

## Subject Description Form

<b>Subject Code</b>	BME32140
<b>Subject Title</b>	<b>Clinical Engineering</b>
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Prerequisite</b>	BME31121 Fundamentals of Biomedical Instrumentation II
<b>Objectives</b>	To equip students with engineering and clinical knowledge in a range of medical equipment; life cycle management of medical equipment; development of analytical and problem-solving skills in management of equipment / engineering plants; and understanding of safety controls in equipment operation.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will achieve knowledge/skills to:</p> <ol style="list-style-type: none"> <li>a. Comprehend the aspects of life cycle management for medical devices;</li> <li>b. Identify the engineering principles and clinical use of a range of common medical equipment, faults/problems and safety precautions that may be encountered in clinical settings in the applications of these medical equipment;</li> <li>c. Identify engineering standards and controls to ensure safety and proper operation of medical devices; Be able to compile proper documentations for clinical engineering practice;</li> <li>d. Identify the aspects of hospital engineering in healthcare environment;</li> <li>e. Interpret the different modes of equipment and plant maintenance; Review of preventive maintenance procedures, safety testing and calibration of common plant and medical equipment used in healthcare institutions;</li> <li>f. Develop self-learning initiatives and integrate learned knowledge for problem solving. Incorporate hands-on maintenance practice for selected common medical equipment employed in healthcare settings;</li> <li>g. Safety management and incident reporting and management systems for engineering plants and medical equipment</li> </ol>
<b>Contribution to Programme Outcomes (Refer to Part I Section 10)</b>	<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 and Practice)</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>

<b>Subject Synopsis/ Indicative Syllabus</b>	<ul style="list-style-type: none"> <li>▪ Clinical engineering: scope and overview of management systems</li> <li>▪ Medical device life cycle management and practices in healthcare institutions</li> <li>▪ Hospital engineering plant and systems in a healthcare institution;</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>▪ Incorporate experience workshops for maintenance practice and problem solving on selected medical equipment</li> <li>▪ Safety and risk management to ensure proper function of medical equipment and case studies</li> </ul> <p>Engineering principles, clinical applications, preventive maintenance, calibration and safety issues related to a range of common medical equipment will be used to achieve the objectives of this course, such as infusion devices, baby incubators, respiratory and pulmonary machines, anesthetic machines, electrosurgery equipment, biomedical lasers, hemodialysis machines, radiation therapy machines, nuclear radiation detection systems, etc.</p>																																																										
<b>Teaching and Learning Methodology</b>	Lectures, specialty seminar and small labs / demonstrations																																																										
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	<table border="1" data-bbox="483 1073 1445 1556"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="8">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> <th></th> </tr> </thead> <tbody> <tr> <td>Assignments</td> <td>40 %</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Mini-project</td> <td>30 %</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Quizzes</td> <td>30 %</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p><i>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</i></p> <p>Different assignments (assignment/tutorial/ mid-term quiz/test) (20+20%) will be used to guide the students toward the learning objectives of the subject contents.</p> <p>The Mini- project is used to facilitate students in applying learned knowledge to solve real-life problems. Students are expected to demonstrate their understanding of related knowledge through the mini project presentation (30%) and the final quiz (30%)</p>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)								a	b	c	d	e	f	g		Assignments	40 %	√	√	√	√	√	√	√		Mini-project	30 %	√	√	√		√	√			Quizzes	30 %	√	√	√	√	√	√	√		Total	100%								
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<b>Student Study Effort Required</b>	Class contact:	
	▪ Lectures / Specialty seminars	21 Hrs.
	▪ Practical / Equipment Workshops	15 Hrs.
	▪ Presentation	3 Hrs.
	▪ Self-study and other student study effort	78 Hrs.
	Total student study effort	117 Hrs.
<b>Reading List and References</b>	<p><b><u>Textbook/References</u></b></p> <ul style="list-style-type: none"> <li>▪ Medical Equipment Maintenance: Management and Oversight (Synthesis Lectures on Biomedical Engineering) 1st Edition by Binseng Wang 2012</li> <li>▪ Clinical Engineering: A Handbook for Clinical and Biomedical Engineers 1st Edition by Azzam Taktak (Editor), Paul Ganney (Editor), David Long (Editor) Academic Press; 1st edition (January 24, 2014)</li> <li>▪ Clinical Engineering: From Devices to Systems, Roberto Miniati, Ernesto Iadanza, FABRIZIO DORI, Academic Press, 23 Dec 2015</li> <li>▪ Clinical Engineering Handbook 2nd Edition - December 4, 2019, Elsevier Academic Press, Editor: Ernesto Iadanza</li> </ul>	
<b>Date of Last Major Revision</b>	15 May 2018	
<b>Date of Last Minor Update</b>	20 December 2022	