



BASIC TRAINING PLAN FOR GRADUATE ENGINEERS

Agricultural Engineering Discipline

EBK/CBA/GEIP/13

VERSION: A

REVISION: 01

	NAME	DESIGNATION	DATE	SIGNATURE
Approved by:				

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PREAMBLE

Foreword

It is with great pleasure that I present the Basic Training Plan developed by the Engineers Board of Kenya. This initiative marks a significant step in our commitment to professional growth of our graduate engineers in Kenya. The Engineers Act 2011 provides that graduate engineers must undergo training for three years before they can apply to be registered as professional engineers. This Training Plan (TP) serves as a critical tool in fulfilling this requirement, ensuring that our engineers are well-prepared to meet professional standards and excel in their careers.

The purpose of the TP is to provide graduate engineers, employers and mentors with a detailed guide on the scope and content of the training necessary for preparing graduate engineers for registration as professional engineers. The creation of this TP was a collaborative effort of experts from academia and industry who worked diligently to develop this plan. This collaborative approach ensures that the training plan is both rigorous and relevant to the needs of the industry.

This training plan aligns with the strategic intent of the EBK to register 10,000 professional engineers by 2027. By providing a clear and structured training pathway, we are not only enhancing the skills and capabilities of our engineers but also contributing to the national goal of increasing the number of qualified professionals in the engineering sector.

I extend my sincere gratitude to all those who contributed to the development of this plan. Your dedication and expertise have been instrumental in creating a valuable resource that will greatly benefit our graduate engineers and the engineering profession as a whole.



Eng. Margaret Ogai

**Registrar/CEO
Engineers Board of Kenya**

PREFACE

The practice of engineering is critically important in all sectors of the Kenyan. To ensure professionalism and upholding of ethical behavior in the engineering practice, the Government of Kenya and other keystakeholders have established various structures and institutions which are legally mandated to provide oversight and related services to all strategic players in the economy.

The Engineers Board of Kenya is a statutory body established under Section 3(1) of the Engineers Act, 2011. The Board is responsible for the registration of engineers and engineering firms, regulation of engineering professional services, setting of standards, development and general practice of engineering.

The Act allows only registered engineers to engage in professional engineering work and/or services. Registration is thus a license and the only way of ensuring that one is professionally qualified to practice engineering. To qualify for registration in the categories of professional engineer one has to acquire adequate professional competence and experience in areas specified by the Board.

One of the functions of the Board is to promote and provide opportunities and facilities for the study of, and for professional training in engineering. Thus, in order to help graduate engineers acquire sufficient professional competence within a period of two years, the Board has conceived and designed a structured professional training programme known as the Graduate Engineers Internship Programme (GEIP).

The programme is designed to enable young graduates to gain hands-on professional experience under close supervision by senior registered professional members of the profession. Under the Programme trainee engineers will undergo professional training, following training guidelines specific to one's field of engineering practice and on non-technical areas. GEIP is, therefore, intended to ensure that trainee engineers are equipped to pursue their professional careers with precision and confidence thereby becoming competitive and able to effectively play their roles in national development. GEIP is a structured internship programme for engineers.

Purpose of the Training Plans

The TP aim to equip graduate engineers, employers, and mentors with a clear and detailed guide on the training required for preparing graduate engineers for registration as professional engineers. This plan outlines the essential areas of knowledge, practical skills, and professional competencies that graduate engineers need to develop during their three-year training period. By adhering to this structured approach, graduate engineers will gain the technical proficiency, hands-on experience, and professional judgment necessary to meet the rigorous standards of the engineering profession.

For employers and mentors, the TP serves as a valuable resource in designing and implementing effective training programs. It provides a comprehensive framework that details key training objectives, performance benchmarks, and assessment criteria, ensuring that the training is thorough and aligned with industry best practices. This guidance helps employers and mentors offer targeted support and mentorship, creating an environment where graduate engineers can develop and excel. By bridging the gap between academic knowledge and practical application, the BTP ensures that graduate engineers are well-prepared to contribute significantly to their fields and progress toward becoming registered professional engineers.

