resources

	while minimising environmental damage. 2.6. Monitor and evaluate the effectiveness of implemented engineering solutions in improving resource efficiency and reducing environmental impact.
3. Explore renewable energy technologies used in farming.	3.1. Identify various renewable energy technologies applicable to farming, including solar, wind, biomass, and hydro power systems. 3.2. Analyse the benefits and challenges of integrating renewable energy sources into agricultural operations, considering factors like location, scale, and energy needs. 3.3. Evaluate the economic and environmental impacts of adopting renewable energy technologies on farms, including cost savings and carbon footprint reduction. 3.4. Assess the feasibility of different renewable energy technologies for specific agricultural applications, such as irrigation, heating, and livestock management. 3.5. Explore the role of government incentives, subsidies, and regulations in supporting the adoption of renewable energy in agriculture. 3.6. Design strategies for the effective integration of renewable energy solutions that enhance sustainability and resource efficiency in farming.

AGE0002-9: Basic Agricultural Safety Practices

This unit aims to provide learners with the knowledge to identify potential hazards in agricultural environments and understand the health and safety practices specific to agricultural engineering. Students will learn to implement safe operating and maintenance procedures for agricultural machinery, ensuring the protection of both workers and equipment. The unit will focus on fostering a safety-conscious approach, preparing learners to create and maintain safe work environments in agricultural settings.

Learning Outcome:	Assessment Criteria:
1. Identify potential hazards in agricultural environments.	1.1. Recognise common physical hazards in agricultural environments, such as machinery, livestock, and working at heights. 1.2. Identify chemical hazards, including pesticides, fertilisers, and hazardous substances used in agricultural processes. 1.3. Analyse biological hazards, such as exposure to zoonotic diseases, bacteria, and allergens present in agricultural settings. 1.4. Assess environmental hazards like extreme weather conditions, soil erosion, and exposure to harmful ultraviolet radiation. 1.5. Identify ergonomic hazards related to manual handling, repetitive tasks, and long working hours in agricultural environments. 1.6. Evaluate the impact of insufficient training and safety protocols on the occurrence of accidents and injuries in farming.
2. Understand health and safety practices specific to agricultural engineering.	2.1. Recognise common physical hazards in agricultural environments, such as machinery, livestock, and working at heights. 2.2. Identify chemical hazards, including pesticides, fertilisers, and hazardous substances used in agricultural processes. 2.3. Analyse biological hazards, such as exposure to zoonotic diseases, bacteria, and allergens present in agricultural settings. 2.4. Assess environmental hazards like extreme weather conditions, soil erosion, and exposure to harmful ultraviolet radiation. 2.5. Identify ergonomic hazards related to manual handling, repetitive tasks, and long working hours in agricultural environments. 2.6. Evaluate the impact of insufficient training and safety protocols on the occurrence of

	accidents and injuries in farming.
3. Implement safe practices for operating and maintaining machinery.	3.1. Recognise common physical hazards in agricultural environments, such as machinery, livestock, and working at heights. 3.2. Identify chemical hazards, including pesticides, fertilisers, and hazardous substances used in agricultural processes. 3.3. Analyse biological hazards, such as exposure to zoonotic diseases, bacteria, and allergens present in agricultural settings. 3.4. Assess environmental hazards like extreme weather conditions, soil erosion, and exposure to harmful ultraviolet radiation. 3.5. Identify ergonomic hazards related to manual handling, repetitive tasks, and long working hours in agricultural environments. 3.6. Evaluate the impact of insufficient training and safety protocols on the occurrence of accidents and injuries in farming.

AGE0002-10: Crop and Livestock Machinery

This unit aims to provide learners with a comprehensive understanding of the machinery used in both crop and livestock production. Students will develop the skills to operate these machines effectively and efficiently. The unit will also focus on troubleshooting and maintaining crop and livestock machinery, ensuring optimal performance and minimizing downtime. By the end of the unit, learners will be equipped to enhance productivity and operational reliability in agricultural systems through the proper use and care of machinery.

Learning Outcome:	Assessment Criteria:
1. Identify and understand the function of machinery used in crop and livestock production.	1.1. Identify key types of machinery used in crop production, such as tractors, ploughs, seeders, and harvesters, and their specific roles in farming operations. 1.2. Understand the function of machinery in livestock production, including feed mixers, milking machines, and livestock handling equipment. 1.3. Analyse the technological advancements in machinery that enhance efficiency, productivity, and precision in both crop and livestock farming. 1.4. Evaluate the factors that influence the selection of machinery for specific agricultural tasks, such as soil type, crop requirements, and livestock needs. 1.5. Recognise the maintenance needs of agricultural machinery to ensure optimal performance and longevity in both crop and livestock production. 1.6. Understand the role of automation and smart technologies in improving the functionality and precision of machinery used in modern agricultural practices.
2. Apply operational knowledge to the effective use of these machines.	2.1. Demonstrate the ability to operate agricultural machinery efficiently, following correct procedures and adjusting settings for optimal performance. 2.2. Apply knowledge of machine capabilities to select the appropriate equipment for specific tasks in crop and livestock production. 2.3. Monitor machine performance during operation, identifying and addressing any issues to ensure continuous, effective use. 2.4. Implement maintenance and troubleshooting practices based on operational knowledge to

