APPLY MECHANICAL SCIENCE PRINCIPLES

UNIT CODE: ENG/OS/TEX/CC/03/6/A

Unit description

This unit describes the competencies required by a textile technician to apply mechanical science principles in their work. It includes determining forces in a system, demonstrating knowledge of moments, understanding friction principles, understanding motions in engineering, describing work, energy and power, performing machine calculations, demonstrating gas principles, applying heat knowledge, applying density knowledge and applying pressure principles.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These assessable statements specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
1. Determine forces in a system	1.1 Forces are defined and described 1.2 ***Forces theorems*** are described 1.3 Resultant of coplanar forces are determined.
2. Demonstrate knowledge of moments	2.1 Moments are defined 2.2 Moments are calculated 2.3 Principles of moments are described 2.4 Couples are identified and applied in engineering systems.
3. Understand friction principles	3.1 Laws of friction are identified 3.2 Limiting friction is calculated 3.3 Forces applied at an angle to a horizontal plane are calculated 3.4 Coefficient of friction is calculated 3.5 Advantages and disadvantages of friction are identified.
4. Understand motions in engineering	4.1 Motion concepts are discussed 4.2 Laws of motion are identified 4.3 Motion calculations are performed 4.4 Displacement/time graphs are applied
5. Describe work, energy and power	5.1 Work is calculated 5.2 Energy is calculated 5.3 Power calculations are performed
6. Perform machine calculations	6.1 ***Problems on simple machines*** are solved 6.2 Problems on levers are solved

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	6.3 Laws of machines are identified
7. Demonstrate gas principles	7.1 ***Gas laws*** are identified 7.2 Gas laws are applied in solving engineering problems 7.3 Uses of gases in engineering systems are identified
8. Apply heat knowledge	8.1 Heat concepts are discussed 8.2 Working principle of heat is defined 8.3 Heat capacity is discussed 8.4 Heat problems are solved
9. Apply density knowledge	9.1 ***Density terminology*** are discussed 9.2 Density measurements are carried out 9.3 Density problems are solved
10. Apply pressure principles	10.1 Pressure concepts are discussed 10.2 Working principles of pressure is discussed 10.3 Pressure problems are solved 10.4 ***Pressure applications*** are identified

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
Forces theorems may include but is not limited to:	• Parallelogram • Triangle • Polygon
Problems on simple machines may include but is not limited to:	• Machine advantage • Velocity ratio • Efficiency
Gas laws may include but is not limited to:	• Boyles law • Charles law • Gas equation
Density terminology may include but is not limited to:	• Density • Relative density

Pressure applications may include but is not limited to:	• Vacuum pump • Hydraulic pump • Hydrometers
Principles may include but is not limited to:	• Newton's laws of motion • Law of conservation of linear momentum • Law of conservation of energy • Archimedes' principle
Mechanical calculations may include but is not limited to:	• Mechanical advantage • Efficiency • Torque • Power/Energy • Work done
Laws of fluids may include but is not limited to:	• Pascal's principle • Gas laws

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
- Gear trains
- 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
- SI units of mechanical energy.
- Power transmission systems
- Parameters of fluid system
- Operation of mechanical machines
- Mechanical calculation of power, energy, work done, torque and safety factor
- Units of measurement, conversions and abbreviations

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 Determined forces in a system 1.2 Demonstrated knowledge of moments 1.3 Understood friction principles 1.4 Understood motions in engineering 1.5 Described work, energy and power 1.6 Performed machine calculations 1.7 Demonstrated gas principles 1.8 Applied heat knowledge 1.9 Applied density knowledge 1.10 Applied pressure principles
2 Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2 Measuring tools and equipment 2.3 Sample materials to be tested
3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Direct Observation 3.2 Demonstration with Oral Questioning 3.3 Case studies 3.4 Written tests
4 Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the –job 4.3 During Industrial attachment

5	Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.