

1 Module Details

Module Name

Principles of Underwater Sound Transmission

Nominal duration

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

Module code

NUE178

Discipline code

0703205.

2 Module purpose

This module will enable students to gain an understanding of the principles of underwater sound transmission.

3 Prerequisites

NUE054 Applied Electricity 2

4 Relationship to competency standards

This module provides some of the knowledge and skills underpinning competencies in the following standards: National Electrotechnology Industry Standards, Unit NES206c Metals & Engineering Industry Standards, Units MEM 18.57A

5 Content

1. Sound Transmission Principles
 - Model
 - source
 - medium
 - detector
 - Temperature
 - Pressure
 - Salinity
 - Compression
 - Rarefaction
 - Sonic Regions
 - infra sonic region
 - sonic region
 - ultra sonic region
 - Sound measurement
 - intensity
 - pressure
 - power
2. Sound Transmission – Conditions
 - Elasticity
 - Density
 - Air
 - Sea water
 - Metal
3. Oceanic Layers
 - Surface layer
 - Seasonal thermocline (long range sound propagation paths)
 - Surface duct
 - Shallow sound channel
 - Deep sound channel
 - Convergence zone

	<ul style="list-style-type: none"> Refraction <ul style="list-style-type: none"> Snells law Permanent thermocline Deep water layer (isothermal) Reflection <ul style="list-style-type: none"> Negative temperature gradient Positive temperature gradient Positive sound speed gradient Negative sound speed gradient Zero sound speed gradient
	<ul style="list-style-type: none"> 4. Propagation Loss <ul style="list-style-type: none"> Introduction Spreading loss <ul style="list-style-type: none"> Spherical spreading Cylindrical spreading Absorption loss Scattering loss <ul style="list-style-type: none"> Surface scattering Volume scattering Bottom scattering Reverberation Noise
6 Assessment strategy	
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 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 a classroom environment.
7 Learning Outcome Details	
Learning Outcome 1	Explain the fundamental principals of underwater sound transmission.
Assessment criteria	<ul style="list-style-type: none"> 1.1 Describe the basic model of sound transmission and its 3 main elements. 1.2 Explain how temperature, pressure and salinity affect the speed of sound in water. 1.3 Describe sound transmission through a medium in terms of compressions and rarefactions. 1.4 Describe the characteristics of the 3 sonic regions. 1.5 Calculate the intensity, pressure and power level of a sound wave.
Learning Outcome 2	Describe the effect of the medium on sound transmission.
Assessment criteria	<ul style="list-style-type: none"> 2.1 Describe the effect of medium elasticity and density on sound transmission.

	<p>2.2 Describe the variations in sound transmission through air, sea water and metal.</p> <p>2.3 Describe the variations in sound transmission with respect to temperature, depth and salinity.</p>
Learning Outcome 3	Describe the oceanic layers and their effects on underwater sound transmission.
Assessment criteria	<p>3.1 Identify and describe the different oceanic layers.</p> <p>3.2 Describe the reflection and refraction of underwater sound waves.</p> <p>3.3 Describe the positive and negative gradients of temperature and velocity using illustrations.</p>
Learning Outcome 4	Describe the propagation losses experienced by underwater sound waves.
Assessment criteria	<p>4.1 Define propagation loss.</p> <p>4.2 Describe the propagation losses of underwater sound.</p>
8 Delivery of the module	
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 way to achieve this is by the integration of theory and practice where students learn by experimentation and through research and laboratory reports. It is recommended that learning and assessment be facilitated in a holistic manner, which may require a learning outcome sequence other than that indicated in the module.
Resource requirements	Resources should be sufficient for students to carry out practical exercises on an individual basis.
Occupational health and safety requirements	A safe and healthy environment will be provided for students and teachers as well as safety procedures followed with regard to teaching/learning activities.