Preparation of the Training Plans

The TP was developed through a collaborative effort involving a task force of experts from academia and industry. These professionals worked diligently to create a comprehensive and effective plan. This approach ensured that the TP is both rigorous and relevant to the industry's needs. The collective expertise and experience of the task force members contributed to a robust framework designed to meet the high standards required for professional engineering registration.

List of Training Plans

The Board has developed Training Plans in the following disciplines:

- a. Agricultural and Biosystems Engineering
- b. Mechanical Engineering
- c. Civil Engineering
 - i. Water,
 - ii. Building & Structures
 - iii. Highways
- d. Electrical Engineering

Acknowledgement

The Engineers Board of Kenya (EBK) sincerely thanks Eng. Jane Simiyu and Eng. Dr. Gareth Kituu for their invaluable contributions to developing the Training Plan for Agricultural and Biosystems Engineering. Their expertise, dedication, and collaborative efforts have been crucial in creating high-quality training plans that align with Board's mission to enhance engineering standards and practices in Kenya.

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ACRONYMS

ACEK	Association of Consulting Engineers of Kenya
EA	Environmental Audit
EBK	Engineers Board of Kenya
EMS	Environmental Management System
ESIA	Environmental and Social Impact Assessment
GEIP	Graduate Engineers Internship Programme
GIS	Geographical Information System
FIDIC	International Federation of Consulting Engineers
KeNHA	Kenya National Highways Authority
OSHA	Occupational Safety and Health Act
SDoR	State Department of Roads
TP	Training Plan



CHAPTER 1 – INTRODUCTION

1.1 Background

The Engineers Board of Kenya (EBK) is a statutory body established under Section 3(1) of the Engineers Act, 2011. The Board is responsible for the registration of engineers and engineering firms, regulation of engineering professional services, setting of standards, development and general practice of engineering

According to Section 7(1)(o) of the Engineers Act 2011, the Board is mandated to *‘establish a school of engineering and provide facilities and opportunities for learning, professional exposure and skills acquisition. Section(1)(r) mandates the Board to collaborate with engineering training institutions, professional associations, engineering organizations and other relevant bodies in matters relating to training and professional development of engineers.*

The Government of Kenya has developed Vision 2030 whose main objective is to turn Kenya into a globally competitive and prosperous nation with a high quality of life by the year 2030. Vision 2030 is anchored on three key pillars: Economic, Social and Political. Each pillar has several strategies designed to deliver different components of the Vision. Engineers are expected to play a key role in the delivery of the vision, especially in the realization of the necessary infrastructure, the industrialization process, and development of new technologies led by the ICT sector. All these activities will be key serving as a catalyst for wealth creation in ‘Kenya’s quest to become a middle-income country by 2030.

Professional registration is practiced by various countries around the world to primarily protect the safety, well-being and interests of the public. In Kenya, professional registration allows one to ‘offer his professional engineering services to the public for gain or reward or by way of trade or for employment in the engineering discipline or category in which he is registered.’ There is therefore need to provide structured training for graduate engineers to enable them gain the requisite training and experience before transitioning to professional engineers.

Graduate engineers are expected to have several desirable attributes that may be expressed in terms of:

- Technical competencies
- Non-technical competencies.

The technical competencies may be categorized into two distinct areas – the science of engineering, and the practice of engineering. The ‘science of engineering is the set of mathematical and scientific tools used to solve engineering problems, while the practice of engineering is the recognition and formulation of a problem and its solution. Mentorship in these two key areas will enable the graduate engineers to enter the job market with greater confidence and apply for professional status within the shortest time possible.

Consequently, the Board has developed the Training Plan (TP) to guide the process of structured of graduate engineers over a period of thirty-six months as required by the Engineers Rules 2019.

