MARL012 Apply basic principles of marine mechanics

Release: 1

MARL012 Apply basic principles of marine mechanics

Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to apply the basic principles of marine mechanics and to perform associated calculations needed to operate and maintain marine machinery.

This unit applies to the work of Marine Engineering Watchkeepers on commercial vessels greater than 750 kW and forms part of the requirements for the Certificate of Competency Marine Engineer Watchkeeper issued by the Australian Maritime Safety Authority (AMSA).

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Not applicable.

Competency Field

L – Marine Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.	
1 Use vector diagrams to calculate the resultant and equilibrant of up to four coplanar forces	1.1	Meaning of force as a vector, moment of a force, resultant and equilibrant are explained
	1.2	Forces using the triangle and polygon of forces are determined
	1.3	Moments and couples applied to beams and levers are explained
	1.4	Centroid of an area is calculated
	1.5	Centre of gravity of regular geometrical shapes is calculated

		1.6	Resultant and equilibrant of a system of concurrent coplanar-planer forces are calculated
2	**Solve problems involving friction**	2.1	Nature of friction and the laws of dry sliding friction are explained
		2.2	Influence of lubrication on bearings and plain surfaces is outlined
		2.3	Coefficient of friction is derived
		2.4	Laws of friction are applied to movement in a horizontal plane and the force to overcome friction on horizontal surfaces
		2.5	Effect of lubricating two surfaces in contact with each other is outlined
3	**Apply laws of motion**	3.1	Laws of motion are explained
		3.2	Velocity/time and acceleration/displacement graphs are sketched and adapted to derive the standard velocity formula for both linear and angular motion
		3.3	Formula and/or graphs are applied to solve problems of linear and angular velocity
		3.4	Linear motion is converted to angular motion and revolutions to radians
4	**Solve problems in dynamics related to marine machinery**	4.1	Relationship between torque, work, energy and power in marine engines and compressors is explained
		4.2	Conservation of energy theorem is used to calculate energy and power during linear and angular motion
		4.3	Meaning of momentum is explained
		4.4	Calculations are performed associated with the collision of rigid bodies
		4.5	Centrifugal force is distinguished from centripetal force
		4.6	Centrifugal and centripetal force in relation to marine machinery is calculated
5	**Determine efficiency of lifting and geared marine machinery**	5.1	Velocity ratio, mechanical advantage and efficiency of simple machines is calculated
		5.2	Calculations are performed to solve problems related to the

operation of simple machines

6	**Calculate stress and strain due to axial loads**	6.1	Normal stress is distinguished from strain
		6.2	Hooke's Law for stress and strain is explained
		6.3	Meaning of elastic limit, ultimate tensile strength, yield stress, limit of proportionality and factor of safety is explained
		6.4	Normal stress and strain caused by axial loads is calculated
7	**Determine shear stress and strain in coupling bolts and simple bolted connections**	7.1	Shear stress in simple bolted connections is determined
		7.2	Torque theory is applied to calculate shear stress in coupling bolts
8	**Determine stresses in thin walled pressure vessels**	8.1	Factor of safety and joint efficiency factor for pressure vessels is calculated
		8.2	Hoop and longitudinal stress in thin walled pressure vessels is calculated

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Simple machines include one or more of the following:	• hydraulic jack
	• pulley blocks
	• reduction gears
	• screw jack
	• single and double purchase crab winches
	• warwick screw
	• wheel and axle
	• worm driven chain blocks

Unit Mapping Information

This unit replaces and is equivalent to MARL5003A Apply basic principles of marine mechanics

Links

Companion Volume implementation guides are found in VETNet -
https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2