

## Subject Description Form

<b>Subject Code</b>	BME32152
<b>Subject Title</b>	<b>Clinical Engineering and Medical Technology Management</b>
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Prerequisite</b>	BME31150 Biomedical Instrumentation and Equipment
<b>Objectives</b>	<p>This subject provides students with the knowledge on the development of innovative engineering technologies in medicine and how technology and engineering skills are applied to healthcare clinical settings.</p> <p>It aims to equip students with engineering, clinical and medical technology knowledge in a range of medical equipment; with emphasis in the life cycle management of medical equipment; analytical and problem-solving skills in equipment and technology management; Under the wide scope of clinical engineering, students are enhanced with a general knowledge of hospital engineering systems, equipment operation and engineering applications in the healthcare environment.</p>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"><li>a. Apprehend the history and development of engineering technologies applied in healthcare clinical settings; and be able to establish the role concept of a clinical engineer;</li><li>b. Identify the engineering principles and clinical use of medical technology and a range of common medical equipment, faults/problems and safety precautions that may be encountered in clinical settings in the applications of these medical technology and equipment;</li><li>c. Identify the development of medical technology in healthcare environment; and comprehend the aspects of life cycle management for medical devices; Understand technology management incorporating IT technology applications and their importance in the delivery of modern health care;</li><li>d. Appreciate the application of engineering technology to selected specialties such as Radio-diagnostic and radiotherapy, Endoscopy Centre, Biochemistry &amp; Laboratory, OT &amp; ICU Equipment, Ophthalmic Equipment, Beauty Therapy, MGPS, eHealth, robotic &amp; IT Applications etc.</li><li>e. Apply safety controls and identify engineering standards to ensure proper application of medical technologies and devices;</li><li>f. Interpret different modes of equipment maintenance; corrective and preventive maintenance procedures and documentation, safety testing and calibration of common medical equipment used in healthcare institutions;</li><li>g. Develop self-learning initiatives and integrate learned knowledge for problem solving.</li></ol>

<p><b>Contribution to Programme Outcomes (Refer to Part I Section 10)</b></p>	<ul style="list-style-type: none"> <li>▪ Programme Outcome 1: Demonstrate an ability to apply knowledge of mathematics, science, and engineering appropriate to the Biomedical Engineering (BME) discipline. (Teach)</li> <li>▪ Programme Outcome 4: Demonstrate an ability to identify, formulate, and solve BME problems. (Teach)</li> <li>▪ Programme Outcome 8: Demonstrate an ability to use the computer/IT tools relevant to the BME discipline along with an understanding of their processes and limitations. (Teach)</li> </ul>
<p><b>Subject Synopsis/ Indicative Syllabus</b></p>	<ul style="list-style-type: none"> <li>▪ History and development of Medical Technology; An overview to Clinical engineering.</li> <li>▪ Innovative Technology, application and scope of Clinical Engineering</li> <li>▪ Aspects of Life cycle management of medical device/equipment</li> <li>▪ Technology management, needs assessment, selection and procurement strategies for medical equipment</li> <li>▪ Equipment asset registry (EAR)</li> <li>▪ Use of medical equipment in clinical environment</li> <li>▪ Maintenance and service management: elements of an equipment control program, determining and organizing technical workload, service quality, equipment maintenance and replacement planning and procedures</li> <li>▪ Hospital engineering plant and systems in a healthcare institution</li> <li>▪ Critical areas of engineering control in healthcare environment</li> <li>▪ Safety and risk management to ensure proper function of medical equipment during service life cycle</li> </ul> <p>Apart from course lectures, specialty seminars are to be engaged in areas of technology development to show-case innovative applications in endoscopy, OT &amp; ICU services, radiology &amp; oncology, ophthalmology, robotic application, infection control, airborne infection isolation room and CAP 633 engineering compliances</p>
<p><b>Teaching and Learning Methodology</b></p>	<p>Lectures, demonstrations, and specialty seminars.</p>

<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						
			a	b	c	d	e	f	g
	1. Assignments, tutorials and quiz	40 %	√	√	√		√		√
	2. Final quiz and mini-project	60 %		√	√	√	√	√	√
Total	100%								
<p><i>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</i></p> <p>Assignments and quiz will be used to guide the students toward the learning objectives of the subject contents. Students are expected to demonstrate their understanding of related knowledge through a mid-term and a final quiz. Finally, a mini project is used to facilitate students in applying learned knowledge to solve real-life problems.</p>									
<b>Student Study Effort Required</b>	Class contact:								
	▪ Lectures		30 Hrs.						
	▪ Speciality Seminars		9 Hrs.						
	▪ Mini project and Presentation		15 Hrs.						
	Other student study effort:								
	▪ Self-study		63 Hrs.						
	Total student study effort			117 Hrs.					

<b>Reading List and References</b>	<b><u>References</u></b> <ul style="list-style-type: none"> <li>▪ WHO Compendium of innovative health technologies for low resource settings 2011-2014.</li> <li>▪ WHO Compendium of innovative health technologies for low resource settings 2016-2017</li> <li>▪ Clinical Engineering Handbook, 2nd Edition Dec 4, 2019, Academic Press 2019, ISBN: 978-0-12-813467-2 Editor: Ernesto Iadanza</li> <li>▪ Biomedical Engineering Handbook May 2019 Joseph D. Bronzino</li> <li>▪ Trends in Development of Medical Devices, Editor Prakash Srinivasan Timiri Shanmugam HCL America Inc., Sunnyvale, CA, United States, ISBN 978-0-12-820960-8 Elsevier Inc. 2020</li> <li>▪ WHO Compendium of innovative health technologies for low resource settings 2021, COVID-19 and other health priorities</li> </ul>
<b>Date of Last Major Revision</b>	28 December 2021
<b>Date of Last Minor Revision</b>	20 December 2022