1.2 Objectives

The objectives of the TP are to:

- i) Provide structured training for the graduate engineers to enable them gain professional competencies in preparation for professional registration.
- ii) Guide mentors and supervisors on areas of training for graduate engineers.
- iii) Facilitate job rotation by employers

1.3 Target users

This TP is expected to be used by graduate engineers and their supervisors and mentors in the discipline of Agricultural and Biosystems Engineering. It is intended to support a programme of training and experience incorporating good practice elements.

This guide applies to persons who have:

- i) Completed the education requirements by obtaining an accredited BEng-type qualification, or a Washington-Accord recognized qualification or through evaluation/assessment.
- ii) Registered as Graduate Engineers by the Engineers Board of Kenya.

1.4 Program Duration

The programme shall be conducted over a period of not less than 36 months. The estimated periods through the training cycle shall be as indicated in the matrix below (Table 1).

Table 1: Estimated duration of the technical training cycle.

No	Description	Duration (months)
1	Planning	6
2	Design	12
3	Construction / product development	6
4	Operation and Maintenance	6
5	Management	6
TOTAL		36

CHAPTER 2 – COMPETENCY STANDARDS

2.1 Professional Competence

A professionally competent person has the attributes necessary to perform activities within the profession to the standards expected in professional employment or independent practice. The Board's Competency Standard gives insight into the elements of competency necessary for competent performance that the graduate engineer is expected to demonstrate in a holistic way at the stage of application for transitioning from graduate to professional registration.

To meet the minimum standard of competence, the graduate engineers must demonstrate that they are able to practice competently in their practice area to the standard expected of a reasonable Professional Engineer. The extent to which the person can perform each of the elements in their practice area will be taken into account in assessing whether or not they meet the overall standard.

2.2 Expected Outcomes

The desired outcomes of the engineering activities undertaken by the candidate are classified under four (4) categories:

- Category I: Engineering Problem Solving;
- Category II: Managing Engineering Activities;
- Category III: Evaluation of Impacts of Engineering Activities; and
- Category IV: Upholding Professional Practice.

2.3 Category I Outcomes: Engineering Problem-Solving

This group of outcomes requires the candidate to apply appropriate theoretical and practical methods to identify, analyze and solve engineering problems.

2.3.1 Outcome 1: Identification and Definition of an Engineering Problem

This outcome is concerned with the discerning, understanding, contextualizing and judgement of a problem. Engineering problems require in-depth, fundamental, and specialized engineering knowledge that facilitates an analytical approach from first principles.

Engineering problems should be high level problems that require judgement in decision-making in uncertain contexts and include components parts or sub problems and should demonstrate the inclusion of one or more of the following:

- Solutions to engineering problems that are not obvious and require abstract thinking or originality in analysis to formulate suitable models.

- Engineering problems that are outside the scope of standards and codes.
- Engineering problems that require information from a variety of sources that is complex, abstract or incomplete.
- Complex engineering problems that involve wide-ranging or conflicting issues such as technical and engineering issues and interested or affected parties.

The engineering problem may be:

- A design requirement,
- An applied research and development requirement
- A maintenance requirement or
- A problematic situation in an existing component, system or process.

2.3.2 Outcome 2: Design / Development of Engineering Solution

This Outcome 2 is concerned with the solution. The solution may be the design of a component, system or process or a recommendation of the remedy to a problematic situation. The design or developed solution will be evidenced by the following indicators: -

- Identified and analyzed design/ planning requirement and drawn up detailed requirements specification;
- Synthesized a range of potential solutions to problem or approaches to project execution;
- Evaluated the potential approaches against requirements and impacts outside requirements;
- Fully developed design of selected option; and
- Produced design documentation for implementation.

