

## Subject Description Form

Subject Code	<b>BSE2502</b>
Subject Title	<b>Operation and Maintenance</b>
Credit Value	3
Level	2
Pre-requisite Co-requisite Exclusion	BSE2202 Air Conditioning II, BSE2101 Electrical Installations I Nil Nil
Objectives	<ol style="list-style-type: none"> <li>1. To introduce the regulations, codes of practice and common rules in relation to maintenance of building services.</li> <li>2. To enhance knowledge and understanding of the general principles of the operation and maintenance of building services.</li> <li>3. To develop the skills to select and apply appropriate operation and maintenance procedures for building services.</li> </ol>
Intended Learning Outcomes	<p>Upon completion of this subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a) set aims and objectives for maintenance programmes for all mechanical and electrical services, based on a good understanding of buildings in use and applicable regulations and codes;</li> <li>b) identify, investigate and to propose appropriate solutions to O&amp;M problems;</li> <li>c) conduct basic engineering economic calculations to inform decision making for O&amp;M issues;</li> <li>d) prepare appropriate O&amp;M data sheets, instructions, programmes, labour and material schedules;</li> <li>e) able to describe the function of a maintenance organization and the roles of its staff, and to select appropriate contracting systems for managing O&amp;M; and</li> <li>f) able to communicate effectively both orally and in writing with regard to O&amp;M issues.</li> </ol>
Subject Synopsis/ Indicative Syllabus	<p><b>Purpose of a building in use:</b> Purpose of a development, buildings as a long term investment, building life, building services life, importance of operation and maintenance. Concept of continuous commissioning of building services systems, maintainability, ease of inspection, in-situ testing.</p> <p><b>Reliability:</b> Introduction to reliability engineering, mean time between failures, availability, back up and standby provision.</p> <p><b>Terotechnology:</b> The concept of terotechnology and life cycle costing applied to building services design, installation, operation and maintenance.</p> <p><b>Statutory requirements:</b> Health, safety and environmental issues, legislation and legal liabilities, codes of practice, statutory and voluntary maintenance,.</p> <p><b>Designing for operation and maintenance:</b> Design for maintenance, roles of the project team, maintenance facilities for services, space utilisation, ergonomic, access for testing, maintenance and replacement.</p> <p><b>O&amp;M planning and execution:</b> Maintenance objectives and strategy, maintenance organization, planning and execution. Duties of O&amp;M practitioners, operation and maintenance contracts, Information and database for operation and maintenance of building services, budgetary control, inventory control.</p> <p><b>BMS applications and condition monitoring:</b> Application of building management system to O&amp;M, condition-based maintenance of building services, condition monitoring principles and techniques.</p> <p><b>Building refurbishment:</b> Review of authority requirements during life span of building, retrofitting, rehabilitation and refurbishment. Fitting out for flexibility in the future, adapting to change of use, access and equipment removal consideration.</p>
Teaching/Learning Methodology	<p>Students will review operation and maintenance (O&amp;M) requirements for buildings, existing practices, and recommended design, commissioning and O&amp;M codes. Appreciation of good O&amp;M practices and identification of problem areas will be through fieldwork visits of building services plant rooms. Mini projects will focus on understanding O &amp; M processes, failure of systems and remedial measures, etc. More interactive discussions will take place in tutorials, where students will discuss the subjects based on previous lectures and self-study. This subject is integrated with the design project.</p>

Assessment Methods in Alignment with Intended Learning Outcomes	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
			a	b	c	d	e	f
	Closed book test	40	✓		✓			
	Project	30	✓	✓	✓	✓	✓	
	Seminar Presentation	30		✓				✓
Total	100							
	<p>The closed book test will allow students to demonstrate their knowledge of O&amp;M fundamentals such as regulations, codes of practice and procedures. In addition students can demonstrate their ability to perform basic calculations relevant to decision making in O&amp;M.</p> <p>A typical example of project work is the planning and provisions for O&amp;M in plant rooms, either in the design project building or a visited plant room. By undertaking such work, students can apply their knowledge of O&amp;M to an actual case study and to propose solutions to problems that they will encounter.</p> <p>The seminar presentation allows students to develop their group working skills and verbal communication. Presentations will be related to a mini project and may involve role play, for example, playing the role of a consultant engineer reporting to the client to justify a proposed O&amp;M strategy.</p>							
Student Study Effort Expected	Class contact:		39 Hrs.					
	▪	Lecture	22 Hrs.					
	▪	Tutorial	9 Hrs.					
	▪	Seminar	4 Hrs.					
	▪	Fieldwork	2 Hrs.					
	▪	Assessment	2 Hrs.					
	Other student study effort:							
	▪	Self-study	36 Hrs.					
	▪	Project and seminar work	20 Hrs.					
	▪	Test preparation	25 Hrs.					
	Total student study effort		120 Hrs.					
Reading List and References	<p>ASHRAE, Guideline 4-2008 (RA2013), Preparation of Operating and Maintenance Documentation for Building Systems, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta GA. 2008.</p> <p>CIBSE, Guide M. Maintenance engineering and management, Chartered Institute of Building Services Engineers, London. 2014. [QRT TH 7225.C5 v.M 2014].</p> <p>Harris J., Maintenance for building services: how to acquire maintenance services contracts, Building Services Research and Information Association, Bracknell, 2008. [QRT TH3351 .H372 2008].</p> <p>Schoen, L. E., Preventive maintenance and building operation efficiency, Building Owners and Managers Association (BOMA) International, Washington. 2010. [TH 3351.S34 2010].</p>							