Tidal Energy Technologies 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

Tidal Energy Technologies Training Course provides a practical and future-focused foundation in marine renewable energy, tidal stream power, tidal range systems, marine hydrokinetic (MHK) technologies, energy conversion, and offshore engineering. Tidal energy is particularly valuable because tidal cycles are highly predictable, while current technology development is increasingly focused on improving energy capture, reliability, deployment, cost competitiveness, and grid integration. Recent research highlights advances in axial-flow and cross-flow turbines, tidal kites, floating systems, and array configurations, alongside continuing challenges involving capital cost, subsea reliability, environmental impacts, and suitable deployment sites.

Designed for professionals, engineers, project teams, researchers, policymakers, and clean-energy practitioners, the course connects technology fundamentals with real-world project development and commercialization. Participants explore resource assessment, turbine design, power take-off systems, electrical infrastructure, array optimization, operations and maintenance, environmental sustainability, techno-economic analysis, and smart-grid integration. Case studies such as La Rance, MeyGen, Morlais, and emerging tidal-stream deployments demonstrate how technical decisions translate into real project outcomes. Current industry trends indicate growing attention to commercial deployment, with significant tidal-stream capacity planned in Europe and continued innovation in marine energy systems.

Programme Curriculum

Tidal Energy Technologies Training Course

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Course Duration

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Course Objectives

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

1. Explain the fundamentals of tidal energy conversion and marine renewable-energy systems.
2. Differentiate tidal stream, tidal range, tidal lagoon, tidal kite, and hydrokinetic technologies.
3. Assess tidal resources using hydrodynamic data, current profiles, bathymetry, and site characterization.
4. Evaluate horizontal-axis, vertical-axis, floating, and seabed-mounted turbine technologies.
5. Understand power take-off, power electronics, controls, and grid-integration technologies.
6. Analyze tidal turbine performance, efficiency, capacity factor, and energy yield.
7. Apply principles of tidal-array design, wake management, and energy optimization.
8. Evaluate offshore installation, subsea infrastructure, cabling, and marine operations.
9. Develop strategies for predictive maintenance, reliability engineering, and asset management.
10. Assess environmental impact, marine biodiversity, permitting, and sustainable deployment.
11. Perform introductory techno-economic analysis, LCOE assessment, CAPEX/OPEX evaluation, and project bankability.
12. Examine commercialization, technology readiness levels, supply chains, and emerging market opportunities.
13. Evaluate pathways for scaling tidal energy within net-zero, resilient, and integrated renewable-energy systems.

Target Audience

1. Renewable Energy Engineers.
2. Electrical and Power Engineers.
3. Mechanical and Marine Engineers.
4. Energy Project Developers.
5. Operations & Maintenance Professionals.
6. Researchers and Academics.
7. Government, Policy & Regulatory Professionals.
8. Sustainability and Energy Managers

Course Modules

Module 1: Tidal Energy Fundamentals & Marine Renewable Energy

- Tidal energy principles, tidal cycles, resource characteristics, and **marine renewable energy fundamentals**.
- Comparison of **tidal stream, tidal range, lagoon, and ocean-current systems**.
- Energy density, predictability, capacity factor, and renewable-energy integration.
- Technology Readiness Levels (**TRLs**) and the pathway from demonstration to commercialization.
- **Case Study: La Rance Tidal Power Station**

Module 2: Tidal Resource Assessment & Site Characterization

- Tidal-current measurement using **ADCPs, hydrodynamic models, and resource datasets**.
- Bathymetry, seabed conditions, flow velocity, turbulence, and environmental constraints.
- **GIS-based site selection** and marine spatial planning.
- Resource uncertainty, energy-yield forecasting, and site suitability.
- **Case Study: Morlais Tidal Energy Site**

Module 3: Tidal Turbine Technologies & Energy Conversion

- **Horizontal-axis tidal turbines (HATTs)** and aerodynamic/hydrodynamic principles.
- **Vertical-axis turbines, tidal kites, oscillating hydrofoils, and enclosed-tip concepts**.
- Rotor design, blade hydrodynamics, cavitation, structural loading, and efficiency.
- Fixed-bottom versus **floating tidal turbine** architectures.
- **Case Study: Orbital Marine Power O2**

Module 4: Power Take-Off, Power Electronics & Grid Integration

- Mechanical, hydraulic, and electrical **power take-off (PTO)** systems.
- Generators, converters, transformers, subsea cables, and electrical protection.
- **Power electronic converters** for energy extraction and grid compliance.
- Control systems, power quality, forecasting, and smart-grid integration.
- **Case Study: Grid-connected tidal-stream projects**

Module 5: Tidal Arrays, Optimization & Offshore Engineering

- Tidal-array configuration, turbine spacing, **wake effects**, and flow interaction.
- Array optimization for maximum energy capture and reduced operational losses.
- Foundations, moorings, anchors, subsea cabling, and offshore logistics.
- Installation vessels, deployment strategies, inspection, and marine operations.
- **Case Study: MeyGen Tidal Energy Project**

Module 6: Operations, Maintenance, Reliability & Digitalization

- Offshore **operations and maintenance (O&M)** strategies.
- Reliability engineering, component degradation, corrosion, biofouling, and marine loads.
- Remote monitoring, sensors, **SCADA, digital twins, AI analytics, and predictive maintenance**.
- Condition-based maintenance and minimizing offshore downtime.
- **Case Study: Multi-device tidal arrays**

Module 7: Environmental Sustainability, Economics & Project Development

- **Environmental impact assessment (EIA)** and marine ecosystem considerations.

- Fisheries, marine mammals, sediment transport, underwater noise, and biodiversity.
- CAPEX, OPEX, **LCOE, financial modeling, risk assessment, and bankability**.
- Permitting, stakeholder engagement, policy frameworks, and responsible development.
- **Case Study: European tidal-energy deployment**

Module 8: Emerging Technologies, Commercialization & Future Trends

- **Floating tidal turbines, tidal kites, advanced hydrofoils, and next-generation converters**
- Hybrid systems combining tidal energy with **offshore wind, solar, storage, and hydrogen**.
- AI-enabled optimization, autonomous inspection, advanced materials, and digital twins.
- Commercial scale-up, supply-chain development, technology innovation, and **net-zero energy systems**.
- **Case Study: UK tidal-stream pipeline**

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

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