Subject Description Form

Subject Code	**BSE1D03**
Subject Title	**Intelligent Building and Associated Fire Safety**
Credit Value	3
Level	1
Pre-requisite Co-requisite Exclusion	Nil Nil Nil
Objectives	The specific objective of this subject is to enlighten students on the fundamentals of fire science and giving them a brief appreciation to fire engineering systems. Students will be equipped with the ability to apply interdisciplinary approach to understanding intelligent technologies used in modern buildings. Fire incidents will also be discussed to reinforce their understanding on the actual causes of fire. Through the learning activities, the subject aims at achieving the following overall objectives of GURs: • Expansion of intellectual capacity and interdisciplinary learning • Safety awareness, self understanding and interpersonal skills • Critical and creative thinking and problem solving skills • Global outlook and lifelong learning
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) understand the cause of a fire and fire science; (b) know the basic fire engineering systems and the physics behind; (c) describe major features of intelligent buildings from the four elements: places, processes, people and management; (d) understand relationships between people and buildings; (e) discuss science background of intelligent buildings and sustainable buildings; and (f) aware of the importance of fire precaution. The stated learning outcomes relate to the following three essential features of GUR subjects are explained as follows: • Literacy (substantial reading & extensive writing): Students have to be literate for them to describe the nature of fire, basic fire services installations, fire precaution in their daily lives, building intelligence and appreciate up-to-date technologies in buildings. • Higher order thinking (systematic, critical, and creative thinking): This is embedded in all intended learning outcomes. • Skills for life-long learning (active enquiry, learning to learn activities): From this subject, students will deeply understand that science and technology is changing with each passing day and it exerts influences on our everyday life. Achieving the above learning outcomes will enable students to increase awareness to the impact of fire to people and environment, learn the importance of fire precautions and update new practice on fire safety throughout their lives.
Subject Synopsis/ Indicative Syllabus	<u>Subject Synopsis</u> Fire is the common enemy in everyday life experience and in the workplace. Many big fire incidents happen from time to time and cause tremendous loss in human lives and property. With the advance of modern building technology, lots of intelligent buildings were developed. These intelligent buildings are dynamic and responsive architectures that provide every occupant with productive, cost effective and environmentally approved conditions through a continuous interaction among its four basic elements: places (fabric; structure; facilities): processes (automation; control; systems): people

	(services; users) and management (design; construction; performance) and the inter-relationship between them. The electronic equipment in intelligent buildings is very vulnerable to fire. Therefore, fire safety issue is one of the important aspects in the development of these intelligent buildings. This subject is to equip students with basic fire fundamentals, including simple calculation of fire size and air flow direction, and the ability to apply interdisciplinary approach to understanding intelligent technologies used in modern buildings. Awareness of different fire engineering systems is necessary for students. <u>Indicative Syllabus</u> 1. Basic concept of intelligent buildings (1 week) Basic terminologies, major features of intelligent buildings, intelligent design and façade. Relationships between human behavior and buildings. 2. Intelligent building technologies and systems (2 weeks) Building automation systems, major components and functions, information technology and network. Digital controller, automatic control fundamentals, control loops and smart sensors. 3. Scientific background of developing intelligent buildings (3 weeks) Introduction to heating, ventilation and air conditioning system, energy efficiency, thermal comfort and building energy management. Security and access control technologies and system. Lighting system and their integration. 4. Cause of a fire, basic concept of fire phenomenon and fire science (1 week) Ignition, heat transfer mechanisms from fire such as conduction, convection and radiation. 5. Fire fundamentals in big fire incidents in buildings (1 week) Terminologies to building fire, fire triangle, fire stages, flashover and compartment fire. 6. Fire precaution measures based on fire physics (2 weeks) Control of heat source and fire load. Smoke and ventilation. 7. Scientific background of fire engineering systems and basic firefighting measures (1 week) Different suppression mechanism such as cooling, oxygen starvation and control of fire load. 8. Public awareness (1 week) How to alert the people on fire safety issues.
Teaching/Learning Methodology	Teaching approach includes lectures, tutorials, laboratory visit, seminar group report and presentation and end-of-semester examination to facilitate learning to achieve all the intended learning outcomes. Lectures will be used to deliver fundamental knowledge of theories and facts. Tutorials will provide opportunities for discussion of lecture materials and they will be conducted in the form of problem-solving sessions to supplement understanding of the subject. Visit to the Intelligent Building Laboratory will be arranged for students. In order to facilitate higher order of thinking of students, coursework assignment in the form of student-based seminars with presentation and report submission will be set. End-of-semester examination will evaluate students' understanding of the knowledge being taught. Independent study by students, such as literature and information searching, is required to achieve all the intended learning outcomes.
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
1. Laboratory visit reports	25			✓	✓	✓	
2. Student-based seminars/ Case study	25	✓	✓				✓
3. End-of-semester examination	50	✓	✓	✓	✓	✓	✓
Total	100 %						

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: The students will be assessed with two continuous assessment components, i.e. lab visit reports and student-based seminars, and a final examination at the end of the semester. Students in groups are required to submit an Intelligent Building laboratory visit report. Building automation system, the definitions and features of intelligent building, the relationship between people and buildings and how intelligent building technologies can contribute to improve the relationship should be discussed. The laboratory report will help to achieve the intended learning outcomes, in particular (c), (d) and (e). The students will be asked to demonstrate logical thinking and reasoning by searching for information, conduct site-visiting and site measurements, carrying out analysis, comparing cases related to fire safety and presenting their findings. These student-based seminars/ case studies with presentation and report submission will facilitate learning to achieve all intended learning outcomes, in particular (a), (b) and (f). The final examination will consolidate students' learning in lectures, tutorials, laboratories and seminars/ case studies. It is most appropriate to achieve all the intended learning outcomes.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Lab visit/ Tutorial/ Seminar/ Case study	13 Hrs.
	Other student study effort:	
	▪ Preparation for seminar/ case study (about 2.7 hrs. of writing per week)	35 Hrs.
	▪ Self study (about 3.5 hrs. of reading per week)	46 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	ASHRAE, ASHRAE Handbook – HVAC Applications: Operation and Management, 2015. Boed V. Networking and Integration of Facilities Automation Systems, CRC Press, 2000. Burke, R. Fire Protection: systems and response. Boca Raton: CRC Press, 2007 Clements-Croome, D.J. Intelligent Buildings: design, management and operation. Thomas Telford, 2004. Fire service features of buildings and fire protection systems. Washington, D.C.: OSHA 3256-09R, U.S. Department of Labor, 2015. Jones, A.M. Jr. Fire protection systems. Jones & Bartlett Publisher, Inc., 2016. Klinoff, R.W. Introduction to fire protection, 4th Edition. Clifton Park, N.Y.: Delmar; Andover: Cengage Learning, 2012. Quintiere, J.G. Principles of fire behavior, 2nd Edition. Boca Raton: CRC Press/Taylor & Francis, 2017. So T.P. and CHAN W.L. Intelligent Building Systems, Kluwer Academic, 1999. Wang S.W. Automatic Control Fundamentals for Building Services Engineering, Department of Building Services Engineering, The Hong Kong Polytechnic University, 1996. Wang S.W. Intelligent Building and Building Automation, Spon Press (Taylor & Francis), London and New York, November 2009.	