	prevent equipment failure and downtime. 2.5. Ensure safe and efficient use of machinery by adhering to operational guidelines, safety standards, and industry best practices. 2.6. Evaluate the impact of machinery use on overall farm productivity, adjusting operational strategies to maximise efficiency and minimise waste.
3. Troubleshoot and maintain crop and livestock machinery.	3.1. Identify common mechanical issues and malfunctions in crop and livestock machinery through systematic troubleshooting techniques. 3.2. Apply operational knowledge to diagnose faults, using appropriate tools and diagnostic equipment to pinpoint problems accurately. 3.3. Perform regular maintenance tasks, such as oil changes, filter replacements, and lubrication, to ensure machinery remains in optimal working condition. 3.4. Implement preventative maintenance schedules to reduce the likelihood of unexpected machinery breakdowns and extend the lifespan of equipment. 3.5. Repair or replace faulty components, ensuring that machinery is restored to full functionality quickly and safely. 3.6. Maintain accurate records of maintenance activities, repairs, and machinery performance to track reliability and inform future troubleshooting efforts.

AGE0002-11: Mechanical Design and CAD for Agricultural Engineering

This unit aims to provide learners with the knowledge and skills to apply mechanical design principles to agricultural engineering projects. Students will gain proficiency in using computer-aided design (CAD) tools to create precise engineering designs for agricultural machinery. The unit will also focus on developing prototypes based on CAD designs, equipping learners with the practical skills necessary to bring innovative agricultural engineering concepts to life through advanced design techniques and technology.

Learning Outcome:	Assessment Criteria:
1. Apply mechanical design principles to agricultural engineering projects.	1.1. Demonstrate a comprehensive understanding of mechanical design principles relevant to agricultural engineering. 1.2. Evaluate design requirements and constraints specific to agricultural engineering applications. 1.3. Apply mechanical design methodologies to create efficient and functional agricultural systems. 1.4. Integrate appropriate materials, components, and technologies to enhance the performance and durability of agricultural machinery. 1.5. Ensure compliance with safety, environmental, and regulatory standards in design processes. 1.6. Assess the effectiveness of design solutions and make necessary modifications to optimise performance.
2. Use computer-aided design (CAD) tools to create engineering designs for agricultural machinery.	2.1. Demonstrate a comprehensive understanding of mechanical design principles relevant to agricultural engineering. 2.2. Evaluate design requirements and constraints specific to agricultural engineering applications. 2.3. Apply mechanical design methodologies to create efficient and functional agricultural systems. 2.4. Integrate appropriate materials, components, and technologies to enhance the performance and durability of agricultural machinery. 2.5. Ensure compliance with safety, environmental, and regulatory standards in design processes. 2.6. Assess the effectiveness of design solutions and make necessary modifications to optimise performance.
3. Develop prototypes based on CAD designs.	3.1. Demonstrate a comprehensive understanding of mechanical design principles relevant to

	agricultural engineering. 3.2. Evaluate design requirements and constraints specific to agricultural engineering applications. 3.3. Apply mechanical design methodologies to create efficient and functional agricultural systems. 3.4. Integrate appropriate materials, components, and technologies to enhance the performance and durability of agricultural machinery. 3.5. Ensure compliance with safety, environmental, and regulatory standards in design processes. 3.6. Assess the effectiveness of design solutions and make necessary modifications to optimise performance.

AGE0002-12: Introduction to Farm Management

This unit aims to provide learners with a solid understanding of the fundamentals of farm management and agricultural operations. Students will explore key concepts in resource planning, budgeting, and farm optimization, equipping them with the tools to enhance farm productivity and profitability. The unit will also highlight the crucial role of engineering in improving farm efficiency, allowing learners to integrate engineering solutions with effective farm management practices.

Learning Outcome:	Assessment Criteria:
1. Understand the basics of farm management and agricultural operations.	1.1. Demonstrate a fundamental understanding of farm management principles, including resource allocation and optimisation. 1.2. Identify key agricultural operations and their impact on farm productivity and sustainability. 1.3. Assess the role of technology and innovation in improving farm management practices. 1.4. Understand the financial aspects of farm management, including budgeting, cost analysis, and profitability. 1.5. Recognise the importance of environmental and regulatory considerations in farm operations. 1.6. Apply basic farm management strategies to improve operational efficiency and resource management.
2. Apply concepts of resource planning, budgeting, and farm optimization.	2.1. Demonstrate a fundamental understanding of farm management principles, including resource allocation and optimisation. 2.2. Identify key agricultural operations and their impact on farm productivity and sustainability. 2.3. Assess the role of technology and innovation in improving farm management practices. 2.4. Understand the financial aspects of farm management, including budgeting, cost analysis, and profitability. 2.5. Recognise the importance of environmental and regulatory considerations in farm operations. 2.6. Apply basic farm management strategies to improve operational efficiency and resource management.
3. Recognize the role of engineering in improving farm efficiency.	3.1. Demonstrate a fundamental understanding of farm management principles, including resource allocation and optimisation.

