Australian Government

MARL044 Apply basic principles of marine mechanics

Release: 1

MARL044 Apply basic principles of marine mechanics

Modification History

Release 1. This is the first release of this unit of competency in the MAR Maritime Training Package.

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 people working in the maritime industry in the capacity of:

- Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited).

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit.

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited) and to meet regulatory requirements this unit must be delivered consistent with Marine Orders and with the relevant sections of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).
- Those regulatory requirements include STCW International Maritime Organization (IMO) model course competencies and areas of knowledge, understanding and proficiency, together with the estimated total hours required for lectures and practical exercises. Teaching staff should note that timings are suggestions only and should be adapted to suit individual groups of trainees depending on their experience, ability, equipment and staff available for training.

Pre-requisite Unit

Not applicable.

Competency Field

L – Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS	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 (CG) 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**	**7.1** Shear stress in simple bolted connections is determined

	connections		
		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.

Unit Mapping Information

This unit replaces and is equivalent to MARL012 Apply basic principles of marine mechanics

Links

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