

MODULE TITLE	STATICS
Nominal Duration	One and a Half modules
Module Code or Number	EA 859
Module Purpose	To enable students to solve problems dealing with the action of force systems on rigid bodies, the composition of these forces being such that the bodies are at rest or are in motion at a constant velocity.
Relationship to Competency Standards	<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>
Prerequisites	(EA 003) Engineering Maths B.
Summary of Content	<p>Force and Gravity</p> <ul style="list-style-type: none"> - the concept of force - characteristics of force - basic principles - rectangular components of force - graphical addition of forces - mathematical addition of forces - universal gravitation - variation in gravity - weight as force - types of supports <p>Equilibrium of Concurrent Coplaner Forces</p> <ul style="list-style-type: none"> - concurrent forces - conditions of equilibrium - the equilibrant force - support reactions - the three force principle - two and three force bodies <p>Moment and Torque</p> <ul style="list-style-type: none"> - moment of force - addition of moments - equilibrium of moments - torque - equivalent force moment systems

Equilibrium of Non-concurrent Coplaner Forces

- conditions of equilibrium
- calculation of beam reactions (simply supported, cantilever, point load, udi, self-weight)
- resultant of non-concurrent forces

Friction

- coefficient of frictional resistance
- the laws of dry sliding friction
- the angle of friction
- the angle of repose
- friction on inclined planes
- resultant of normal reaction and friction force
- wedges
- stability - overturning versus sliding

Couples

- definition
- applications
- moment of a couple
- replacing a force with a force and a couple

Forces in Frames

- general principles
- method of joints
- combined force polygon (Maxwell diag)
- method of sections
- method of members

Delivery

Learning outcomes

Successful completion of this module should enable the student to:

Learning Outcome 1

Define and manipulate conversion of units of mass, length, time and force, and distinguish between vector and scalar quantities.

Assessment criteria

Define and convert standard units. Explain, with examples, vector and/or scalar quantities.

Assessment method

Written short answer questions.

<i>Learning Outcome 2</i>	Determine the resultant and equilibrant of systems of coplanar concurrent and non-concurrent forces.
Assessment criteria	Calculate the magnitude and direction of resultant and equilibrant of coplanar concurrent and non-concurrent force systems.
Assessment method	Written questions.
<i>Learning Outcome 3</i>	Solve problems using the principle of moments.
Assessment criteria	Calculate the line of action of a resultant using the principle of Moment.
Assessment method	Written questions.
<i>Learning Outcome 4</i>	Calculate support reactions for simple structures using the equations of equilibrium and including the moment effect of a couple.
Assessment criteria	Calculate the support reactions, given combinations of loading which may include concentrated, uniformly and non-uniformly distributed and couples applied to a simple structure.
Assessment method	Written questions.
<i>Learning Outcome 5</i>	Solve problems using the laws of dry sliding friction applicable to horizontal and inclined planes.
Assessment criteria	Calculate forces caused by dry sliding friction.
Assessment method	Written questions.
<i>Learning Outcome 6</i>	Determine the support reactions and internal forces acting on the members of a pin jointed framed structure subjected to point loads at the joints, (graphical method and method of sections for various members).
Assessment criteria	Calculate the magnitude and nature of the internal forces produced using method of joint, method of section and graphical method, given a loading for a simple determinate truss or frame.
Assessment method	Graphical and written questions.

Learning Outcome 7

Determine the support reactions and internal forces acting in the members of a pin jointed framed structure subjected to point loads at the joints, (graphical method and method of sections for various members).

Assessment criteria

Calculate the magnitude and nature of the internal forces produced using method of joint, method of section and graphical method, given a loading for a simple determinate truss or frame.

Assessment method

Graphical and written questions.

Learning Outcome 8

Determine pin and support reactions for a simple non-complanar non-concurrent force system.

Assessment criteria

Given a simple shaft or trapdoor system, calculate the magnitude of the components of force at supports, pins or hinges.

Assessment method

Written questions.

Suggested Learning Resources

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

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