	3.2. Identify key agricultural operations and their impact on farm productivity and sustainability. 3.3. Assess the role of technology and innovation in improving farm management practices. 3.4. Understand the financial aspects of farm management, including budgeting, cost analysis, and profitability. 3.5. Recognise the importance of environmental and regulatory considerations in farm operations. 3.6. Apply basic farm management strategies to improve operational efficiency and resource management.

AGE0002-13: Advanced Agricultural Engineering Principles

This unit aims to deepen learners' understanding of advanced engineering principles and their application to agricultural systems. Students will develop the skills to solve complex engineering problems in agriculture, focusing on the integration of advanced concepts in mechanics, thermodynamics, and materials science. The unit will enable learners to tackle more sophisticated challenges in agricultural engineering, fostering innovation and improving the efficiency and sustainability of agricultural practices.

Learning Outcome:	Assessment Criteria:
1. Deepen understanding of engineering principles applied to agriculture.	1.1. Analyse advanced engineering principles and their specific applications in agricultural systems and machinery. 1.2. Assess the relationship between engineering theory and practical agricultural solutions, focusing on efficiency and innovation. 1.3. Evaluate the impact of agricultural engineering on resource optimisation, sustainability, and farm productivity. 1.4. Apply principles of mechanical, electrical, and civil engineering to design and improve agricultural equipment and infrastructure. 1.5. Integrate cutting-edge technologies and engineering advancements into agricultural practices to address industry challenges. 1.6. Explore the role of engineering in enhancing the resilience and adaptability of agricultural systems to changing environmental conditions.
2. Solve complex engineering problems in agricultural systems.	2.1. Analyse advanced engineering principles and their specific applications in agricultural systems and machinery. 2.2. Assess the relationship between engineering theory and practical agricultural solutions, focusing on efficiency and innovation. 2.3. Evaluate the impact of agricultural engineering on resource optimisation, sustainability, and farm productivity. 2.4. Apply principles of mechanical, electrical, and civil engineering to design and improve agricultural equipment and infrastructure. 2.5. Integrate cutting-edge technologies and engineering advancements into agricultural practices to address industry challenges. 2.6. Explore the role of engineering in enhancing the resilience and adaptability of agricultural systems to changing environmental conditions.

3. Apply advanced concepts in mechanics, thermodynamics, and materials science.	3.1. Analyse advanced engineering principles and their specific applications in agricultural systems and machinery. 3.2. Assess the relationship between engineering theory and practical agricultural solutions, focusing on efficiency and innovation. 3.3. Evaluate the impact of agricultural engineering on resource optimisation, sustainability, and farm productivity. 3.4. Apply principles of mechanical, electrical, and civil engineering to design and improve agricultural equipment and infrastructure. 3.5. Integrate cutting-edge technologies and engineering advancements into agricultural practices to address industry challenges. 3.6. Explore the role of engineering in enhancing the resilience and adaptability of agricultural systems to changing environmental conditions.

AGE0002-14: Renewable Energy Applications in Agriculture

This unit aims to provide learners with a comprehensive understanding of the role of renewable energy sources in agricultural operations. Students will explore the design and integration of solar, wind, and biomass energy systems into farming practices. The unit will also focus on evaluating the cost-effectiveness and environmental benefits of renewable energy solutions, equipping learners with the knowledge to implement sustainable energy practices that enhance both the economic and environmental sustainability of agricultural systems.

Learning Outcome:	Assessment Criteria:
1. Understand the use of renewable energy sources in agricultural operations.	1.1. Identify various renewable energy sources suitable for agricultural operations, including solar, wind, and biomass. 1.2. Assess the benefits and challenges of integrating renewable energy technologies into farming practices. 1.3. Evaluate the environmental and economic impact of using renewable energy in agricultural systems. 1.4. Understand the technical requirements for implementing renewable energy solutions in irrigation, heating, and other agricultural processes. 1.5. Apply principles of energy efficiency to optimise the use of renewable resources on farms. 1.6. Explore innovative renewable energy solutions that contribute to sustainable agricultural practices and reduce dependency on non-renewable sources.
2. Design systems that integrate solar, wind, and biomass energy into farming.	2.1. Analyse energy needs in agricultural operations to determine appropriate integration of solar, wind, and biomass energy systems. 2.2. Design hybrid renewable energy systems that combine solar, wind, and biomass to optimise energy supply and reduce operational costs. 2.3. Evaluate the technical feasibility of integrating renewable energy systems with existing farm infrastructure and equipment. 2.4. Ensure that the design accounts for energy storage solutions to manage intermittent energy generation from solar and wind sources. 2.5. Select and integrate appropriate technologies and components, such as solar panels, wind turbines, and biomass converters, to create efficient systems.

