Subject Description Form

Subject Code	EE4012 / EE4012A
Subject Title	Intelligent Buildings
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE4012: EE3009 Pre-requisite for EE4012A: EE3009A
Objectives	1. To enable students to establish a broad knowledge on the concepts of intelligent buildings. 2. To enable students to describe on how intelligence of a building can be achieved by integration and optimization of building structure, services systems, information technology, management and valued-added services. 3. To enable students to describe basic features of an intelligent building and the required services system to support these features. 4. To enable students to describe the operation principle and characteristics of various service systems/technologies of an intelligent buildings; such as the building automation system, intelligent vertical transportation systems, communications, structured cabling and etc. 5. To enable student to describe the impacts these services systems/ technologies on the building and people.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify benefits, impacts and driving forces of intelligent buildings, and its subsystems; understand the concepts of Building Information Modelling. b. Describe design philosophy at system level, system configurations, system sub-modules of vertical modern vertical transportation systems and building automation systems, including the out-stations, etc. c. Describe general design concept and principles of communication systems in intelligent building, such as voice communication system, video communication systems, LAN, wireless LAN, data networks, office automation systems, etc. d. Describe the general principle, concepts and system configurations of structure cabling, including the features, characteristics and applications of different categories of cables. e. Given a technical topic related to the subject, carry out literature search and present the findings in a technical report.
Subject Synopsis/ Indicative Syllabus	1. ***Intelligent building characteristics*:** Features and benefits of intelligent buildings. The anatomy of intelligent buildings. Environmental aspect. The marketplace and other driving forces behind the emergence of intelligent buildings. Upgraded design of electrical distribution systems for intelligent buildings (6 hours) 2. ***Building automation systems & controls*:** Philosophy, system configuration, system modules, distributed systems and on-line measurements. Fire protection, security and energy management. Control objectives. Sensors, controllers and actuators. Control system schematics, system design, and internal elements of outstations. Microprocessor based controllers & digital controls. Examples of sub-systems such as: Digital Addressable Lighting Interface (DALI) (10 hours)

3. ***Modern intelligent vertical transportation systems:*** Sky lobby, double-deck lifts, twin lifts, advanced call registration systems, large scale monitoring systems, applications of artificial intelligence in supervisory control, energy saving measures related to lift systems/escalator systems, other modern vertical transportation systems, such as: gondola systems, materials handling systems, etc. (6 hours)
4. ***Communication and security systems*****:** Voice communication systems, local area network, wireless LAN, Digital TV, CCTV, and CABD. SMATV. Public address/sound reinforcement systems. Digital public address system. Modern security systems (8 hours)
5. ***Structured cabling systems*****:** Characteristics and benefits. Standards, configurations and physical media. EMI/EMC issues, grounding problems. System design. Different Categories of cables. (3 hours)
6. ***Building information Modelling (BIM)***: Concept of BIM, its features and benefits. Levels and Dimensions of BIM, Its applications in (Mechanical & Electrical Plants) MEP of buildings. Case studies. (3 hours)
7. ***Integrating the technologies and systems*****:** The impact of information technology on buildings and people. Interaction and integration between building structure, systems, services, management, control and information technology. (3 hours)

Case study:

International Financial Centre II, International Commerce Centre, Central Plaza and similar buildings.

Teaching/Learning Methodology

Lectures and tutorials are effective teaching methods:

1. To provide an overview or outline of the subject.
2. To introduce new concepts and knowledge to the students.
3. To explain difficult ideas and concepts of the subject.
4. To motivate and stimulate students' interest.
5. To provide students feedback in relation to their learning.

Mini-project works/Assignments are essential ingredients of this subject:

1. To supplement the lecturing materials.
2. To add real experience for the students.
3. To provide deep understanding of the subject.
4. To enable students to organize principle and challenge ideas.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	
Tutorials	✓	✓	✓	✓	
Mini-project					✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓	✓	
2. Class tests	18%		✓	✓	✓	
3. Assignments	11%	✓				✓
4. Mini-project	11%	✓				✓
Total	100%					

	The understanding on theoretical principle and practical considerations, analytical skills and problem solving technique will be evaluated. Examination, class tests and mini-project report are an integrated approach to validly assess students' performance with respect to the intended subject learning outcomes.	
Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	39 Hrs.
	Other student study effort:	
	▪ Mini-project/Assignments	20 Hrs.
	▪ Self-study	46 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	**Reference books:** 1. M Dastbaz, CA Gorse and A Moncastor, Building Information Modelling, Building Performance, Design and Smart Construction, Springer, 2017 2. Clements-Croome, Derek, Intelligent Buildings: An introduction, Routledge, 2014 3. Shengwei Wang, Intelligent Buildings and Building Automation, Spon Press, 2010 4. Jim Sinopoli, Smart Building Systems for Architectures, Owners and Builders, Elsevier, 2010 5. J.P. Guyer, An Introduction to Facility Security Systems (Building Secuirty Systems), 2018 6. O.V.G. Swathika, K. Karthikeyan, S. Padmanaban.; Smart Buildings Digitalization : IoT and Energy Efficient Smart Buildings Architecture and Applications, CRC Press, 2022 7. D. Clements-Croome, Intelligent Buildings: An Introduction, Routledge, 2014 8. A. Oliviero, Cabling [electronic resource]: The Complete Guide to Copper and Fiber-ooptic Networking, John Wiley & Sons, 2014 9. W.T. Grondzik, & A.G. Kwok, Mechanical and Electrical Equipment for Buildings, Wiley, 2015	