Training Course on Underwater Robotics

Professional Development Training Course Outline

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

Course Introduction

The field of **underwater robotics** is experiencing rapid growth, driven by increasing demands for **ocean exploration**, **offshore infrastructure inspection**, and **environmental monitoring**. This comprehensive training course provides participants with the essential knowledge and practical skills to excel in this cutting-edge domain. Participants will gain a thorough understanding of the design, operation, and maintenance of various **underwater vehicles**, including **Remotely Operated Vehicles (ROVs)** and **Autonomous Underwater Vehicles (AUVs)**. The curriculum emphasizes hands-on experience and real-world applications, preparing individuals for successful careers in the burgeoning **marine technology** sector.

Training Course on Underwater Robotics delves into the core principles of **robotics engineering** as applied to the unique challenges of the underwater environment. Key areas of focus include **underwater navigation**, **sensor integration**, **hydraulic systems**, and **electrical systems**. Through a blend of theoretical instruction and practical exercises, learners will develop proficiency in piloting, troubleshooting, and deploying **submersible robots** for a wide range of tasks, from **deep-sea exploration** to **infrastructure maintenance**. The course also covers critical aspects of **underwater safety protocols** and **operational best practices**, ensuring graduates are well-equipped to contribute effectively and safely to the **oceanographic research**, **offshore energy**, and **underwater inspection** industries.

Programme Curriculum

Training Course on Underwater Robotics

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Course Duration

10 days

Course Objectives

This training course is designed to equip participants with the following key skills and knowledge:

1. Understand the fundamental principles of **underwater robotics** and its diverse applications.
2. Identify and differentiate between various types of **underwater vehicles**, including ROVs and AUVs.
3. Gain practical experience in the **operation and piloting of underwater robots**.
4. Learn the principles of **underwater navigation and positioning systems**.
5. Develop skills in the **integration and calibration of underwater sensors**.
6. Understand the fundamentals of **underwater communication technologies**.
7. Acquire knowledge of **hydraulic and electrical systems** used in underwater robots.
8. Master **pre- and post-mission procedures** for underwater robotic deployments.
9. Develop **troubleshooting and basic maintenance skills** for underwater vehicles.
10. Understand the importance of **safety protocols and risk assessment** in underwater operations.
11. Learn about **data acquisition and interpretation** from underwater robotic systems.
12. Explore the applications of **artificial intelligence in underwater robotics**.
13. Gain insights into the future trends and advancements in **marine autonomous systems**.

Organizational Benefits

Investing in this Underwater Robotics Training Course offers significant benefits for organizations operating in or looking to enter the marine environment:

- **Enhanced Operational Efficiency:** Trained personnel can operate and maintain underwater robotic systems effectively, leading to faster project completion and reduced downtime.
- **Improved Safety:** Proper training ensures that personnel understand and adhere to safety protocols, minimizing risks associated with underwater operations.
- **Cost Reduction:** Skilled operators can perform inspections, maintenance, and data collection tasks more efficiently, reducing the need for expensive human divers in many scenarios.
- **Access to Advanced Technology:** Equipping staff with the knowledge to utilize advanced underwater robotics opens up new possibilities for exploration, research, and operational capabilities.
- **Increased Innovation:** A well-trained team can better leverage the capabilities of underwater robots to develop innovative solutions and approaches to marine challenges.

- **Competitive Advantage:** Organizations with skilled underwater robotics personnel gain a competitive edge in the rapidly evolving marine technology landscape.
- **Higher Quality Data Collection:** Trained operators can ensure the accurate and reliable collection of underwater data for analysis and decision-making.
- **Reduced Environmental Impact:** Utilizing robots for certain tasks can minimize the environmental impact associated with human underwater activities.

Target Audience

This training course is ideal for individuals in various roles and industries, including:

1. **Offshore Oil and Gas Personnel:** Technicians, engineers, and inspectors involved in subsea infrastructure maintenance and inspection.
2. **Marine Scientists and Researchers:** Individuals utilizing underwater robots for data collection, environmental monitoring, and exploration.
3. **Naval and Coast Guard Personnel:** Those responsible for underwater surveillance, mine countermeasures, and search and rescue operations.
4. **Underwater Surveyors and Inspectors:** Professionals conducting seabed mapping, pipeline inspections, and structural assessments.
5. **Aquaculture Professionals:** Individuals using underwater robots for monitoring fish health and infrastructure.
6. **Renewable Energy Sector Employees:** Technicians working on offshore wind farms and other underwater energy installations.
7. **Search and Rescue Teams:** Personnel deploying underwater robots for locating and recovering objects or individuals.
8. **Engineers and Technicians:** Professionals interested in specializing in the design, development, and maintenance of underwater robotic systems.

Course Outline

Module 1: Introduction to Underwater Robotics

- Overview of the history and evolution of underwater robotics.
- Classification of underwater vehicles: ROVs, AUVs, Hybrid Vehicles.
- Applications of underwater robotics across various industries.
- Key components and systems of a typical underwater robot.
- The unique challenges and opportunities of operating in the underwater environment.