2.3.3 Outcome 3: Application of Advanced Knowledge

Outcome 3 involves the comprehension and application of advanced knowledge including principles underpinning good practice, specialist knowledge, jurisdictional knowledge and local knowledge. Applicable knowledge includes:

- Specialist knowledge that has depth in the practice area and is underpinned by the fundamental knowledge of an engineering discipline or cross-disciplinary area. In-depth specialist knowledge in the practice area supports a fundamentals-based, first-principles analytical approach and develops models as required;
- A working knowledge of interacting disciplines (engineering and other) to underpin teamwork; and
- Jurisdictional knowledge that includes legal and regulatory requirements in addition to locally relevant codes of practice.

2.4 Category II Outcomes: Managing Engineering Activities

This group of outcomes requires the candidate to demonstrate technical leadership and effective interpersonal skills.

2.4.1 Outcome 4: Management of Engineering Activities

This outcome requires the candidate to demonstrate their capability to manage part or all of one or more engineering activities. Management is directed at achieving engineering results through the management of people, resources, processes, systems and money. Management involves:

- i) Planning engineering activities;
- ii) Organizing engineering activities;
- iii) Coordinating engineering activities;
- iv) Leading engineering activities; and
- v) Controlling engineering activities.

2.4.2 Outcome 5: Communication

The candidate is required to demonstrate their capacity to communicate effectively and clearly with others in the course of the engineering activities including:

- i) Communication: strategic, managerial, technical and wider impacts of engineering work.
- ii) Material communication: concepts, analyses, proposals and informative subjects.
- iii) The audience: peers, superiors, persons implementing designs and other work, persons in other disciplines, clients and wider stakeholders.
- iv) Communication functions

2.5 Category III Outcomes: Evaluation of Impacts of Engineering Activity

This group of outcomes requires the candidate to demonstrate recognition of an obligation to society, the profession and the environment, to make an evaluation of the outcomes and impacts of engineering activities and to make a commitment to abide by the Professional Code of Conduct.

2.5.1 Outcome 6: Recognition of Obligations to Society

The candidate is expected to be able to recognize and address the reasonably foreseeable social, cultural and environmental effects of engineering activities including:

- i. Recognition that protection of society is the highest priority
- ii. Due regard for the principles of sustainability
- iii. Direct, indirect, immediate and long-term effects of engineering solutions

2.5.2 Outcome 7: Legal and Regulatory Requirements

Meet all legal and regulatory requirements and protect the health and safety of persons during his/her complex engineering activities, including:

- i) Impacts and regulatory requirements
- ii) Regulatory requirements that are explicit for the context and are generally applicable.

2.5.3 Outcome 8: Judgement in Decision Making

Exercise sound judgement during execution of engineering activities. Judgement in decision-making involves consideration of:

- i) Diverse and wide-ranging risk factors.
- ii) Significant consequences in a range of contexts; and
- iii) Wide ranges of interested and affected parties with widely varying needs.

2.5.4 Outcome 9: Responsibility

The outcome requires the candidate to be responsible for the decision-making for part or all of the engineering activities. It encompasses responsibility exercised for outcomes of significant parts of one or more engineering activities.

2.6 Category IV Outcomes: Upholding Good Professional Practices

This group of outcomes requires a candidate to conduct uphold the code of ethics and conduct for engineers in undertaking engineering activities.

2.6.1 Outcome 10: Upholding Code of Ethics and Conduct

Conduct engineering activities ethically. Ethical behavior of no less than that defined by the Code of Conduct.

2.6.2 Outcome 11: Continuing Professional Development

This outcome requires a candidate to demonstrate a commitment to lifelong learning. And to undertake sufficient professional development activities to maintain and extend competence. Professional development includes:

- i) Planning own professional development strategy;
- ii) Selecting appropriate professional development activities; and
- iii) Recording of professional development strategy and activities while displaying independent learning ability.

CHAPTER 3 – PROGRAMME COMPONENTS

3.1 Agricultural Engineering

Agricultural engineering is that branch of professional engineering which requires such education and experience as is necessary to understand and apply engineering principles to the design, construction and use of specialized equipment, machines, structures and materials relating to the agricultural industry and economy. Agricultural engineering is applied in irrigation and water resources engineering, power and machinery engineering and mechanization, process and food engineering and built environment engineering.