	2.6. Assess the environmental impact and sustainability of the designed renewable energy systems, ensuring compliance with regulations and best practices.
3. Evaluate the cost and environmental benefits of renewable energy solutions.	3.1. Conduct a comprehensive cost-benefit analysis of renewable energy solutions, considering installation, maintenance, and operational costs. 3.2. Assess the long-term financial savings associated with using renewable energy, including reduced energy bills and energy independence. 3.3. Evaluate the environmental impact of renewable energy systems, focusing on reductions in greenhouse gas emissions and carbon footprint. 3.4. Compare the lifecycle costs and environmental benefits of various renewable energy sources, such as solar, wind, and biomass. 3.5. Identify potential subsidies, grants, or incentives that can offset initial capital costs and improve the financial viability of renewable energy solutions. 3.6. Monitor and report on the performance of renewable energy systems to ensure they meet expected cost and environmental benefit targets.

AGE0002-15: Advanced Irrigation and Water Management Systems

This unit aims to equip learners with the knowledge and skills to design and implement advanced irrigation systems that optimize water usage on farms. Students will explore modern technologies and innovative approaches to enhance water efficiency in agricultural operations. The unit will also address key challenges related to water management and conservation, preparing learners to develop sustainable solutions that improve crop yields while minimizing environmental impact.

Learning Outcome:	Assessment Criteria:
1. Design and implement advanced irrigation systems.	1.1. Demonstrate a comprehensive understanding of advanced irrigation system designs, ensuring alignment with industry best practices and environmental sustainability. 1.2. Select and utilise appropriate materials and technologies to optimise irrigation efficiency and water conservation. 1.3. Develop detailed, feasible plans that incorporate system specifications, resource management, and regulatory requirements. 1.4. Conduct thorough site assessments to determine the most suitable irrigation solutions based on topography, soil type, and climate conditions. 1.5. Implement the irrigation system while ensuring compliance with health, safety, and environmental standards. 1.6. Evaluate system performance post-implementation and provide recommendations for adjustments or improvements to optimise operational effectiveness.
2. Use modern technologies to optimize water usage on farms.	2.1. Identify and assess modern technologies available for water optimisation in farming, considering environmental and economic impacts. 2.2. Select appropriate technologies based on farm size, crop type, and water availability to maximise efficiency. 2.3. Implement automated irrigation systems, sensors, and data analytics to monitor and control water usage in real time. 2.4. Ensure the integration of water-saving technologies with existing farm operations and equipment. 2.5. Evaluate the effectiveness of technologies in reducing water consumption while

	maintaining crop yield and quality. 2.6. Provide ongoing support and adjustments to optimise the performance of water usage technologies.
3. Address challenges related to water management and conservation.	3.1. Evaluate the key challenges facing water management and conservation in various sectors. 3.2. Analyse the impact of water scarcity and its effects on environmental, social, and economic systems. 3.3. Identify effective water conservation techniques and strategies for sustainable resource management. 3.4. Assess the role of technology and innovation in addressing water management challenges. 3.5. Critically evaluate policy frameworks and regulations that support water conservation efforts. 3.6. Propose actionable solutions for improving water management practices at local, national, and global levels.

AGE0002-16: Precision Agriculture Technologies

This unit aims to provide learners with the knowledge and skills to apply precision agriculture technologies, such as GPS, remote sensing, and data analytics, to optimize agricultural production. Students will explore how these technologies enhance efficiency, increase crop yield, and improve farm management practices. The unit will also focus on implementing precision farming solutions to reduce operational costs and promote sustainability, preparing learners to integrate cutting-edge technologies into modern agricultural systems.

Learning Outcome:	Assessment Criteria:
1. Apply GPS, remote sensing, and data analytics to optimize agricultural production.	1.1. Assess the potential of GPS technology in enhancing precision agriculture practices. 1.2. Analyse the use of remote sensing tools for monitoring crop health and soil conditions. 1.3. Evaluate data analytics techniques for processing agricultural data to improve decision-making. 1.4. Integrate GPS and remote sensing data to optimise resource management in agricultural production. 1.5. Critically review the impact of these technologies on crop yield, cost efficiency, and sustainability. 1.6. Propose strategies for the effective adoption and integration of these technologies in agricultural practices.
2. Understand how precision farming technologies improve efficiency and yield.	2.1. Assess the potential of GPS technology in enhancing precision agriculture practices. 2.2. Analyse the use of remote sensing tools for monitoring crop health and soil conditions. 2.3. Evaluate data analytics techniques for processing agricultural data to improve decision-making. 2.4. Integrate GPS and remote sensing data to optimise resource management in agricultural production. 2.5. Critically review the impact of these technologies on crop yield, cost efficiency, and sustainability. 2.6. Propose strategies for the effective adoption and integration of these technologies in agricultural practices.
3. Implement precision agriculture solutions to reduce costs and increase sustainability.	3.1. Evaluate the cost-saving potential of precision agriculture technologies in reducing input costs.

