

APPLY MECHANICAL SCIENCE

UNIT CODE:ENG/OS/CE/CC/5/6

UNIT DESCRIPTION

This unit describes the competencies required by a technician in order to apply a wide range of Mechanical science principles in their work. It includes applying principles of physics, mechanics of machines, solid mechanics and fluid mechanics.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. <i>Bold and italicized terms are elaborated in the Range.</i>
1. Apply principles of physics	1.1 <i>Types of forces</i> are identified 1.2 Equilibrium of forces and plane framework are calculated 1.3 Resultant and resolution of forces is performed 1.4 Application of forces is identified 1.5 <i>Motions</i> are determined 1.6 Equations of motions are applied 1.7 Temperature scales are determined 1.8 Modes of heat transfer are determined 1.9 Coefficient of thermal conductivity is determined 1.10 Coefficient of friction is determined 1.11 Friction equations are derived 1.12 Focal length is determined 1.13 Refractive indices are determined 1.14 Velocity of sound is determined 1.15 Sound level is determined 1.16 Sound is regulated 1.17 Angular momentum is determined 1.18 Momentum of a moving body is determined
2. Apply mechanics of machines	2.1 Velocity ratio, mechanical advantage and efficiency of machines are determined 2.2 <i>Principles of mechanical systems</i> are applied 2.3 Principle of conservation of energy is applied
3. Apply solid mechanics	3.1 Tensile and compressive strengths of materials are determined 3.2 Stress and strain graph is plotted 3.3 Strain in pressurized vessels are determined

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	3.4 Position and magnitude of greatest bending moments is determined 3.5 Shear force and bending moment diagrams are plotted 3.6 Young's modulus for beams are determined 3.7 Moments for loaded beams are determined 3.8 Slopes and deflections of beams are determined
4. Determine parameters of a fluid system	4.1 <i>Laws of fluids</i> are identified 4.2 Tools and equipment for measuring system parameters are identified 4.3 Tools and equipment are operated 4.4 Fluid system <i>parameters</i> are measured 4.5 Measured parameters are recorded and interpreted.

RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
1. Types of forces include but not limited to	1.1 Friction 1.2 Centrifugal 1.3 Centripetal 1.4 Gravitational
2. Motions include but not limited to	2.1 Linear motion 2.2 Circular motions 2.3 Projectile motions 2.4 Simple harmonic motions
3. Mechanical systems include but not limited to	3.1 Pulleys 3.2 Belts 3.3 Gears 3.4 Ropes 3.5 Levers 3.6 Wedge

	3.7 Screws 3.8 Wheel and axle
4. Principles include but not limited to	4.1 Newton's laws of motion 4.2 Law of conservation of linear momentum 4.3 Law of conservation of energy 4.4 Archimedes' principle
5. Laws of fluids include but not limited to	5.1 Pascal's principle 5.2 Gas laws
6. Parameters include but not limited to	6.1 Density 6.2 Velocity 6.3 Temperature 6.4 Viscosity 6.5 Pressure

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit of competency.

Required Skills

The individual needs to demonstrate the following skills:

- Apply basic mechanical formulas
- Use of basic mechanical machines
- Perform various unit conversions of mechanical quantities
- Basic mechanical systems design
- Mechanical machine operation
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

Required knowledge

The individual needs to demonstrate knowledge of:

- Newton's law
- Levers
- Gears
- Pulleys
- Laws of conservation of energy
- Laws of friction
- Type of forces
- Thermodynamics
- Calculation of fluid pressure and flow rate
- Mechanical advantage and efficiency calculations
- Properties of materials
- Gas laws

- Strength of materials
- SI units.
- Parameters of fluid system
- Operation of mechanical machines
- Mechanical calculation of power, energy, work done, torque and safety factor

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

1 Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied principles of physics 1.2 Applied mechanics of machines 1.3 Applied solid mechanics 1.4 Identified laws of fluids
6. Resource Implications	The following resources should be provided: 2.5 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.6 Measuring tools and equipment 2.7 Sample materials to be tested
7. Methods of Assessment	Competency in this unit may be assessed through: 7.1 Direct Observation 7.2 Demonstration with Oral Questioning 7.3 Case studies 7.4 Written tests
Context of Assessment	Competency may be assessed individually in the actual workplace or through accredited institution
Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.