## 1. Module details

**Module name**

# Introduction to Optics

**Module duration**

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 18-20 hours.

**Module code**

NUE073

**Discipline code**

## 2. Module purpose

This module helps prepare students for further learning in optics, lasers and photonics. It provides students with an understanding of common components and principles used in the Photonics industry.

## 3. Prerequisites

NUE078 - Applied Electrical Science

## 4. Relationship to competency standards

This module provides part of the underpinning knowledge and skills in the 'Evidence Guide' of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from EEQSBA.

## 5. Content

1. Introduction to Optics
   - Photonics -
     - Applications
     - Advantages
     - Disadvantages

2. Optical Fibre
   - Optical fibre -
     - Construction
     - Types
     - Physical properties and characteristics
       - Glass cladding
       - Bend radius
       - Specifications

3. Optics and light
   - Electromagnetic spectrum
     - Light as an electromagnetic wave
     - The particle properties of Light
     - Transmission of light
   - Optic fibre
     - Safety requirements

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| | Connectors<br>Splicing/Joining<br>Sensors<br>Lasers |

## 6. Assessment strategy

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| **Assessment methods** | Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving. |
| **Conditions of assessment** | Learning and assessment will take place in an environment that is conducive to a learner's development. |

## 7. Learning outcome details

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| **Learning outcome 1** | **Demonstrate knowledge of the use of Photonics in the Electrotechnology industry.** |
| **Assessment criteria** | 1.1 List the applications of Photonics in the electrotechnology industry.<br>1.2 State two advantages of Photonic technology over existing technology.<br>1.3 State two disadvantages of Photonic technology over existing technology. |
| **Learning outcome 2** | **Describe the basic characteristics of optical fibre.** |
| **Assessment criteria** | 2.1 Describe the basic construction of optical fibre.<br>2.2 State two types of material used in optic fibre.<br>2.3 Sketch a cross sectional view of a typical optic fibre and identify the *Core, Cladding* and *Buffer.*<br>2.4 Demonstrate the effects of an excessive 'bend' radius'on optic fibre transmission<br>2.5 List the typical specifications of an optic fibre. |
| **Learning outcome 3** | **Describe the transmission of light through an optic fibre.** |
| **Assessment criteria** | 3.1 List the commonly used frequency bands in the electromagnetic spectrum. |

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| | 3.2 Outline the main characteristics of an electromagnetic waveform.<br><br>3.3 Describe the properties of light, which make it an electromagnetic waveform.<br><br>3.4 Describe the particle nature of light.<br><br>3.5 State the requirements for *'total internal reflection'* in an optic fibre. |
| **Learning outcome 4** | **Demonstrate knowledge of optic fibre requirements** |
| **Assessment criteria** | 4.1 List the OH&S requirements to be observed when using optic fibre.<br><br>4.2 Identify typical connectors used in optic fibre systems<br><br>4.3 State the methods used to splice and join optic fibre.<br><br>4.4 State the names of typical components used as sensors.<br><br>4.5 State the names of typical devices used as light sources. |

## 8. Delivery of the module

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| **Delivery strategy** | Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require learning outcome sequence other than that indicated in the module. |
| **Resource requirements** | Resources should be sufficient for students to carry out experiments on an individual basis. This will require a range of supporting materials to simulate workplace scenarios.<br><br>Trainers/teachers/facilitators must have qualifications in the relevant subject area they are engaged to deliver, recognised trainer and assessment training and at least five years relevant work experience<br><br>Useful references include:<br>*Optics* – Hecht and Zajac, Addison-Wesley publishing<br><br>*Principles of Optics* – Born and Wolf, Permagon press |

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| | AS/NZS 2211.1:1997 Laser Safety. Part 1 Equipment classification, requirements and user's guide.<br><br>AS/NZS 2211.1 Supp1: 1999 Laser Safety. Part 1 Equipment classification, requirements and user's guide. Supplement 1 Application guidelines and explanatory notes (Supplement to AS/NZS 2211.1:1997).<br><br>AS/NZS 2211.2:1997 Safety of optical fibre communication systems.<br><br>Class notes<br><br>Material from a variety of organisations, industry magazines and journals should be available. |
| **Occupational health and safety requirements** | A safe and healthy environment will be provided for students and teachers as well as safety procedure with regard to learning/teaching activity. |