	3.2. Analyse the environmental benefits of implementing precision agriculture solutions for sustainable farming practices. 3.3. Assess the integration of GPS, remote sensing, and data analytics in optimising resource use and reducing waste. 3.4. Critically review the financial impact of adopting precision agriculture on farm profitability. 3.5. Develop strategies for the effective implementation of precision agriculture techniques to achieve long-term sustainability. 3.6. Propose best practices for monitoring and evaluating the success of precision agriculture solutions in reducing costs and enhancing sustainability.

AGE0002-17: Farm Mechanization and Automation

This unit aims to provide learners with a comprehensive understanding of the integration of automation in agricultural machinery. Students will explore the role of robotics and autonomous systems in modern farming, and how these technologies are transforming agricultural practices. The unit will also focus on applying mechanization to enhance farm productivity, reduce labour costs, and improve operational efficiency, equipping learners with the skills to implement innovative solutions in agricultural systems.

Learning Outcome:	Assessment Criteria:
1. Explore the integration of automation in agricultural machinery.	1.1. Assess the technological advancements enabling the integration of automation in agricultural machinery. 1.2. Analyse the impact of automation on labour efficiency and cost reduction in farming operations. 1.3. Evaluate the role of automated machinery in improving precision and consistency in agricultural tasks. 1.4. Investigate the environmental implications of automation, particularly in terms of resource conservation and sustainability. 1.5. Critically review the challenges and barriers to the widespread adoption of automated agricultural machinery. 1.6. Propose strategies for overcoming these challenges and fostering the integration of automation into agricultural systems.
2. Understand the role of robotics and autonomous systems in modern farming.	2.1. Assess the technological advancements enabling the integration of automation in agricultural machinery. 2.2. Analyse the impact of automation on labour efficiency and cost reduction in farming operations. 2.3. Evaluate the role of automated machinery in improving precision and consistency in agricultural tasks. 2.4. Investigate the environmental implications of automation, particularly in terms of resource conservation and sustainability. 2.5. Critically review the challenges and barriers to the widespread adoption of automated agricultural machinery. 2.6. Propose strategies for overcoming these challenges and fostering the integration of automation into agricultural systems.

3. Apply mechanization to improve farm productivity and reduce labour costs.	3.1. Assess the technological advancements enabling the integration of automation in agricultural machinery. 3.2. Analyse the impact of automation on labour efficiency and cost reduction in farming operations. 3.3. Evaluate the role of automated machinery in improving precision and consistency in agricultural tasks. 3.4. Investigate the environmental implications of automation, particularly in terms of resource conservation and sustainability. 3.5. Critically review the challenges and barriers to the widespread adoption of automated agricultural machinery. 3.6. Propose strategies for overcoming these challenges and fostering the integration of automation into agricultural systems.

AGE0002-18: Agricultural Environmental Engineering

This unit aims to equip learners with the knowledge and skills to identify and address environmental challenges in agriculture. Students will explore engineering solutions to minimize environmental impacts such as soil erosion, waste, and pollution. The unit will focus on applying sustainable engineering practices to farming systems, preparing learners to design and implement solutions that enhance environmental sustainability while maintaining agricultural productivity.

Learning Outcome:	Assessment Criteria:
1. Identify environmental challenges in agriculture.	1.1. Assess the impact of agricultural practices on soil degradation and loss of fertility. 1.2. Evaluate the role of water scarcity and overuse in affecting agricultural productivity. 1.3. Analyse the contribution of agriculture to greenhouse gas emissions and climate change. 1.4. Investigate the effects of pesticide and fertiliser overuse on ecosystem health and biodiversity. 1.5. Review the implications of deforestation and habitat destruction due to agricultural expansion. 1.6. Propose sustainable agricultural practices to mitigate environmental challenges and promote long-term viability.
2. Develop engineering solutions to minimize environmental impacts such as soil erosion, waste, and pollution.	2.1. Assess the effectiveness of engineering techniques in preventing soil erosion and preserving soil quality. 2.2. Evaluate innovative waste management systems that reduce agricultural waste and promote recycling. 2.3. Analyse pollution control technologies that minimise the environmental impact of agricultural runoff and emissions. 2.4. Investigate the role of sustainable engineering practices in reducing water and air pollution from agricultural activities. 2.5. Propose engineering solutions for creating efficient irrigation systems that minimise water waste and soil degradation. 2.6. Develop strategies for integrating green engineering technologies into agricultural practices to enhance sustainability.
3. Apply sustainable engineering practices to farming systems.	3.1. Assess the effectiveness of sustainable engineering practices in improving soil health

	and fertility in farming systems. 3.2. Evaluate the use of renewable energy sources in agricultural operations to reduce carbon footprints. 3.3. Analyse water management technologies that promote efficient use and conservation of water resources. 3.4. Investigate the integration of waste management systems in farming to reduce environmental impact and enhance resource efficiency. 3.5. Review the role of precision agriculture in optimising inputs and minimising environmental degradation. 3.6. Propose engineering solutions for adapting farming systems to climate change while maintaining sustainability.

