Fundamentals of Marine Technology
Level 1

Course Overview
Fundamentals of Marine Technology focuses on the basic understanding of systems, applications, troubleshooting, calibration and safety requirements specific to marine technology and marine environments.

Objectives
Participants will conduct electrical measurements and diagnostics using multimeters and oscilloscopes and will demonstrate competencies for introductory analysis, construction and troubleshooting techniques for DC and AC circuits including marine batteries and battery charging systems. Emphasis is placed on basic design, repair and integration of cabling, tether, communication devices, sensors, and components into marine technology systems. Participants will use test equipment and protocols to develop troubleshooting methods to analyze and integrate this technology. Additionally, a basic overview of fiber optics and fiber troubleshooting will be demonstrated including fiber splicing. Safe electrical practices will be emphasized.

Marine Fluid Power:
- Focus on basic systems, applications, and safety requirements specific to the marine environments. Participants will build, test, repair hydraulic hoses and components associated with common shipboard applications. Participants will use test equipment and protocols to develop trouble-shooting methods to analyze and integrate this technology.

Marine Sonar & Acoustics:
- Provides a foundation for the use of acoustics in the marine environment while focusing on best practices for underwater search, survey and visualization programs. Multiple sonar systems that are representative of current industry equipment, operations and practices will be emphasized. Participants will gain an understanding of field applications where sonar platform, water depth, temperature, target range, size, acoustic frequency, and object reflectivity/absorption have an effect on target detection, resolution and data accuracy.

ROV:
- The ROV training will introduce the technology of remotely operated vehicles (ROV) as a system used for subsea activities including scientific study and research, subsea exploration and industrial applications. Components of competencies gained in the Fundamentals of Marine Technology will be demonstrated using multiple ROV systems and sensors.
Training Program Outcomes

At the end of the training, participants will be able to:

1. Apply the knowledge, techniques, skills, and modern tools of the discipline to broadly defined marine technology activities.
2. Conduct standard tests and measurements and identify troubleshooting techniques for operations and repair of marine technology systems.
3. Acquire a basic understanding of how to properly mobilize, calibrate and troubleshoot marine sonar systems.
4. Acquire a basic understanding of how to integrate and troubleshoot sensor systems to Remotely Operated Vehicles (ROV).

Schedule of Activities

Participants will arrive Monday at 1200 at NMC Parsons-Stulen Campus.

A one hour lunch break will be given Tuesday – Friday.

<table>
<thead>
<tr>
<th>January 21, 2019 – January 25, 2019</th>
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<tr>
<td><strong>Monday</strong></td>
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<td><strong>Friday</strong></td>
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Travel and Logistics

Traverse City offers many hotel options during this time frame. Please refer to two options below:

<table>
<thead>
<tr>
<th><strong>Best Western Plus</strong></th>
<th><strong>Travel Lodge</strong></th>
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<tbody>
<tr>
<td>(231) 946 – 8424</td>
<td>(231) 922 – 9111</td>
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<tr>
<td>$84/Night</td>
<td>$45/Night</td>
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<tr>
<td>King-sized bed</td>
<td>King-sized bed</td>
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<tr>
<td>Full breakfast available</td>
<td>Continental breakfast available</td>
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<tr>
<td>Located 1.5 miles from NMC</td>
<td>Located 0.75 miles from NMC</td>
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Fundamentals of Marine Technology
Level 1
Proposed Services

Training: Fundamentals of Marine Technology - Level 1

Scope of Service:
Course content: (see attached curriculum)
- Marine electronics and electrical systems
- Marine fluid power
- Marine sonar and acoustics
- ROV training

Cost: $1,450 per person

Number of Participants: 16 max.

Dates: January 21, 2019 – January 25, 2019

Location: Northwestern Michigan College
Parsons-Stulen Building
2600 Aero Park Drive
Traverse City, Michigan 49686

Terms:
1. Payment must be received by January 7, 2019
2. Program cost excludes all travel, lodging, transportation and meals.
3. NMC accepts checks and credit cards – Please contact The Marine Center by phone or email for payment options and details.
Fundamentals of Marine Technology

Course Curriculum

I. Electronics and Electrical Systems (13 Hours)
   a. Diagnostic tools
      i. Digital volt meter
      ii. Oscilloscope
      iii. Megger
      iv. Power supplies
   b. Soldiering and cable splicing
      i. Basic circuit design
      ii. Connector repair and splicing
   c. Batteries and battery charging systems
   d. Fiber optics and software/hardware interfaces
   e. Diagnostic tools
      i. OTDR
      ii. Power meters
      iii. Fusion splice

II. Marine Fluid Power (8 Hours)
    a. Hydraulic hose building and testing
    b. Hydraulic circuit design
    c. Hydraulic systems troubleshooting

III. Marine Sonar and Acoustics (10 Hours)
    a. Basic sonar theory
       i. Sonar equation
       ii. Speed of sound
    b. Sonar calibration
       i. Patch test
       ii. Motion Reference Unit
       iii. Offsets
    c. Sonar systems and operations
       i. Scanning
       ii. Side Scan
       iii. Multibeam
       iv. USBL

IV. ROV (4 Hours)
    a. ROV systems and operations
b. ROV – Sonar/sensor integrations  
c. Software communication protocol  
d. Tether repair and troubleshooting