The most common areas of engagement for agricultural engineers include: - research and education, agro-industries, renewable energy industries, manufacture of agricultural machinery, post-harvest food and by-products processing industry, irrigation and water resources management industries, environmental and social impact assessment and audit (ESIA and EA) agencies.

Technological and engineering inputs are very important in agricultural production systems. In commercial farming for instance, engineering systems such as irrigation, machinery, farm structures and post-harvest systems may constitute more than 90% of the capital investment. Therefore, the design and effective management of engineering systems is central to the profitability and sustainability of commercial farming.

A well prepared program is required to equip the agricultural engineer with the technical know-how, competence and t needed to address the following challenges:

- a) Ensuring adequate and safe food supply for the expanding and increasingly urbanizing populations;
- b) Managing and protecting water and land resources;
- c) Exploiting existing energy resources and supplying adequate power for farming and livelihood in the rural areas; and
- d) Minimizing losses and adding value to meet higher quality local and global market demands.

More specifically, the training will seek to do the following:

- i) Impart knowledge and skills in design, construction, operation, management and maintenance of water supply systems including small earthdams, water pans and rainwater harvesting for agricultural production;
- ii) Impart knowledge and skills required to fill in gaps encountered in agro-industries;
- iii) Impart knowledge and skills to design and construct simple renewable energy sources for agricultural production as well as for domestic purposes;
- iv) Understand engineering principles for planning, design and management of agricultural mechanization programmes;

- v) Induce competence in the technology and art of handling, processing and storage of agricultural products with the objective of minimizing losses and adding value to satisfy market demands;
- vi) Develop entrepreneurial skills required for creating and operating small and medium scale engineering enterprises.

To obtain such knowledge base and skills, the training program will require working in a combination from the following areas:

- a) Large-scale irrigation farms;
- b) Small and medium scale farmer managed irrigation projects;
- c) Food processing industries;
- d) Design and manufacturing firms dealing with agricultural machines and implements;
- e) Small and Medium Scale industries producing energy saving systems suitable for agricultural and rural household use;
- f) Firms using controlled environment production systems;
- g) Engineering sales and advisory firms;
- h) Consulting firms;
- i) Land use management and environmental protection organizations;
- j) NGOs promoting use of low cost agricultural engineering based technologies;
- k) Research and training institutions.

3.2 Training Plan

The technical components include design of engineering systems, tendering and procurement of engineering products and services, contract management, project management, occupational safety and health, manufacturing, risk analysis and management. The interns shall be exposed to duties and responsibilities as outlined in Table 2.

Table 2: The Training Curriculum.

No	Training	Module	Objective and area to be covered	Duration (months)
1	Induction	Module 1	• Operating environment • Rules and regulations, ethical issues/code of ethics • Code of ethics for engineers, • Career and life skills • Communication and presentation skills • Collaboration, • Self-drive, guidance, motivation and management • Problem-solving and decision-making • Human interaction • Service orientation • Cognitive flexibility • Emotional intelligence • Achievement orientation • Attitude towards training and professional development • Expectation of the institution(s) • General management • Human resource management • Financial management • Procurement procedures, rules and regulations • Stores and inventory management • Contract Management • Resources mobilization and Management • Energy Management • Financial management • Engineers Scale of Fees • Negotiation Skills • Arbitration • Marketing management • Environmental management • Environmental laws and regulations • Environmental and Social Impact Assessment and Audit (ESIA and EA) • Environmental Management Systems (EMS) • Climate change	3
2	Project Development implementation, and Management	Module 2	• Project formulation and Management • Pre-feasibility and feasibility studies, • preliminary designs and detailed designs, • generation of engineering drawings and design report, • detailed cost estimates, • development of bill of quantities, • derivation of specifications and applicable standards, • preparation of tender documents and tendering processes (local and international), • procurement laws and procurement process, • tendering procedures,	6