AGE0002-19: Maintenance and Repair of Agricultural Machinery

This unit aims to equip learners with the skills necessary to maintain and repair agricultural machinery and equipment effectively. Students will develop the ability to diagnose mechanical issues and implement appropriate repair solutions. The unit will emphasize the importance of regular maintenance practices in ensuring the longevity and optimal performance of agricultural machinery, preparing learners to reduce downtime and enhance the efficiency of farming operations.

Learning Outcome:	Assessment Criteria:
1. Develop skills to maintain and repair agricultural machinery and equipment.	1.1. Assess the key components of agricultural machinery and equipment to understand maintenance and repair needs. 1.2. Evaluate troubleshooting techniques for diagnosing common faults in agricultural machinery. 1.3. Analyse preventive maintenance practices to extend the lifespan and efficiency of farming equipment. 1.4. Develop practical skills in servicing and repairing engines, hydraulics, and electrical systems in agricultural machinery. 1.5. Investigate the use of technology and diagnostic tools in modern equipment maintenance and repair. 1.6. Propose best practices for regular maintenance schedules to minimise downtime and optimise machinery performance.
2. Diagnose mechanical issues and implement effective repair solutions.	2.1. Assess common mechanical issues in agricultural machinery and equipment to identify root causes. 2.2. Evaluate diagnostic tools and techniques for effectively troubleshooting mechanical faults. 2.3. Analyse repair strategies for resolving mechanical issues, focusing on efficiency and cost-effectiveness. 2.4. Develop practical skills in disassembling and reassembling mechanical components for repair. 2.5. Investigate the use of replacement parts and materials to ensure long-lasting repairs. 2.6. Propose preventive measures to minimise the recurrence of mechanical issues and optimise machinery performance.
3. Understand the importance of regular maintenance for equipment longevity.	3.1. Assess the relationship between regular maintenance and the overall lifespan of

	agricultural machinery. 3.2. Analyse the cost implications of routine maintenance versus the expense of equipment repair or replacement. 3.3. Evaluate the impact of neglecting maintenance on equipment performance and efficiency. 3.4. Investigate the role of regular maintenance in reducing downtime and improving productivity. 3.5. Review industry best practices for scheduling and conducting preventive maintenance on agricultural equipment. 3.6. Propose strategies for developing a comprehensive maintenance plan to optimise equipment longevity and reduce operational costs.

AGE0002-20: Agricultural Engineering Project Management

This unit aims to provide learners with a thorough understanding of project management principles as they apply to agricultural engineering projects. Students will gain the skills to plan, execute, and manage agricultural engineering projects effectively, from initiation to completion. The unit will focus on the application of budgeting, scheduling, and resource management techniques, enabling learners to oversee projects that are completed on time, within budget, and with optimal resource utilization.

Learning Outcome:	Assessment Criteria:
1. Understand project management principles as applied to agricultural engineering projects.	1.1. Demonstrate a comprehensive understanding of core project management principles in the context of agricultural engineering projects. 1.2. Identify and describe the various project management processes and their relevance to agricultural engineering. 1.3. Evaluate the significance of effective planning, budgeting, and scheduling for agricultural engineering projects. 1.4. Assess the role of risk management strategies in mitigating challenges specific to agricultural engineering projects. 1.5. Apply project management methodologies to agricultural engineering case studies, showing an ability to adapt approaches to specific needs. 1.6. Analyse the overall impact of project management on the success and sustainability of agricultural engineering projects.
2. Plan, execute, and manage agricultural engineering projects from start to finish.	2.1. Develop a detailed project plan that includes objectives, scope, timelines, resources, and risk management strategies tailored to agricultural engineering projects. 2.2. Execute project plans efficiently, ensuring that tasks are completed on schedule and within budget while maintaining quality standards. 2.3. Monitor and manage project progress, adjusting resources and timelines as necessary to meet project goals. 2.4. Coordinate with stakeholders, including clients, contractors, and team members, to ensure smooth project execution and communication. 2.5. Identify and resolve issues promptly during project execution to minimise delays and cost overruns. 2.6. Assess project outcomes upon completion,

	documenting lessons learned and evaluating performance against initial objectives.
3. Apply budgeting, scheduling, and resource management techniques.	3.1. Develop and implement a comprehensive project budget that accounts for all financial aspects of an agricultural engineering project. 3.2. Use scheduling tools to create realistic project timelines, ensuring tasks are prioritised and deadlines are met. 3.3. Allocate resources efficiently, ensuring that personnel, equipment, and materials are available when needed to avoid delays. 3.4. Monitor the budget and schedule throughout the project, making adjustments as required to maintain alignment with project goals. 3.5. Evaluate the effectiveness of resource management strategies, identifying opportunities for cost reduction and efficiency improvement. 3.6. Report regularly on budget, schedule, and resource status, providing stakeholders with clear and accurate updates.

