# Training Course on Hydroponics and Aeroponics Systems Design and Operation

Professional Development Training Course Outline

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|---|---|---|---|
| **Category** | Agriculture | **Duration** | 10 Days |
| **Base Fee** | $3,000 USD | **Delivery Mode** | Online / On-site Hybrid |

## Course Introduction

With the rapid advancement of sustainable agriculture and food security technologies, hydroponics and aeroponics have emerged as innovative solutions that maximize productivity while minimizing resource use. These soilless farming systems offer high-yield, climate-resilient methods ideal for urban agriculture, vertical farming, and smart farming integration. Training Course on Hydroponics and Aeroponics Systems Design and Operation equips participants with the technical know-how and hands-on skills required to design, operate, and manage hydroponic and aeroponic systems successfully. Whether for commercial ventures, educational purposes, or household food security, this course provides a foundation for effective adoption of modern agricultural technologies.

The course emphasizes precision farming, nutrient management, and automated system control to ensure optimal plant growth and sustainability. Through real-world case studies, hands-on modules, and expert-led sessions, participants will understand the design principles, infrastructure requirements, crop selection strategies, and environmental monitoring crucial for success in hydroponics and aeroponics. This training also explores scalable models, climate-smart agriculture, and circular economy integration, preparing participants for agribusiness entrepreneurship or institutional development in the fast-growing field of controlled environment agriculture (CEA).

## Programme Curriculum

**Training Course on Hydroponics and Aeroponics Systems Design and Operation**

**Introduction**

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**Course Objectives**

1. Understand the fundamentals of soilless agriculture, hydroponics, and aeroponics.
2. Identify and compare various hydroponic and aeroponic system designs.
3. Learn nutrient solution formulation and precision nutrient delivery.
4. Master environmental control systems (EC, pH, light, humidity).
5. Explore automation technologies and IoT integration in system operation.
6. Implement effective water and energy management strategies.
7. Design scalable systems for urban, rooftop, and vertical farming.
8. Conduct pest and disease management in controlled environments.
9. Develop business plans and feasibility studies for agribusiness startups.
10. Apply sustainable practices in resource-efficient food production.
11. Utilize data analytics and AI in crop monitoring and yield optimization.
12. Understand regulatory compliance and food safety protocols.
13. Analyze successful case studies of commercial hydroponics/aeroponics ventures.

**Target Audiences**

1. Aspiring agripreneurs
2. Agricultural extension officers
3. Urban farmers
4. Agricultural engineers and technicians
5. Agribusiness investors
6. Educators and researchers in agri-tech
7. Policy makers and development agencies
8. NGOs and community-based farming initiatives

**Course Duration:** 10 days

**Course Modules**

**Module 1: Introduction to Soilless Agriculture**

- Overview of hydroponics and aeroponics
- Benefits of controlled environment agriculture
- Limitations and challenges
- Overview of system types and applications
- Global market trends and opportunities
- **Case Study: Urban farming initiatives in Singapore**

**Module 2: Types of Hydroponic Systems**

- Deep Water Culture (DWC)
- Nutrient Film Technique (NFT)
- Ebb and Flow system

- Wick systems and drip irrigation
- System comparison and suitability
- **Case Study: NFT success story in South Africa**

**Module 3: Understanding Aeroponic Systems**

- High-pressure vs. low-pressure systems
- Mist generation technologies
- Root zone management
- Energy consumption considerations
- Crop suitability for aeroponics
- **Case Study: NASA research and vertical farming**

**Module 4: Design and Infrastructure Planning**

- Greenhouse structures and climate zones
- Growing media and root support alternatives
- Lighting and shading systems
- Water storage and circulation design
- Cost estimation and budgeting
- **Case Study: Rooftop aeroponics in urban India**

**Module 5: Nutrient Formulation and Management**

- Macronutrients and micronutrients
- Mixing and monitoring nutrient solutions
- Nutrient deficiencies and corrections
- EC and pH management tools
- Organic vs. synthetic options
- **Case Study: Organic hydroponics in Kenya**