No	Training	Module	Objective and area to be covered	Duration (months)
			• Tender evaluation report and recommendations on the best contractors. • Tender award and signing, contract management, • Business aspects of engineering, understanding Basic Elements of contracts, • Engineering tools such as office software, drafting software. • Construction supervision: quality control in the implementation of projects. • Conditions of engagement: Bidding processes and International Federation of Consulting Engineers (FIDIC), Association of Consulting Engineers of Kenya (ACEK), etc • Financial control reports. • Certificates of compliance. • Practical completion report. • Contractor payment certificates. • List of defects. • Progress reports. • Minutes of site meetings. • Schedules of predicted cash flow. • Construction documentation. • Site supervision: Resourced work plan including Materials, Money, Machinery, manpower and time. • Project completion report. • Final accounts report. • As-built drawings and documentation. • Operations and maintenance manuals. • Guarantees and warranties. • Final payment certificates. • final inspection and commissioning. • Basic Engineering	
3	Planning	Module 3	• Selection of processing machinery and equipment for cleaning, sorting, grading and packaging of agricultural produce. • Planning, design and construction of an irrigation scheme and tertiary system design • Principles of farm accounting and economics, • Farm budgeting, planning and credit control, • International Agribusiness operations, • Farm resource planning including land, buildings, labour, machinery, soil, carbon and waste management, and • Product development and Prototype testing • Planning of facilities and equipment for processing, packaging and marketing of agricultural products. • Planning and scheduling of factory material handling operations. • Works scheduling and programming (daily/monthly)	0.75

No	Training	Module	Objective and area to be covered	Duration (months)
4	Preliminary Design	Module 1	- Generation of design specification for crop and animal product storage structures. - Materials in engineering practice - Word processing, spreadsheet, presentation, - Generation of design specification for crop and animal product storage structures. - Selection of processing machinery and equipment for cleaning, sorting, grading and packaging of agricultural produce.	2
	Final Design	Module 1	- Design, construction and maintenance of farm infrastructure. - Design modifications, construction and operation of controlled environments - Design of processing machinery and equipment for cleaning, sorting, grading and packaging of agricultural produce. - Selection and design for controlled traffic farming. - Design of farm waste disposal systems. - Design of controlled environments. - Design of small earth dams - Design of facilities and equipment for processing and packaging agricultural products.	7
		Module 4	- Design and construction of buildings for processing and handling of crop and animal products; - Design and construction of buildings for farm animals to meet their environmental and psychological needs and to meet management needs for ease of feeding, handling and hygiene; - Selection, design and construction / provision of energy supplies to farm and rural communities, including animal power, electricity, biogas, wind power, solar power, water power and engine power; - Selection, design and provision of water supplies to farm and rural communities; - Design and implementation of farm waste disposal schemes; - Design, construction and maintenance of rural roads and market centers; - Design and operation of controlled environments for floriculture and green house production systems. - Design and modification of Farm structures:	6
		Module 3	- Development of design specifications for crop and animal product storage structures; - Selection, design and development of processing machinery and equipment for cleaning, sorting, grading and packaging of agricultural produce.	1

No	Training	Module	Objective and area to be covered	Duration (months)
	Design (Agro Industries, State Departments and Corporation,	Module 1	- Selection, design, development evaluation, and manufacture of Agricultural and Biosystems machinery, equipment and power sources for agricultural and biosystems mechanization operations; - Selection, design and development of agricultural and biosystems machines with ergonomic consideration for human comfort and safety; - Design of maintenance and workshop support facilities for field machinery. - Project formulation and Management	12
		Module 1	- Planning, design ,construction and management of irrigation and drainage systems; - Rural development for small holder irrigation schemes and water supply - Improved drainage of farm	12
	Design and Research and Product Development	Module 1	- Problem/Need identification - Research and project proposal development - Design and development of irrigation systems - Water resources development - Design of drainage systems. - Mechanization such as pumping systems, center pivot sprinkler systems among others - Design modifications, evaluation, development and prototyping of machinery with ergonomic considerations;	12
		Module 1	- Problem/Need identification - Farm building and structures: design and modifications - Identification and selection of energy supplies to the farm: electricity, biogas, wind power, solar power, water power and engine power; - Design of agricultural waste disposal systems in industry; - Design, construction, and maintenance of farm, forestry and rural infrastructure; - Design modifications, construction and operation of controlled environments such as greenhouse structures animal production structures and farm auxiliary structure. - Design, development and testing of appropriate technology.	
		Module 1	- Problem/need identification - Design, development, evaluation, and fabrication of Agricultural and Biosystems machinery, equipment and power sources for agricultural and Biosystems mechanization operations; - Design and development of agricultural and Biosystems machines with ergonomic consideration for human comfort and safety; - Design of maintenance and workshop support facilities for field machinery.	