AGE0002-21: Agricultural Engineering Systems Integration

This unit aims to equip learners with the knowledge and skills to integrate various agricultural engineering systems, including machinery, irrigation, and automation, into cohesive and efficient systems. Students will explore the challenges of system integration in farm engineering and develop solutions to ensure that all components work together seamlessly. The unit will focus on optimizing farm performance through effective integration, enhancing overall productivity and sustainability in agricultural operations.

Learning Outcome:	Assessment Criteria:
1. Integrate various agricultural engineering systems (machinery, irrigation, automation) into cohesive systems.	1.1. Identify the key components of agricultural engineering systems, including machinery, irrigation, and automation technologies, and understand their roles. 1.2. Design integrated systems that combine machinery, irrigation, and automation for optimal performance and efficiency. 1.3. Evaluate the compatibility of different systems and ensure they work together seamlessly to achieve project objectives. 1.4. Apply systems integration techniques to enhance operational efficiency, reduce waste, and improve productivity in agricultural engineering projects. 1.5. Manage the implementation of integrated systems, coordinating between different technologies and stakeholders to ensure smooth operation. 1.6. Assess the performance of integrated systems post-installation, making adjustments to improve functionality and system cohesiveness.
2. Solve integration challenges in farm engineering.	2.1. Identify common integration challenges in farm engineering, such as compatibility issues between machinery, irrigation, and automation systems. 2.2. Analyse the specific needs of a farm or agricultural operation to determine the most effective solutions for system integration. 2.3. Apply technical knowledge to troubleshoot and resolve compatibility issues between different agricultural systems and technologies. 2.4. Develop innovative strategies for integrating new technologies with existing farm systems to enhance productivity and sustainability. 2.5. Collaborate with multidisciplinary teams to

	address integration challenges, ensuring all systems function cohesively. 2.6. Evaluate the long-term impact of integration solutions, ensuring they contribute to the overall efficiency and sustainability of farm operations.
3. Ensure that all systems work together efficiently to optimize farm performance.	3.1. Identify potential integration challenges in farm engineering, including technological, operational, and logistical issues. 3.2. Analyse the compatibility and functionality of various farm systems, such as machinery, irrigation, and automation, to pinpoint areas of improvement. 3.3. Develop and implement solutions to address integration issues, ensuring all systems operate in harmony. 3.4. Utilise systems engineering principles to ensure that different technologies and processes align to enhance overall farm performance. 3.5. Monitor the performance of integrated systems, identifying any inefficiencies and making necessary adjustments to optimise farm operations. 3.6. Collaborate with stakeholders to ensure that integrated solutions are practical, cost-effective, and sustainable for long-term farm success.

AGE0002-22: Sustainable Farm Design and Layout

This unit aims to provide learners with the skills and knowledge to design farms that prioritize sustainability, optimizing land use and resource efficiency. Students will explore engineering solutions for creating sustainable farm layouts and operations, focusing on minimizing environmental impact. The unit will also address strategies for mitigating negative environmental effects in farm design, preparing learners to implement innovative solutions that support long-term agricultural sustainability.

Learning Outcome:	Assessment Criteria:
1. **Design farms with sustainability in mind, optimizing land use and resource efficiency.**	1.1. Analyse environmental, economic, and social factors to design farms that prioritise sustainability and long-term viability. 1.2. Apply principles of land-use planning to maximise productivity while maintaining ecological balance and minimising environmental impact. 1.3. Incorporate resource-efficient practices, such as water conservation, energy management, and waste reduction, into farm designs. 1.4. Utilise sustainable agricultural technologies and practices to enhance productivity and resource conservation. 1.5. Evaluate the potential impacts of farm designs on local ecosystems and implement strategies to protect biodiversity. 1.6. Collaborate with stakeholders to ensure farm designs meet regulatory requirements, community needs, and industry standards for sustainability.
2. **Implement engineering solutions for sustainable farm layout and operation.**	2.1. Design and implement farm layouts that optimise space, minimise resource use, and enhance operational efficiency while promoting sustainability. 2.2. Integrate renewable energy sources, water management systems, and waste recycling technologies into farm operations to reduce environmental impact. 2.3. Apply engineering solutions that improve soil health, water conservation, and energy efficiency to support sustainable farming practices. 2.4. Evaluate and select appropriate materials, technologies, and equipment that align with sustainability goals and operational requirements. 2.5. Monitor and assess the performance of

	implemented solutions, making adjustments as needed to enhance efficiency and sustainability. 2.6. Collaborate with farm management and other stakeholders to ensure that engineering solutions are practical, cost-effective, and aligned with long-term sustainability objectives.
3. **Understand the environmental impact of farm design and how to mitigate it.**	3.1. Analyse the potential environmental impacts of farm designs, including soil degradation, water consumption, and biodiversity loss. 3.2. Identify key factors that contribute to environmental harm, such as overuse of resources, pollution, and habitat disruption. 3.3. Apply sustainable design principles to minimise the environmental footprint, focusing on land use, water management, and energy efficiency. 3.4. Incorporate mitigation strategies, such as crop rotation, agroforestry, and controlled irrigation, to reduce negative environmental effects. 3.5. Assess and implement environmental monitoring systems to track the effectiveness of mitigation measures and ensure compliance with regulations. 3.6. Collaborate with environmental experts and stakeholders to refine designs and ensure farm operations contribute positively to local ecosystems.

