

1 Module Details	
Module Name	Biomedical Mechanics
Nominal duration	It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 to 40 hours.
Module code	NUE914
Discipline code	0703230
2 Module purpose	This module provides students with the knowledge of the mechanical properties of materials used in medical science and technology, and introduces the mechanical concepts associated with physiological function and medical device operation.
3 Prerequisites	nil
4 Relationship to competency standards	This module provides some of the knowledge and skills underpinning competency in the following standards: National Electrotechnology Industry Standards, Units NES304, NES406, NES504 and the relevant specialisation. Metals & Engineering Industry Standards, Units 18.56A, 18.57A, 18.58A, 18.65A, 18.66A.
5 Content	<ol style="list-style-type: none"> 1 Material mechanics <ul style="list-style-type: none"> • classes of material • properties of solids, gasses and liquids in terms of mechanical testing and quantification • measurement of gas flow and pressure 2 Material properties <ul style="list-style-type: none"> • physical characteristics of commonly used medical-grade materials: <ul style="list-style-type: none"> metals plastics rubbers biologically derived materials • material requirements for the following application: <ul style="list-style-type: none"> surgical implantation surgical instrumentation topical application • deterioration of commonly used medical materials 3 Elementary mechanics <ul style="list-style-type: none"> • levers, pulleys and other devices utilised in physical therapy and orthopaedic equipment • potential hazards in the event of malfunction physical therapy equipment • physical parameters monitored and controlled in physical rehabilitation and physical therapy 4 Units of measurement – scientific and physiological <ul style="list-style-type: none"> • scientific units of measurement • physiological units of measurement • conversion tables between physiological and

	scientific units
	5 Elementary hydraulics <ul style="list-style-type: none"> • flow measurement of hydraulic circuits <ul style="list-style-type: none"> renal dialysis machine human circulatory systems • diffusion and osmosis
6 Assessment strategy	
Assessment methods	Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.
Conditions of assessment	Normally learning and assessment will take place in a classroom/laboratory.
7 Learning Outcome Details	
Learning Outcome 1	Describe the distinguishing properties of solids, liquids and gases.
Assessment criteria	1.1 Define solids, liquids and gases as classes of materials. 1.2 Describe the basic properties of a solid in terms of typical mechanical testing and quantification. 1.3 Describe the basic properties of a liquid in terms of typical mechanical testing and quantification. 1.4 Describe the basic properties of a gas in terms of typical mechanical testing and quantification. 1.5 Describe those properties of a gas which distinguish it most from solids and liquids and have profound physiological and medical implications. 1.6 Describe the measurement problems associated with gas flow and pressure, and their significance to ventilators and other medical gas devices.
Learning Outcome 2	Describe materials having specific uses in medical science and technology.
Assessment criteria	2.1 Identify the distinguishing physical characteristics of commonly used medical-grade materials including metals, plastics, rubbers and biologically derived materials. 2.2 List commonly used materials with specific requirements for topical application, surgical implantation, surgical instrumentation. 2.3 List the cause and nature of deterioration of a range of commonly used medical materials. 2.4 Explain biocompatibility and the implications of deterioration of medically used materials. 2.5 Describe the preventive/protective measures

	appropriate to the prevention of this deterioration, or its timely detection
Learning Outcome 3	Describe the commonly used mechanical concepts associated with physiological function and medical device operation.
Assessment criteria	<p>3.1 Demonstrate a basic understanding of levers, pulleys and other mechanically advantageous devices commonly utilised in physical therapy and orthopaedic equipment.</p> <p>3.2 Identify the potential hazards which can occur with common physical therapy equipment in the event of malfunction.</p> <p>3.3 Describe physical parameters which may be monitored or controlled in physical rehabilitation and physical therapy.</p> <p>3.4 Describe the means of monitoring or controlling those parameters, and their calibration.</p>
Learning Outcome 4	State the relation between commonly used units of physiological measurement and scientific units (SI) of measurement.
Assessment criteria	<p>4.1 List the basic units of the MKS (SI) measurement system.</p> <p>4.2 Describe the derived units of measurement which are of physiological significance such as pressure, flow, ionic concentration, etc.</p> <p>4.3 Convert between commonly used physiological units and scientific (SI) units using conversion tables.</p>
Learning Outcome 5	Describe the hydraulic nature of physiological and medical device circulatory systems.
Assessment criteria	<p>5.1 Describe the common means of flow measurement of hydraulic circuits such as the human circulatory system, or the renal dialysis machine.</p> <p>5.2 Describe the interactions of pressure and flow in closed hydraulic circulatory systems.</p> <p>5.3 Describe the importance of diffusion and osmosis as means of mass transfer within the body and within medical devices such as the renal dialysis machine or the heart-lung machine.</p>
8 Delivery of the module	
Delivery strategy	Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective way to achieve this is by the integration of theory and practice where students learn by experimentation and through research and laboratory reports. It is recommended that learning and assessment be facilitated in a holistic

Resource requirements

manner, which may require a learning outcome sequence other than that indicated in the module.

Access to the relevant medical equipment for demonstration purposes.

Occupational health and safety requirements

A safe and healthy environment will be provided for students and teachers as well as safety procedures followed with regard to teaching/learning activities.