No	Training	Module	Objective and area to be covered	Duration (months)
5	Construction	Module 6	• Material forming; forging. Plate and pipe bending, sheet metal work and press work. • Jointing and welding; riveting, bolting, welding, brazing and soldering • Use of maintenance manuals, parts catalogues and preventive plant and breakdown maintenance schedules • Routine monitoring of plant performance, fault diagnosis and servicing techniques • Specification, selection, installation, testing and commissioning of machinery and plant • Computer application in manufacturing systems Parts inspection and site acceptance tests • Process automation design • Material handling procedures • Material removal; includes the use of common hand tools and machine tools for turning, shaping, milling, drilling, and grinding. • Metrology and testing; including the use of gauges and measuring instruments in marking out, inspection and other workshops processes. • Knowledge on the use of maintenance manuals, parts catalogues and preventive plant and breakdown maintenance schedules • Routine monitoring of plant performance, fault diagnosis and servicing techniques • Maintenance of log books, machinery repair and maintenance records • Procurement and stores & inventory management • Computer application in inventory management and manufacturing systems • Parts inspection and site acceptance tests • Process automation design • Production planning, manufacture and control (ergonomics) of industrial products • Familiarization with industrial engineering and interrelationships of technical, production and service departments • Assessment of plant infrastructure condition • Material handling procedures.	

No	Training	Module	Objective and area to be covered	Duration (months)
6		Module 4	- Environmental laws and regulations - Environmental and Social Impact Assessment and Audit (ESIA and EA) - Environmental Management Systems (EMS) - Familiarization with energy supplies to the farm: electricity, biogas, wind power, solar power, waterpower and engine power; - Selection, design and development of processing machinery and equipment for cleaning, sorting, grading and packaging of agricultural produce. - Planning, design and construction of an irrigation scheme and tertiary system design. - Rural development for small holder irrigation schemes and water supply - Land drainage - Computer Aided design office practice - Specifications, standards, codes of practice in building design - Pricing of Bills of Quantities and provision of provision estimates - Approval of materials, fitting and equipment for installation - Site installation, testing and commissioning. - Preparation of payment certificates and analysis of claims - Settling claims and disputes in Agricultural Engineering projects	3
7	Farm and Field Operations and Maintenance	Module 7	- Evaluation of land and water resources - Remote sensing and GIS - Integration, Operation, maintenance and management of irrigation, drainage, and soil conservation systems in agricultural activities - Development and operation of smallholder irrigation and drainage schemes - Rainwater harvesting technologies	12
		Module 5	- Time schedule, machinery operation, maintenance and management in all field operations; - Optimal use of power within the three levels (manual, animal and engine power) of mechanization. - Post- Harvest and Bio-Processing - Bio-processing at farm and industrial levels e.g. milling, oil extraction, sugar production, milking machines and dairy processing equipment. - Improvement of processes in production - Post-harvest preservation techniques – dehydration, refrigeration, sealed-bin storage and chemical treatment - Technical support in agro-processing and agro food industry - Quality control – cleaning, sorting, grading, milling and packaging - Food, feed, fibre and agro-industrial raw material safety and storage	12

