

<p>1 Module Details</p> <p>Module Name</p> <p>Nominal duration</p> <p>Module code</p> <p>Discipline code</p>	<p>Common Medical Equipment 3</p> <p>It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 54 to 60 hours.</p> <p>NUE917</p> <p>0703230</p>
<p>2 Module purpose</p>	<p>This module provides students with knowledge of the clinical function, application, hazards and common faults of a diverse range of medical equipment eg. Dialysis Machines, Pacemakers, Lasers, Endoscopes, Ventilators. In addition, the module provides students with the skills to perform functional verification of the equipment to AS3551.</p>
<p>3 Prerequisites</p>	<p>Basic Principles of Anatomy and Physiology (NUE910) Microbiology of Infection Control (NUE 912)</p>
<p>4 Relationship to competency standards</p>	<p>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.</p>
<p>5 Content</p>	<ol style="list-style-type: none"> 1. Dialysis <ul style="list-style-type: none"> • function • principles of operation <ul style="list-style-type: none"> - haemodialysis machine - peritoneal machine • water quality requirements • dialysate <ul style="list-style-type: none"> - chemistry - concentration - temperature - pressure • hazards • common faults • functional verification to AS3551 <ul style="list-style-type: none"> - haemodialysis machine - peritoneal machine 2. Laboratory equipment – overview <ul style="list-style-type: none"> • function • principles of operation of the following types of laboratory equipment: <ul style="list-style-type: none"> - centrifuge - microtome - laminar flow cabinet - incubator - microscope • hazards • common faults • functional verification to AS3551

3. Pacemakers
 - function
 - physical and electrical specification
 - internal pacemakers
 - external pacemakers
 - application
 - common faults
 - hazards
 - functional verification to AS3551
4. EEG
 - EEG signals
 - principles of operation
 - application
 - EEG interpretation
 - hazards
 - common faults
 - functional verification to AS3551
5. Lasers
 - function
 - principles of operation
 - application
 - hazards
 - common faults
 - functional verification to AS3551
6. Endoscopes
 - function
 - principles of operation
 - application
 - hazards
 - common faults
 - functional verification to AS3551
7. Ventilators
 - function
 - principles of operation
 - ventilation monitoring
 - hazards
 - functional testing to AS3551
8. Medical Gas Installations
 - function
 - application
 - hazards
 - common faults
 - functional testing to AS3551

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 a typical dialysis machine in terms of function, application, hazards and common faults and perform functional verification to AS3551.
Assessment criteria	<p>1.1 Describe the underlying physiology and pathology, which might necessitate the implementation of dialysis in chronic and acute renal failure.</p> <p>1.2 Define dialysis and describe the function of a dialyser in terms of hydraulic and osmotic pressures.</p> <p>1.3 Draw a block diagram of a haemodialysis machine and describe its principles of operation.</p> <p>1.4 List the water quality requirements for dialysis and describe the methods of achieving them.</p> <p>1.5 Describe the preparation and monitoring of dialysate in terms of chemistry, concentration, temperature and pressure.</p> <p>1.6 List the potential hazards to the patient from incorrect dialysate.</p> <p>1.7 Describe common failures in the haemodialysis process due to operator, patient, or machine.</p> <p>1.8 List the essential safety and performance parameters of a haemodialysis machine which should be tested and documented, and specify the test equipment required for testing.</p> <p>1.9 Describe the procedures for safety and functional testing of a haemodialysis machine to AS3551.</p>
Learning Outcome 2	Describe a peritoneal dialysis machine in terms of function, application, common faults and functional verification to AS3551.
Assessment criteria	<p>2.1 Draw a block diagram of a peritoneal dialysis machine and describe its principles of operation.</p> <p>2.2 List the essential safety and performance parameters of a peritoneal dialysis machine which should be tested and documented, and specify the test equipment required for testing.</p> <p>2.3 Describe the procedures for safety and functional testing of a peritoneal dialysis machine to AS3551.</p> <p>2.4 State the advantages and disadvantages and clinical</p>

	applicability of the two forms of dialysis.
Learning Outcome 3	Describe common laboratory equipment (centrifuge, microtome, laminar flow cabinet, incubator, microscope) with regard to function, application, hazards and common faults, and perform functional verification to AS3551.
Assessment criteria	<p>3.1 Outline the clinical investigative procedures which necessitate the use of laboratory equipment.</p> <p>3.2 Describe the principles of operation of the following types of laboratory equipment:</p> <ul style="list-style-type: none"> - centrifuge - microtome - laminar flow cabinet - incubator - microscope <p>3.3 Describe the hazards and common faults in operation of laboratory equipment, with reference to a schematic diagram indicating the mode of operation.</p> <p>3.4 List the potential hazards associated with particular laboratory equipment, support devices and associated chemistry.</p> <p>3.5 List the essential safety and performance parameters which should be tested and documented, and specify the test equipment required for testing.</p> <p>3.6 Perform and document the functional testing of an item of laboratory equipment to AS3551.</p> <p>3.7 Describe the additional performance verification of laboratory equipment required for NATA laboratory registration.</p>
Learning Outcome 4	Describe the function, application and hazards of cardiac pacemakers when used either for emergency life support or permanently implanted for long-term life support.
Assessment criteria	<p>4.1 Outline the underlying physiology and pathology that might necessitate the use of a cardiac pacemaker.</p> <p>4.2 Describe the different physical and electrical specification of external and internal pacemakers, temporary and permanent implantable units.</p> <p>4.3 List the commonly used modes for pacing and the requirements in terms of leads and pulse generator types in order to perform these tasks.</p> <p>4.4 Describe the commonly encountered causes of failure to pace, including lead or other failure and positioning, cardiac non-responsiveness, technical causes.</p> <p>4.5 Describe the electrical hazards to patients when</p>

	using intracardiac electrodes.
	4.6 Describe electrical and electromagnetic environmental conditions which might influence the performance of an implanted pacemaker.
	4.7 Describe the precautions needed when performing electrosurgery on a patient having an implanted pacemaker.
	4.8 Describe the hazards of using a defibrillator on a patient having an implanted pacemaker.
	4.9 Demonstrate functional performance testing of a temporary external pacemaker to AS3551.
Learning Outcome 5	Describe the operation of an electroencephalograph (EEG) with regard to function, application, hazards and common faults and functional verification to AS3551.
Assessment criteria	5.1 Describe EEG signals in terms of neurophysiology and required frequency spectra.
	5.2 Draw a block diagram and describe the operating principals of a modern EEG machine.
	5.3 Describe commonly encountered circuit methods for providing the required electrical isolation of patients.
	5.4 Describe the common causes of unsatisfactory EEG recording.
	5.5 Briefly describe EEG interpretation.
	5.6 List the essential safety and performance parameters, which should be tested and documented, and specify the test equipment required for testing.
	5.7 Describe the procedures for safety and functional testing to AS3551.
Learning Outcome 6	Describe a range of clinically used lasers with regard to function, application, hazards and common faults, and functional verification to AS3551.
Assessment criteria	6.1 Outline the various clinical situations, which necessitate the use of lasers, and compare these procedures with other available technologies.
	6.2 Describe the principles of operation of the various types of laser.
	6.3 Describe the hazards and common faults in operation of lasers, with reference to a schematic diagram indicating the mode of operation of lasers.
	6.4 List the essential safety and performance parameters, which should be tested and documented, and specify

	the test equipment required for testing.
	6.5 Describe the procedure for safety and functional testing to AS3551.
Learning Outcome 7	Describe endoscopes , telescopes and associated equipment with regard to function, application, hazards and common faults, and perform functional verification to AS3551.
Assessment criteria	<p>7.1 Outline the clinical situations which necessitate the use of flexible endoscopes or rigid telescopes.</p> <p>7.2 Describe the principles of operation of the various types of medical optical devices.</p> <p>7.3 Describe the common faults associated with these devices.</p> <p>7.4 Describe the cleaning and infection control requirements specific to endoscopes and associated equipment</p> <p>7.5 Describe the hazards and common faults in operation of endoscopes, telescopes, light sources and accessories.</p> <p>7.6 List the essential safety and performance parameters which should be tested and documented, and specify the test equipment required for testing.</p> <p>7.7 Perform safety and functional testing to AS3551.</p>
Learning Outcome 8	Describe the operation of intensive therapy ventilators with regard to their function, hazard and common faults, and perform functional verification to AS3551.
Assessment criteria	<p>8.1 Outline the underlying physiology and pathology, which might necessitate the use of an intensive therapy (ICU) ventilator.</p> <p>8.2 Describe the operating principles and draw the block diagram of a generic ICU ventilator including the time-cycling, pressure-cycling and volume-cycling modes of operation.</p> <p>8.3 Describe the different modes of ventilation with reference to patient physiological condition – CPAP, PEEP, trigger modes (patient or ventilator).</p> <p>8.4 Describe the monitoring of ventilation including pressure, flow and time regimens, oxygen saturation, respired gases and alarm functions including disconnection.</p> <p>8.5 Describe the resources necessary for ventilator operation in the event of failure of reticulated power or gas supply.</p>

	<p>8.6 List the essential safety and performance parameters, which should be tested and documented, and specify the test equipment required for testing.</p> <p>8.7 Perform the functional testing of a ventilator to AS3551.</p>
Learning Outcome 9	Describe typical medical gas installations with regard to function, application, hazards and common faults, and functional verification to AS3551.
Assessment criteria	<p>9.1 Outline the clinical situations which are supported by a medical gas installation.</p> <p>9.2 Describe the hazards and common faults in operation of medical gas installations with reference to a schematic diagram indicating the mode of operation.</p> <p>9.3 List the essential safety and performance parameters which should be tested and documented and specify the test equipment required for testing.</p> <p>9.4 Describe the procedure for safety and functional testing to AS3551.</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 manner, which may require a learning outcome sequence other than that indicated in the module.
Resource requirements	<p>Resources should be sufficient for students to carry out practical exercises in small groups. This will require access to the relevant medical equipment.</p> <p>Useful references include:</p> <p>Carr, Joseph J., Brown John M. Introduction to Biomedical Equipment Technology, Third Edition, Prentice Hall, 1998. ISBN 0-13-849431-2</p> <p>Carr, Joseph J. Biomedical Equipment - Use, Maintenance and Management, Prentice Hall, 1992. ISBN 0-13-257577-9</p> <p>Useful references include a range of manufacturers operational and maintenance manuals for the relevant medical equipment.</p>

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.