Subject Description Form

Subject Code	BSE332
Subject Title	Fire Services
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	BSE2214 HVACR Fundamentals II or BSE2280 HVACR Fundamentals
Objectives	The subject aims to enable students to: • use codes of practices for fire engineering designs; • design basic water-based fire engineering systems for buildings in Hong Kong; • design gas protection systems; • design fire detection and alarm systems; and • understand basic passive protection systems in buildings.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) design basic fire services systems for buildings; (b) understand and appraise the governing legislation, rules and codes of practices related to the fire services systems; and (c) link relevant fundaments with practical design and make rational choices of the systems, materials and equipment based on both economics and performance.
Subject Synopsis/ Indicative Syllabus	**Introduction to building fires and fire services systems:** Fundamental concepts of fire, fire triangle, properties of fuel, fire load, fire extinguishing mechanisms, fire fighting agents, fire process, ignition, fire growth, flashover, and heat transfer. **Fire safety provisions and code requirements:** Laws of Hong Kong, building regulations, provisions of fire service installations, codes of practice for means of escape, fire resisting construction, means of access for fire fighting and rescue. **Water-based systems:** Sprinkler heads, sprinkler systems, fire hydrant and hose reel systems. Stand-pipe, wet, dry, pre-action, drencher, and water mist systems, etc. System components, source of water supply, design hazard classifications, water discharge density, pipe sizing methods, pump duty, system pressure and flow characteristics, high-rise systems, operation and maintenance, and case studies. **Gas protection systems:** Halon and halon alternatives, CO_2 systems, FM200 systems, system components and layouts, operation and maintenance. **Fire detection and alarm systems:** Selection of detectors, components and layouts, cross zoning, beam detection systems, application of codes and design guides, and audibility of fire alarm. **Passive fire protection systems:** Design of passive fire safety measures. Fire resistance and fire resisting construction, compartmentation, building evacuation, means of access for fire-fighting, and refuge floor.

Teaching/Learning Methodology

Teaching approach includes lectures, tutorials, in-class assessment, student-based seminars/ case studies, laboratory work and examination to facilitate learning. Designs of fire services systems, applications of technical data, regulations, standards and guidance notes prepared by various statutory bodies and others will be discussed in lectures with all intended learning outcomes to be achieved.

Tutorials will be used to support lectures, including discussions on problem areas and on solving tutorial questions. Student participation is expected in solving selected examples in tutorial work, including examination questions and longer open-ended problems. In addition, visual aids such as films and slides will be shown and discussion will be held during tutorials in order to develop a better understanding of the subject. These will facilitate learning to achieve all intended learning outcomes.

Related design work on automatic sprinkler systems, fire hydrant and hose reel systems, fire detection and automatic fire alarm systems will be included. Assignment work includes problem solving and in-class assessment which will evaluate student's understanding of the knowledge being taught. Student-based seminars and examination will also achieve all the intended learning outcomes.

Related laboratory work is an integral part of this subject, to serve as a vehicle for contrasting theory with practice, and provide students familiarity with equipment and testing techniques. Laboratory sessions will be jointly organized together with other technical subjects of the programme, but will be assessed as part of this subject. Topics include investigation of the characteristics of water mist system, use of thermocouple in fire engineering, smoke movement using water models, conventional and addressable fire alarm systems. Laboratory work mainly helps to achieve the intended learning outcome on designing the basic fire services systems for buildings.

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			
1. In-class assessment	10	✓	✓				
2. Student-based seminar	10	✓	✓	✓			
3. Laboratory work	10	✓					
4. Examination	70	✓	✓	✓			
Total	100 %						

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

1. In-class assessment, usually in the format of closed book test, is delivered with questions to evaluate the students' understanding on fire basic, passive and active fire safety design for buildings, fire detection and alarm systems and sprinkler system design etc. The intended learning outcomes (a) and (b) can be achieved through this assessment.

2. Student-based seminars on fire engineering system design and performance evaluation with group presentation and group report submission is to ensure that students can achieve critical thinking and all-roundedness with professional competence defined by the programme outcomes. Seminars will facilitate learning and achieve all intended learning outcomes.

3. Laboratory sessions allow students to understand how to design fire protection systems. Intended learning outcome, in particular (a) will be achieved.

4. Examination is the final assessment for students to ensure their understanding and learning abilities. All intended subject learning outcomes will be achieved.

Student Study Effort Expected	Class contact:	
	• Lecture and seminar	30Hrs.
	• Tutorial	7Hrs.
	• Laboratory	9Hrs.
	• In class assessment	2Hrs.
	Other student study effort:	
	• Self study, laboratory reports, seminar assessment and exam preparation etc.	72Hrs.
	Total student study effort	120Hrs.
Reading List and References	Buildings Ordinance and Regulations, Laws of Hong Kong, Hong Kong Special Administrative Region (HKSAR). Code of Practice for Fire Resisting Construction, Building Authority, Hong Kong, 1996. Code of Practice for the Provision of Means of Access for Firefighting and Rescue, Buildings Department, Hong Kong, 2004. Code of Practice for the Provision of Means of Escape in Case of Fire, Building Authority, Hong Kong, 1996. Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment, Fire Services Department (FSD), HKSAR, 2005. Chartered Institution of Building Services Engineers (CIBSE) Guide E: Fire Safety Engineering, CIBSE, London, UK, 2010. Fire Protection Handbook, 20th Edition, National Fire Protection Association (NFPA), Quincy, USA, 2008. Laws of Hong Kong with Ordinance and the Sub-leg Regulations, HKSAR. List of FSD Circular Letters, especially No. 3/2006 and No, 1/2009, http://www.hkfsd.gov.hk/home/eng/circular.html. Loss Prevention Council LPC Rules for Automatic Sprinklers Installations Incorporating British Standard BS EN 12845:2003 – Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance, LPC, UK, 2003. Sturges, J.L., Fire safety and buildings, Blackwell Science, 2003.	