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	Upon completion of the subject, students will be able to: 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	**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. **Water-based fire engineering systems:** A critical analysis on the application, design, installation, operation, and maintenance of fire hydrant/hose reel systems. Fire hydrant & Hose reel systems; Sprinkler systems; Thermal responses of sprinkler heads; Water mist; Drencher systems. **Total flooding gas protection systems:** A critical analysis on application, design, installation such as Halon substitutes systems, carbon dioxide systems and dry powder systems. Basic engineering science of gas systems; Inhibition; Fire extinction theories of gaseous extinguishing agents and dry powders. **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. **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.

Teaching/Learning Methodology

- Lectures and seminars
- Student assignments
- Laboratory

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.	
1. Examination	60%	✓	✓	✓	✓	✓	
2. Continuous assessment	40%	✓	✓	✓	✓		
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Based on examination mark (60%) and continuous assessment mark (40%). The continuous assessment consists of laboratory report and assignment.

Tutorials are conducted with aids of demonstrations, discussions on published papers and problem solving based on examination type questions.

Reading List and References

Chow, W.K. & Dong, X. (2014). Legislation, Codes of Practice and Standards in Hong Kong and Mainland China. In: Stollard, P. (Editor). *Fire from First Principles - A Design Guide to International Building Fire Safety*, 4th Ed., Chapter 10, London; New York: Routledge/Taylor & Francis Group.

Fire Services Department (2012). *Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection and Testing and Maintenance of Installations and Equipment*, Hong Kong: Fire Services Department, Hong Kong SAR Government.

Fire Services Department (2016). *Guidelines on Formulation of Fire Safety Requirements for New Railway Infrastructures,* Hong Kong: Fire Services Department, Hong Kong SAR Government.

Hurley M.J. et al. (Editor) (2016). *SFPE Handbook of Fire Protection Engineering*, 5th Ed., Quincy, MA, Society of Fire Protection Engineers, Boston, MA, USA.

Klote, J.H. & Milke, J.A. (2002). *Principles of Smoke Management*, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA, Society of Fire Protection Engineers, Boston, MA, USA.

National Fire Protection Association (2008). *Fire Protection Handbook*, 20th Ed., Quincy, MA, USA.

NFPA 92 (2018). Standard for Smoke Control Systems, National Fire Protection Association, Quincy, MA, USA.

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. BS EN 12845:2015+A1:2019, Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance.