

<b>MODULE TITLE</b>	<b>INTRODUCTORY STRENGTH OF MATERIALS</b>
<b>Nominal Duration</b>	One Module
<b>Module Code or Number</b>	EA 804
<b>Module Purpose</b>	To enable students to define terms concerned with the mechanical properties of materials as they relate to problems of strength and stability of structures and mechanical components and to determine values for these terms, using appropriate formulae and diagrams.
<b>Relationship to Competency Standards</b>	<p>This module will be modified in line with the requirements of the national metals and Engineering Standards when they become available.</p> <p>The module contains the knowledge and skills identified and agreed by all state/territories. It has been developed on the assumption that these will be reflected in the Standards.</p>
<b>Prerequisites</b>	EA 859 Statics EA 003 Engineering Maths B
<b>Summary of content</b>	<p>Stress and Strain</p> <ul style="list-style-type: none"><li>- normal stress and strain</li><li>- modulus of elasticity</li><li>- deformation</li><li>- Poisson's Ratio</li><li>- shear stress and strain</li><li>- modulus of rigidity</li><li>- yield stress, ultimate stress, proportional limit</li><li>- factor of safety</li><li>- allowable stress</li></ul> <p>Centrally Loaded Connections</p> <ul style="list-style-type: none"><li>- bolted connections<ul style="list-style-type: none"><li>- shear, tensile and bearing stresses</li></ul></li><li>- centrally loaded welded connections<ul style="list-style-type: none"><li>- fillet and butt</li><li>- method of failure</li><li>- size and length</li></ul></li><li>- punching of plates</li></ul>

Thin Walled Pressure Vessels

- define thin wall
- longitudinal stress
  
- hoop stress

Properties of Plane Figures

- first moment of area
- second moment of area

Simple Beams (point and distribute loads)

- shear force diagrams
- bending moment diagrams
- bending stress
- deflection by formula

Torsional Stress

- torque diagrams
- angle of twist
- torsional shear stress

Thermal Stress

- coefficient of linear expansion
- thermal stresses in single members

**Learning outcomes**

Successful completion of this module should enable the student to:

***Learning Outcome 1***

**Define the terms normal stress and strain, modulus of elasticity, Poisson's ratio and determine normal stresses, strains and deformations caused by axial loads.**

Assessment criteria

Define all relevant terms related to normal stress and strain.  
Given sufficient data calculate values for these terms.

Conditions

Standard classroom conditions  
Laboratory

Assessment method

Written short answer questions  
Laboratory report

***Learning Outcome 2***                      **Define the terms shear stress, shear strain, modulus of rigidity and determine the shear stresses in simple bolted connections.**

Assessment criteria                      Define all relevant terms related to shear stress and strain.  
Given sufficient data calculate defined terms.

Conditions                                  Standard classroom conditions  
Laboratory

Assessment method                      Written short answer questions  
Laboratory report

***Learning Outcome 3***                      **Explain the failure method of fillet welds and determine the nominal weld size or length of weld required on simple welded connections.**

Assessment criteria                      Given the load conditions for a fillet welded connection  
calculate weld size and length for simple connections and  
bolted connections.

Conditions                                  Standard classroom conditions  
Laboratory

Assessment method                      Written answer questions  
Laboratory report

***Learning Outcome 4***                      **Determine the hoop and longitudinal stress in thin walled cylinders subjected to pressure.**

Assessment criteria                      Solve problems involving internal pressure, hoop and  
longitudinal stress in thin walled cylinders.

Conditions                                  Standard classroom conditions  
Laboratory

Assessment method                      Written answer questions  
Laboratory report

<b><i>Learning Outcome 5</i></b>	<b>Determine the centroid, second moment of area and radius of gyration of plan figures.</b>
Assessment criteria	Given dimension of a section calculate centroid, second Moment of area and radius of gyration.
Conditions	Standard classroom conditions Laboratory
Assessment method	Written answer questions Laboratory report
<b><i>Learning Outcome 6</i></b>	<b>Draw shear force and bending moment diagrams for simply supported and cantilevered beams subjected to vertical point loads and UDLs.</b>
Assessment criteria	Given load conditions (either point load or UDL) for simply supported and cantilevered beams draw shear force and bending Moment diagrams.
Conditions	Standard classroom conditions Laboratory
Assessment method	Written answer questions Laboratory report
<b><i>Learning Outcome 7</i></b>	<b>Determine the bending stress in a beam subjected to bending, using the flexure formula.</b>
Assessment criteria	Use flexible formula to calculate bending stress in a beam.
Conditions	Standard classroom conditions Laboratory
Assessment method	Written answer questions Laboratory report
<b><i>Learning Outcome 8</i></b>	<b>Calculate the deflection of beams subjected to loads specified in 6 above using appropriate deflection formulae.</b>
Assessment criteria	Use deflection formula to calculate deflection of beams for point load and uniformly distributed load.
Conditions	Standard classroom conditions Laboratory
Assessment method	Written answer questions Laboratory report

***Learning Outcome 9***                      **Draw and use torque distribution diagrams to calculate torsional shear stress and angle of twist on circular shaft subjected to torques.**

Assessment criteria                      Solve problems involving torque applied, shear stress and angle of twist on circular shafts.

Conditions                                  Standard classroom conditions  
Laboratory

Assessment method                      Written answer questions  
Laboratory report

***Learning Outcome 10***                      **Use the coefficient of linear expansion to determine the thermal stress in single members caused by restraint and changes in temperature.**

Assessment criteria                      Calculate stress created in restrained single bars due to change in temperature.

Conditions                                  Standard classroom conditions  
Laboratory

Assessment method                      Written answer questions  
Laboratory report

**Suggested learning resources**

**Suggested Texts**

Ivanoff, V., (1984), Mechanical Engineering Science : An Introduction, McGraw-Hill, Sydney

Kinsky, R., (1986), Engineering Mechanics and Strength of Materials, McGraw-Hill, Sydney.