No	Training	Module	Objective and area to be covered	Duration (months)
		Module 1	• Electrification at farm level • Bio-sensors and instrumentation • Harnessing of bio-energy • Construction and maintenance of agricultural structures including farmhouses, greenhouses, abattoirs, market centers, etc. • Agricultural waste management • Access road construction	12
8	Management	Module 1	• Service and maintenance of farm equipment and machinery. • Farm Machinery and Mechanization • Management of field and workshop operations - technical and financial aspects. • Systems analysis to identify improved sequences of operations using technical, economic, and social criteria. • Farmstead and factory operations • Farmstead planning, construction and maintenance. • Installation and operation of various utility systems – rainwater harvesting systems, renewable energy sources and waste disposal systems. • Small-holder Irrigation Management • Develop capacity of local communities to operate and manage small irrigation schemes. • Develop and promote low-cost irrigation technologies. • Sales Engineering • Conducting market research. • Advisory work to clients on selection of products. • Application and effective operation of agricultural equipment and machinery. • Consulting Work • Conducting feasibility Service and studies and environmental impact studies;	1
		Module 5	• Maintenance of farm equipment and machinery • Operation and maintenance of workshop facilities • Stores procurement and inventory maintenance	1
		Module 5	• Management of field and workshop operations with special regard to technical and financial aspects; • Systems analysis to identify improved sequences of operations using technical, economic and social criteria	1
		Module 3	• Installation and operation of various utility systems – rain water harvesting systems, renewable energy sources and waste disposal systems; • Planning and scheduling of factory material handling operations.	1

No	Training	Module	Objective and area to be covered	Duration (months)
		Module 5	- Develop capacity of beneficiaries to operate and manage smallholder irrigation schemes - Develop and promote low-cost water use efficient irrigation technologies.	1
		Module 1	- Conducting market research - Advisory work to clients on selection of products - Providing training and demonstrations on application and effective operation of agricultural and Biosystems equipment and machinery.	1
		Module 1	- Project proposal preparation - Interpretation of terms of reference - Preparation of methodologies and tasks	1
		Module 4	- Identification of environmental aspects of projects. - Environmental impact assessment and rectification.	1
9	Quality Management	Module 1	Specifications, standards, codes and practice in engineering design, manufacture and quality control	3
			All the various procedures and tests	3
10	Quality Assurance	Module 1	- Background and policy - Objectives - Concept of quality assurance	1
		Module 1	- Procedural audits - Technical audits - Environmental audits	1
		Module 1	- Review of the available documents and records - Comparison of the proposed work plan and the actual recorded in the progress reports - Assessment of the quality of the work performed. - Check for any deviations in work plans	1
		Module 1	- Review procurement procedures for selection process of consultants - Review all contract documents, drawings, testing methods and test results. - Review the BoQ and compare it to the interim and final payment certificates - Inspect the completed works and review the quality in general - Prepare an audit report - Presentation of the formal audit report	1
		Module 1	- Allocate funds, staff, materials and equipment in an appropriate manner - Review the procurement process in relation to contracts, material supplies, services, - Review the stores procedures	1

No	Training	Module	Objective and area to be covered	Duration (months)
11	Consulting Services	Module 8	• Pre-feasibility and feasibility studies, preliminary designs and detailed designs, generation of engineering drawings and design report, detailed cost estimates, development of bill of quantities, derivation of specifications and applicable standards, preparation of tender documents and tendering processes (local and international), procurement laws and procurement process, tendering procedures, contract management, final inspection and commissioning. • Business aspects of engineering, understanding basic elements of contracts, • Engineering tools such as office software, drafting software, and others. • construction supervision: quality control in the implementation of projects. • Conditions of engagement: Bidding processes and International Federation of Consulting Engineers (FIDIC), Association of Consulting Engineers of Kenya (ACEK), etc • Site supervision: Resourced work plan including Materials, Money, Machinery, manpower and time. • Basic Engineering surveying activities.	12



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