

Subject Description Form

Subject Code	BSE532
Subject Title	Fire Engineering Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To equip the students with an in-depth and up-to-date knowledge of fire engineering systems based on a rational and critical analysis of the systems.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. have a clear understanding of the role of fire engineering systems in fire safety design; b. identify and evaluate the design and operating principles of different types of fire engineering systems used in the building services industry; c. appreciate the merit and limitations of various types of fire engineering systems under different fire scenarios; d. understand the code requirement of fire engineering systems; e. conduct basic fire engineering system design with rational and critical analysis.
Subject Synopsis/ Indicative Syllabus	<p>Introduction to active protection systems: Extinguishing mechanism of water jet and spray, sprinkler systems, water droplet sizes, cooling and entrainment, interaction of water-based system with smoke layer, carbon dioxide and halon systems.</p> <p>Water-based fire engineering systems: A critical analysis on the application, design, installation, operation, and maintenance of fire hydrant/hose reel systems.</p> <p>Fire hydrant & Hose reel systems; Sprinkler systems; Thermal responses of sprinkler heads; Water mist; Drencher systems.</p> <p>Total flooding gas protection systems: A critical analysis on application, design, installation such as Halon substitutes systems, carbon dioxide systems and dry powder systems.</p> <p>Basic engineering science of gas systems; Inhibition; Fire extinction theories of gaseous extinguishing agents and dry powders.</p> <p>Smoke management systems: Requirements of smoke extraction, dynamics and static systems, staircase pressurization, critical review of the principles, equations, design guides, codes of practice etc, hot smoke tests.</p> <p>Fire detection and alarm systems: Fire detection systems, fire communication systems and false alarm; System control, operation and maintenance of fire engineering systems; System reliability.</p>

Teaching/Learning Methodology	<ul style="list-style-type: none"> • Lectures and seminars • Student seminars and tutorials • Laboratory 																																												
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1" data-bbox="443 349 1469 786"> <thead> <tr> <th data-bbox="443 349 772 546" rowspan="2">Specific assessment methods/tasks</th> <th data-bbox="777 349 927 546" rowspan="2">% weighting</th> <th colspan="6" data-bbox="932 349 1469 479">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th data-bbox="932 486 1018 546">a.</th> <th data-bbox="1023 486 1109 546">b.</th> <th data-bbox="1114 486 1200 546">c.</th> <th data-bbox="1204 486 1291 546">d.</th> <th data-bbox="1295 486 1382 546">e.</th> <th data-bbox="1386 486 1469 546"></th> </tr> </thead> <tbody> <tr> <td data-bbox="443 553 772 613">1. Examination</td> <td data-bbox="777 553 927 613">60%</td> <td data-bbox="932 553 1018 613">✓</td> <td data-bbox="1023 553 1109 613">✓</td> <td data-bbox="1114 553 1200 613">✓</td> <td data-bbox="1204 553 1291 613">✓</td> <td data-bbox="1295 553 1382 613"></td> <td data-bbox="1386 553 1469 613"></td> </tr> <tr> <td data-bbox="443 620 772 712">2. Continuous assessment</td> <td data-bbox="777 620 927 712">40%</td> <td data-bbox="932 620 1018 712"></td> <td data-bbox="1023 620 1109 712">✓</td> <td data-bbox="1114 620 1200 712"></td> <td data-bbox="1204 620 1291 712"></td> <td data-bbox="1295 620 1382 712">✓</td> <td data-bbox="1386 620 1469 712"></td> </tr> <tr> <td data-bbox="443 719 772 786">Total</td> <td data-bbox="777 719 927 786">100%</td> <td colspan="6" data-bbox="932 719 1469 786"></td> </tr> </tbody> </table> <p data-bbox="443 801 1469 869">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p data-bbox="443 902 1469 1003">Based on examination mark (60%) and continuous assessment mark (40%). The continuous assessment consists of course work, seminar, laboratory report and case study.</p> <p data-bbox="443 1037 619 1070">Tutorial Work</p> <p data-bbox="443 1104 1469 1171">Tutorials will be conducted with aids of demonstrations, discussions on published papers and problem solving based on examination type questions.</p>							Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						a.	b.	c.	d.	e.		1. Examination	60%	✓	✓	✓	✓			2. Continuous assessment	40%		✓			✓		Total	100%						
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Reading List and References	<p data-bbox="443 1205 1469 1339">Chow, W.K. & Dong, X. (2014). Legislation, Codes of Practice and Standards in Hong Kong and Mainland China. In: Stollard, P. (Editor). <i>Fire from First Principles - A Design Guide to International Building Fire Safety</i>, 4th Ed., Chapter 10, London; New York: Routledge/Taylor & Francis Group.</p> <p data-bbox="443 1373 1469 1507">Fire Services Department (2012). <i>Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection and Testing and Maintenance of Installations and Equipment</i>, Hong Kong: Fire Services Department, Hong Kong SAR Government.</p> <p data-bbox="443 1541 1469 1630">Fire Services Department (2016). <i>Guidelines on Formulation of Fire Safety Requirements for New Railway Infrastructures</i>, Hong Kong: Fire Services Department, Hong Kong SAR Government.</p> <p data-bbox="443 1664 1469 1765">Hurley M.J. et al. (Editor) (2016). <i>SFPE Handbook of Fire Protection Engineering</i>, 5th Ed., Quincy, MA, Society of Fire Protection Engineers, Boston, MA, USA.</p> <p data-bbox="443 1798 1469 1899">Klote, J.H. & Milke, J.A. (2002). <i>Principles of Smoke Management</i>, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA, Society of Fire Protection Engineers, Boston, MA, USA.</p> <p data-bbox="443 1933 1469 2000">National Fire Protection Association (2008). <i>Fire Protection Handbook</i>, 20th Ed., Quincy, MA, USA.</p> <p data-bbox="443 2033 1469 2101"><i>NFPA 92 (2018). Standard for Smoke Control Systems</i>, National Fire Protection Association, Quincy, MA, USA.</p>																																												

NFPA 2001 (2018). Standard on Clean Agent Fire Extinguishing Systems, National Fire Protection Association, Quincy, MA, USA.

Wang, X.S., Chow, W.K. & Wu M. (2008-2009). A Review on Determining Water Spray Droplet Characteristics by Laser Techniques. *Journal of Applied Fire Science*, Vol. 18, No. 3, p. 211-239.