## Module Details

**Module 9: Earthing and Lightning / Surge Protection**

Nominal duration: 5 weeks (60 hours total time commitment)

This time commitment includes the preparation reading, attendance at each webinar (1 hour plus 15-30 minutes for discussion), and the time necessary to complete the assignments and further study.

## Module Purpose

To provide participants with fundamentals of earthing in electrical systems, national and international standards, earthing and bonding, systems that cannot be earthed, shielding of sensitive communications cables from noise and interference, surge and transient protection, troubleshooting and fixing earthing and surge problems.

## Pre-Requisite Module(s)

Module 8: Power Cables and Accessories

## Assessment Strategy

To evaluate the achievement of the learning outcomes; written assignments, group projects and practical exercises are set.

## Summary of Learning Outcomes

1. Outline the various methods of earthing electrical systems and the applicable national standards
2. Examine and discuss the purpose of earthing and bonding
3. Outline the correct methods for shielding sensitive communications cables and electronic equipment
4. Examine and discuss lightning protection methods
5. Outline surge protection methods and systems

### Learning Outcome 1

Outline the various methods of earthing electrical systems and the applicable national standards

### Assessment Criteria

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<tr>
<td>1.1</td>
<td>Compare and contrast earthing methods</td>
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<td>1.2</td>
<td>Outline effects of electric shock and how to prevent electric shock hazards</td>
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<td>Learning Outcome 2</td>
<td>Examine and discuss the purpose of earthing and bonding</td>
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| Assessment Criteria | 2.1 Discuss earth electrode systems  
                             2.2 Describe earthing designs of substations  
                             2.3 Examine static electricity and associated protection methods |
| Learning Outcome 3 | Outline the correct methods for shielding sensitive communications cables and electronic equipment |
| Assessment Criteria | 3.1 Outline methods of shielding  
                             3.2 Outline methods of protecting electronic equipment |
| Learning Outcome 4 | Examine and discuss lightning protection methods |
| Assessment Criteria | 4.1 Outline lightning protection of structures, electrical lines and substations  
                             4.2 Describe lightning risk assessment  
                             4.3 Discuss lightning protection of marine electrical systems |
| Learning Outcome 5 | Outline surge protection methods and systems |
| Assessment Criteria | 5.1 Outline surge protection methods  
                             5.2 Discuss electrical noise and mitigating role of earthing |

**Delivery mode**

A combination of asynchronous and synchronous e-learning delivery comprising a judicious mix of interactive online web conferencing, simulation (virtual labs) software, remote online labs, online videos, PowerPoint slides, notes, reading and study materials (in PDF, HTML and Word format) accessed through the Moodle Learning Management System (LMS).