Module 2: Principles of Underwater Navigation and Positioning

- Introduction to underwater acoustics and its role in navigation.
- Different types of underwater positioning systems: USBL, LBL, SBL.
- Inertial Measurement Units (IMUs) and Doppler Velocity Logs (DVLs).
- GPS and its limitations underwater; alternative positioning methods.
- Practical exercises in interpreting navigation data and waypoints.

Module 3: Underwater Sensors and Instrumentation

- Overview of common underwater sensors: sonar, cameras, depth sensors.
- Water quality sensors: temperature, salinity, dissolved oxygen, pH.
- Acoustic imaging and profiling systems.
- Integration and calibration of different sensor types.
- Data acquisition and logging techniques for underwater sensors.

Module 4: Underwater Communication Technologies

- Principles of underwater acoustic communication.
- Different types of acoustic modems and their characteristics.
- Optical communication methods in underwater environments.
- Tethered communication systems for ROVs.
- Challenges and limitations of underwater communication.

Module 5: Hydraulic and Electrical Systems in Underwater Robots

- Fundamentals of hydraulic power transmission underwater.
- Components of a hydraulic system: pumps, actuators, valves.
- Principles of underwater electrical power distribution.
- Waterproofing and pressure compensation techniques for electrical components.
- Safety considerations for high-voltage systems in underwater robots.

Module 6: ROV Operation and Piloting Techniques

- Introduction to ROV control consoles and user interfaces.
- Basic piloting maneuvers: forward, backward, lateral movement, vertical ascent/descent.
- Advanced piloting techniques: station keeping, object manipulation.
- Operating ROVs in different underwater conditions and environments.
- Emergency procedures and troubleshooting during ROV operations.

Module 7: AUV Operation and Mission Planning

- Understanding AUV autonomy levels and control architectures.
- Mission planning software and waypoint programming.
- Pre-mission checks and deployment procedures for AUVs.
- Tracking and recovery of autonomous underwater vehicles.
- Data retrieval and post-mission analysis for AUV missions.

Module 8: Underwater Imaging and Data Acquisition

- Principles of underwater photography and videography.
- Different types of underwater cameras and lighting systems.
- Techniques for capturing high-quality underwater imagery.
- Data logging and storage methods for video and still images.
- Introduction to photogrammetry and 3D modeling from underwater images.

Module 9: Underwater Manipulation and Tooling

- Types of robotic manipulators used on underwater vehicles.
- Operating and controlling manipulator arms for various tasks.
- Introduction to common underwater tools: cutters, grabs, cleaning systems.
- Attaching and detaching payloads and tools underwater.
- Safety considerations for underwater manipulation tasks.

Module 10: Inspection and Non-Destructive Testing (NDT) Underwater

- Visual inspection techniques for underwater structures.
- Introduction to underwater NDT methods: UT, MT, CP.
- Deployment and operation of NDT equipment using underwater robots.
- Data interpretation and reporting of underwater inspection results.
- Standards and regulations for underwater inspection.

Module 11: Maintenance and Troubleshooting of Underwater Robots

- Preventive maintenance procedures for ROVs and AUVs.
- Basic troubleshooting of hydraulic and electrical systems.
- Identifying and addressing common mechanical issues.
- Repair and replacement of underwater components.
- Post-mission cleaning and storage procedures for underwater robots.

Module 12: Safety and Operational Best Practices

- Risk assessment and hazard identification in underwater operations.
- Emergency procedures and contingency planning.
- Communication protocols and teamwork in underwater deployments.
- Regulations and guidelines for operating underwater robotic systems.
- Environmental considerations and responsible use of underwater technology.

Module 13: Artificial Intelligence and Future Trends in Underwater Robotics

- Introduction to AI concepts relevant to underwater robotics: computer vision, machine learning.
- Applications of AI for autonomous navigation and object recognition.
- Developments in bio-inspired underwater robot designs.
- The role of swarm robotics and multi-vehicle collaboration underwater.
- Future trends in underwater power sources and communication technologies.

Module 14: Practical Deployment and Mission Simulation

- Hands-on exercises in deploying and recovering underwater robots.
- Simulated mission scenarios covering various applications.
- Team-based exercises in mission planning and execution.
- Data analysis and reporting based on simulated mission data.
- Assessment of individual and team performance in practical scenarios.

Module 15: Project Development and Presentation

- Participants work on a small project applying the learned concepts.
- Project topics can include mission planning, sensor integration, or system design.
- Guidance and mentorship provided by instructors.
- Final project presentations by participants.
- Feedback and evaluation of project work and presentations.

Training Methodology

This course employs a blended learning approach that combines:

- **Interactive Lectures:** Engaging presentations covering the theoretical foundations of underwater robotics.
- **Hands-on Practical Sessions:** Direct experience with operating, deploying, and maintaining underwater robotic systems.
- **Simulation Exercises:** Utilizing software tools to simulate underwater missions and scenarios.
- **Case Studies:** Analyzing real-world applications and challenges in underwater robotics.
- **Group Discussions:** Facilitating knowledge sharing and problem-solving among participants.
- **Demonstrations:** Showcasing the capabilities of various underwater robotic technologies.
- **Project-Based Learning:** Applying learned concepts to a practical project.

- **Site Visits (Optional):** Visiting relevant industry facilities or research institutions (subject to availability).

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.

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
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

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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