

Subject Description Form

Subject Code	BSE2502
Subject Title	Operation and Maintenance
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"> 1. To introduce the regulations, codes of practice and common rules in relation to maintenance of building services. 2. To enhance knowledge and understanding of the general principles of the operation and maintenance of building services. 3. To develop the skills to select and apply appropriate operation and maintenance procedures for building services.
Intended Learning Outcomes	<p>Upon completion of this subject, students will be able to:</p> <ol style="list-style-type: none"> 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; b) identify, investigate and to propose appropriate solutions to O&M problems; c) conduct basic engineering economic calculations to inform decision making for O&M issues; d) prepare appropriate O&M data sheets, instructions, programmes, labour and material schedules; 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&M; and f) able to communicate effectively both orally and in writing with regard to O&M issues.
Subject Synopsis/ Indicative Syllabus	<p>Purpose of a building in use: 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>Reliability: Introduction to reliability engineering, mean time between failures, availability, back up and standby provision.</p> <p>Terotechnology: The concept of terotechnology and life cycle costing applied to building services design, installation, operation and maintenance.</p> <p>Statutory requirements: Health, safety and environmental issues, legislation and legal liabilities, codes of practice, statutory and voluntary maintenance,.</p> <p>Designing for operation and maintenance: Design for maintenance, roles of the project team, maintenance facilities for services, space utilisation, ergonomic, access for testing, maintenance and replacement.</p> <p>O&M planning and execution: Maintenance objectives and strategy, maintenance organization, planning and execution. Duties of O&M practitioners, operation and maintenance contracts, Information and database for operation and maintenance of building services, budgetary control, inventory control.</p> <p>BMS applications and condition monitoring: Application of building management system to O&M, condition-based maintenance of building services, condition monitoring principles and techniques.</p> <p>Building refurbishment: 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&M) requirements for buildings, existing practices, and recommended design, commissioning and O&M codes. Appreciation of good O&M practices and identification of problem areas will be through fieldwork visits of building services plant rooms. Mini projects will focus on understanding O & 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&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&M.</p> <p>A typical example of project work is the planning and provisions for O&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&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&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>							