Wave Energy Systems Training Course

Professional Development Training Course Outline

Category	Renewable Energy	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Wave Energy Systems Training Course provides a practical and industry-focused understanding of wave energy conversion, marine renewable energy, offshore engineering, hydrodynamic modelling, resource assessment, power conversion, and sustainable energy development. Participants explore how ocean-wave resources can be assessed and transformed into useful electrical power through technologies such as point absorbers, oscillating water columns, overtopping devices, attenuators, and submerged pressure-differential systems. The course connects engineering theory with real-world project development, including technology selection, site characterization, environmental considerations, grid integration, and project economics. Contemporary marine-energy training increasingly combines lectures, numerical modelling, laboratory activities, field experience, group work, and case studies.

Designed for professionals, graduates, researchers, project developers, and energy-sector stakeholders, the programme emphasizes clean energy transition, blue economy, energy resilience, decarbonization, offshore innovation, digital modelling, sustainability, and commercialization. Participants develop the ability to evaluate wave-energy opportunities from resource assessment through conceptual design and deployment planning while considering technical, environmental, regulatory, and financial requirements. Real-world case-study analysis is integrated throughout the programme to help learners connect engineering concepts with practical marine-energy development challenges.

Programme Curriculum

Wave Energy Systems Training Course

Introduction

Wave Energy Systems Training Course provides a practical and industry-focused understanding of wave energy conversion, marine renewable energy, offshore engineering, hydrodynamic modelling, resource assessment, power conversion, and sustainable energy development. Participants explore how ocean-wave

resources can be assessed and transformed into useful electrical power through technologies such as point absorbers, oscillating water columns, overtopping devices, attenuators, and submerged pressure-differential systems. The course connects engineering theory with real-world project development, including technology selection, site characterization, environmental considerations, grid integration, and project economics. Contemporary marine-energy training increasingly combines lectures, numerical modelling, laboratory activities, field experience, group work, and case studies.

Designed for professionals, graduates, researchers, project developers, and energy-sector stakeholders, the programme emphasizes clean energy transition, blue economy, energy resilience, decarbonization, offshore innovation, digital modelling, sustainability, and commercialization. Participants develop the ability to evaluate wave-energy opportunities from resource assessment through conceptual design and deployment planning while considering technical, environmental, regulatory, and financial requirements. Real-world case-study analysis is integrated throughout the programme to help learners connect engineering concepts with practical marine-energy development challenges.

Course Duration

5 days

Course Objectives

By the end of the course, participants should be able to:

1. Understand the fundamentals of wave energy resources and marine renewable energy systems.
2. Evaluate wave-resource characteristics using modern resource assessment and data-analysis techniques.
3. Differentiate major Wave Energy Converter (WEC) technologies and their applications.
4. Assess the hydrodynamic performance of wave-energy devices.
5. Apply basic principles of numerical modelling and simulation to wave-energy systems.
6. Evaluate structural, mooring, anchoring, and offshore-system requirements.
7. Analyze Power Take-Off (PTO) systems and energy-conversion pathways.
8. Assess electrical systems, power conditioning, grid integration, and energy-storage options.
9. Evaluate environmental, ecological, permitting, and ESG considerations.
10. Analyze technical feasibility, CAPEX/OPEX, LCOE, and project economics.
11. Apply risk management, reliability, operations, maintenance, and lifecycle strategies.
12. Develop strategies for commercialization, scaling, and blue-economy integration.
13. Prepare a conceptual wave-energy project using integrated engineering, sustainability, financial, and regulatory considerations.

Target Audience

1. Renewable Energy Engineers
2. Marine & Ocean Engineers
3. Coastal Engineers
4. Offshore Engineers
5. Energy Project Managers & Developers
6. Researchers, Academics & Postgraduate Students
7. Environmental & Sustainability Professionals
8. Government, Policy, Utility & Energy-Sector Professionals

Course Modules

Module 1: Wave Energy Fundamentals & Marine Energy Landscape

- **Wave-energy principles** and ocean-energy fundamentals
- Wave formation, propagation, height, period, and energy flux
- Role of **marine renewable energy** in the clean-energy transition
- Major global wave-energy development trends
- Opportunities, challenges, and commercialization pathways
- **Case Study:** Comparison of wave-energy development opportunities in island and coastal energy systems.

Module 2: Wave Resource Assessment & Site Characterization

- Wave-data collection, measurement, and quality control
- **Wave climate analysis** and resource mapping
- Significant wave height, wave period, spectra, and energy flux
- Site-selection criteria and offshore metocean conditions
- Resource uncertainty and long-term energy-yield estimation
- **Case Study:** Applying resource-assessment principles to select a hypothetical coastal WEC deployment site.

Module 3: Wave Energy Converter Technologies

- **Point absorbers** and heaving-body systems
- **Oscillating Water Columns (OWC)**
- Attenuators and oscillating surge devices
- Overtopping and submerged pressure-differential systems
- Technology selection, performance, and scalability
- **Case Study:** Technology-selection exercise comparing different WEC architectures for a high-energy coastal site.

Module 4: Hydrodynamics, Modelling & Simulation

- Wave-device interaction and hydrodynamic response
- Frequency-domain and time-domain concepts
- **Numerical modelling** and computational analysis
- Device motion, loads, resonance, and response optimization
- Interpretation of simulation and performance data
- **Case Study:** Modelling the response of a conceptual WEC under different wave conditions.

Module 5: PTO, Electrical Systems & Grid Integration

- **Power Take-Off (PTO)** technologies and conversion principles
- Mechanical, hydraulic, pneumatic, and electrical conversion systems
- Power electronics and energy-conditioning systems
- **Grid integration**, subsea cables, and transmission considerations
- Energy storage and hybrid renewable-energy systems
- **Case Study:** Conceptual grid-integration strategy for a small wave-energy array serving a coastal community.

Module 6: Offshore Structures, Mooring & Operations

- Structural design principles for marine-energy devices

- Fixed versus floating WEC concepts
- **Mooring, anchoring, station-keeping**, and deployment systems
- Offshore installation, inspection, and maintenance
- Reliability, availability, survivability, and lifecycle management
- **Case Study:** Risk and maintenance planning for a hypothetical floating wave-energy project.

Module 7: Environmental, Regulatory & Project Sustainability

- Marine environmental impact assessment
- Biodiversity, marine ecosystems, and ecological monitoring
- Navigation, fisheries, coastal-community, and stakeholder considerations
- **Permitting, regulatory compliance, ESG**, and marine spatial planning
- Climate resilience and sustainable blue-economy development
- **Case Study:** Environmental and stakeholder assessment for a proposed offshore WEC array.

Module 8: Economics, Commercialization & Project Development

- **Techno-economic analysis** and project feasibility
- CAPEX, OPEX, LCOE, financing, and revenue models
- Risk assessment and project-development strategies
- Commercialization, scaling, innovation, and investment readiness
- Integrated project planning and future **marine-energy markets**
- **Case Study:** Preliminary business case for a wave-energy project, covering technology, resource, environmental, financial, and deployment considerations.

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com