**Module 6: Environmental Monitoring and Automation**

- Sensors for temperature, humidity, EC, pH
- IoT and data logging systems
- Climate control software
- Smart irrigation scheduling
- Power backup and remote access
- **Case Study: Automation in Dutch greenhouses**

**Module 7: Crop Selection and Plant Management**

- Leafy greens, herbs, and fruiting plants
- Crop cycles and rotation strategies
- Plant spacing and density
- Pruning and trellising techniques
- Harvesting protocols
- **Case Study: High-yield lettuce farm in California**

**Module 8: Pest and Disease Management**

- Common pests in soilless systems
- Biological control methods
- Chemical and organic treatments
- Preventive system design
- Hygiene and sanitation practices

- **Case Study: IPM implementation in UAE farms**

**Module 9: Water and Energy Efficiency**

- Water recycling and filtration
- Energy-efficient pumps and lighting
- Solar-powered hydroponics
- Climate-smart resource optimization
- Wastewater management
- **Case Study: Solar-powered hydroponic farm in Tanzania**

**Module 10: System Maintenance and Troubleshooting**

- Equipment maintenance schedules
- Diagnosing plant stress
- Dealing with power failures and system breakdowns
- Preventive inspections
- Spare parts management
- **Case Study: Maintenance SOPs in commercial farm**

**Module 11: Agribusiness Planning and Investment**

- Business model development
- Market research and pricing
- ROI analysis
- Funding and grant sources
- Risk management strategies
- **Case Study: Youth-led agribusiness startup in Rwanda**

**Module 12: Scaling and Commercialization**

- Modular design principles
- Partnering with retailers and food services
- Branding and marketing strategies
- Legal and regulatory considerations
- Expansion into B2B/B2C models
- **Case Study: Commercial vertical farm in UAE**

**Module 13: Food Safety and Quality Assurance**

- Contamination risks in hydroponics/aeroponics
- Hygiene protocols and GAP certification
- Record-keeping and traceability
- Harvesting and post-harvest handling
- Product labeling and consumer trust
- **Case Study: HACCP-compliant hydroponic farm**

**Module 14: Data and AI for Precision Agriculture**

- Real-time monitoring platforms
- Predictive analytics for yield
- AI-driven nutrient balancing
- Integrating drones and sensors
- Using dashboards for insights
- **Case Study: AI-driven farm in Israel**

**Module 15: Policy, Sustainability & Future Trends**

- Policy support for smart agriculture
- Sustainability metrics and LCA
- Carbon footprint of soilless systems
- Community farming and CSR
- The future of vertical and space farming
- **Case Study: UNDP-supported agritech hubs**

**Training Methodology**

- Interactive expert-led presentations
- Hands-on design simulations
- Virtual farm tours and video demos
- Real-world case study analysis
- Group activities and quizzes
- Final project and certification

**Register as a group from 3 participants for a Discount**

**Send us an email: info@fineskilltrainingcenter.org or call** *+254769199797*

***Certification***

*Upon successful completion of this training, participants will be issued with a globally- recognized certificate.*

***Tailor-Made Course***

*We also offer tailor-made courses based on your needs.*

**Key Notes**

**a.** The participant must be conversant with English.

**b.** Upon completion of training the participant will be issued with an Authorized Training Certificate

**c.** Course duration is flexible and the contents can be modified to fit any number of days.

**d.** The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

**e.** One-year post-training support Consultation and Coaching provided after the course.

**f.** Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

## Upcoming Scheduled Sessions

| Start Date | End Date | Location | Price |
|---|---|---|---|
| **23 Nov 2026** | 04 Dec 2026 | Online | $2,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $3,000 |

| Start Date | End Date | Location | Price |
|---|---|---|---|
| **23 Nov 2026** | 04 Dec 2026 | Physical | $6,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $6,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $12,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $9,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $12,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $12,000 |

Ready to enroll or request a customized program? Book online or contact us:

**Register Online Now**

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