AGE0002-23: Business and Entrepreneurship in Agricultural Engineering

This unit aims to equip learners with the entrepreneurial skills necessary for launching and managing agricultural engineering businesses. Students will gain an understanding of the market dynamics of agricultural technologies and the business opportunities within the sector. The unit will focus on creating business plans for innovative engineering solutions in agriculture, preparing learners to successfully navigate the business landscape and contribute to the growth of sustainable agricultural enterprises.

Learning Outcome:	Assessment Criteria:
1. **Develop entrepreneurial skills for launching and managing agricultural engineering businesses.**	1.1. Demonstrate the ability to identify and assess opportunities in the agricultural engineering sector. 1.2. Analyse market trends and business risks to make informed decisions in agricultural entrepreneurship. 1.3. Develop a comprehensive business plan outlining key strategies, financial projections, and operational processes. 1.4. Apply financial management principles to ensure the sustainability and growth of an agricultural engineering business. 1.5. Exhibit leadership and management skills to effectively run a team and manage resources in an agricultural engineering context. 1.6. Understand the legal, ethical, and regulatory frameworks affecting agricultural engineering businesses and ensure compliance.
2. Understand the market dynamics of agricultural technologies.	2.1. Analyse the current trends and emerging technologies in the agricultural sector. 2.2. Evaluate the impact of technological innovations on agricultural productivity and sustainability. 2.3. Assess market demand for various agricultural technologies and identify key drivers of change. 2.4. Understand the competitive landscape and position of agricultural technology providers in the market. 2.5. Apply economic principles to evaluate the cost-benefit analysis of adopting new agricultural technologies. 2.6. Identify potential barriers to the adoption of agricultural technologies and propose solutions to overcome them.
3. Create business plans for innovative engineering	3.1. Develop a detailed business plan for an

solutions in agriculture.	innovative agricultural engineering solution, including clear objectives and goals. 3.2. Conduct market research to identify target customers, competitors, and potential demand for the solution. 3.3. Outline a strategic approach to product development, testing, and commercialization within the agricultural sector. 3.4. Prepare financial projections, including start-up costs, revenue forecasts, and break-even analysis. 3.5. Develop a marketing strategy to promote the solution, focusing on key channels and messaging for agricultural stakeholders. 3.6. Ensure compliance with relevant legal, environmental, and safety regulations in the development and deployment of the solution.

AGE0002-24: Research and Development in Agricultural Engineering

This unit aims to equip learners with the skills to conduct research focused on addressing current challenges in agricultural engineering. Students will explore methods for developing innovative solutions that improve agricultural practices, fostering advancements in the field. The unit will emphasize the importance of staying updated on the latest trends and technological developments, preparing learners to contribute to the continuous evolution of agricultural engineering through research and innovation.

Learning Outcome:	Assessment Criteria:
1. **Conduct research to address current challenges in agricultural engineering.**	1.1. Identify and define key challenges in agricultural engineering through a comprehensive review of current industry literature and reports. 1.2. Analyse relevant data to evaluate the root causes and implications of these challenges. 1.3. Apply appropriate research methodologies to gather primary and secondary data on agricultural engineering issues. 1.4. Critically assess existing solutions and innovations aimed at addressing these challenges in the sector. 1.5. Formulate research findings into actionable recommendations to improve practices or technologies in agricultural engineering. 1.6. Communicate research results effectively to stakeholders, ensuring clarity and relevance to practical agricultural engineering applications.
2. Develop innovative solutions for improving agricultural practices.	2.1. Identify areas within agricultural practices that can benefit from innovation through research and industry consultation. 2.2. Generate creative ideas and solutions that address identified challenges in agricultural practices, focusing on sustainability and efficiency. 2.3. Apply engineering principles and modern technologies to design practical and scalable solutions. 2.4. Evaluate the feasibility of proposed solutions, considering technical, economic, and environmental factors. 2.5. Prototype and test solutions to ensure they meet the required performance and safety standards. 2.6. Collaborate with stakeholders to refine and implement the most effective solutions in real-world agricultural settings.

3. Stay updated on the latest trends and technological advancements in the field.	3.1. Regularly review academic journals, industry publications, and reports to monitor emerging trends and innovations in agricultural engineering. 3.2. Attend conferences, seminars, and webinars to gain insights from experts and professionals in the field. 3.3. Engage with industry networks and online communities to exchange knowledge and stay informed about recent developments. 3.4. Participate in training and development programmes to enhance technical skills and adapt to new technologies. 3.5. Assess the potential impact of new technologies on agricultural practices and evaluate their applicability. 3.6. Apply new knowledge and technological advancements to improve existing agricultural systems and practices.

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