Subject Code	LSGI3613
Subject Title	**Construction & Maintenance of Utility Networks**
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The aims of this subject are: • To provide students with basic concepts of construction and operational management of utility construction and maintenance projects. • To enable students to develop their understanding of construction and operational management of utility system and their critical thinking through discussions on case studies through Building Information Modeling (BIM), understanding of contract document, tender bidding and role play in progress meeting of projects designed by students. • To give students the means to assess and manage the operation inherent to utility survey, construction and maintenance projects and operation of utility systems.
Intended Learning Outcomes	At the end of this subject students who gain a pass will be able to: 1. Design and plan necessary tasks and resources for construction and operational management of utility projects and systems in terms of design, surveying, construction and maintenance (L4). 2. Draft method statement and master program related to construction and operations of utility projects and systems (L4). 3. Control the time, quality, cost and environmental issues of utility construction, surveying and maintenance project under the roles as client, consultant, contractor and utility surveyor (L4). 4. Assess and control the risks that can occur during such a project (L4). 5. Construct utility systems according to Hong Kong Government and industry standards in Building Information Management (BIM) environment (L4) 6. Summarize, integrate and apply the knowledge gained in previous subjects (L4).
Subject Synopsis/ Indicative Syllabus	**A. Requirements of trench and trenchless construction and maintenance projects like dewatering and trench support.** Open-cut and trenchless replacement and rehabilitation of underground utilities, such as cured in-place pipe (CIPP), slip-lining, in-line replacement, close-fit, etc. **B. Material properties – mechanical properties (strength, modulus of elasticity, etc.) and durability (corrosion, carbonation, etc) of utility materials.** Observation and record of internal condition of manholes and pipe flow details, coding system and diagnosis of pipe structural health condition.

C. Basic Concept of Construction, Operational and Risk Management

Functions of different roles played in the industry, project planning, critical path analysis, centralized and district zoning of utility systems, network distribution, asset management, risk assessment, risk acceptance and mitigation, and risk control of utility systems.

D. Construction and Contract Management of Utility Survey, Construction and Maintenance projects in BIM environment

Different contract type, tender bidding, costing, drawings, schedule of rates, master program, general specifications, technical specifications, preamble, control of workflow.

Teaching/Learning Methodology

Lecture	Tutorial/ practical	Experiment	Field survey	Guest lecture	Site visit	On-line learning
✓	✓			✓	✓	

Concepts of construction, operational and risk management are presented during the lectures. Site visits to different utility undertakers will be arranged for better understanding of the subject in the industry.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		1	2	3	4	5	6
1. Mid-term test	20	✓	✓	✓	✓	✓	✓
2. Group project	30	✓					✓
3. Examination	50	✓		✓	✓	✓	✓
Total	100 %						

For the group project, students are required to make use of different stages of BIM to construct one of utility systems, i.e. water supplies, drainage and sewer, in a case-specific scenario in Hong Kong. Students are required to make close link between the general principles of utility construction and the proposed case-specific scenario to encourage critical thinking and avoid excessive reliance on Generative AI.

Student Study Effort Expected	Class contact:	
	▪ Lectures/tutorials/site visits	26 Hrs.
	▪ Tutorial/practical	26 Hrs.
	Other student study effort:	
	▪ Self-study, reading and revision	60 Hrs.
	Total student study effort	112 Hrs.
Reading List and References	1. Daniel W. Halpin, Bolivar A. Senior (2011). *Construction management* 4th Ed. Hoboken, NJ : J. Wiley & Sons. 2. Arun K. Deb, Frank M. Grablutz, Yakir J. Hasit and Jerry K. Snyder (2002). *Prioritizing water main replacement and rehabilitation* Denver, Colo: Awwa Research Foundation and American Water Works Association. 3. M. Armstrong (2006), *A Handbook of Management Techniques* 3rd, Part 2, Operational Management, Kogan Page. 4. W. Kent Muhlbauer (2004), *Pipeline Risk Management Manual* 3rd Ed, Elsevier. 5. K. Wong and R.J. Allan (2009) *Hong Kong Conduit Condition Evaluation Codes*, Utility Training Institute. 6. Water Resource Centre (2013). *Manual of Sewer Condition Classification 5th Edition (MSCC)*, 5th Ed. 7. ISO 19650 | BSI Hong Kong - BSI Group, https://www.bsigroup.com/en-HK/ 8. *The BIM management handbook*, Shepherd David, Newcastle upon Tyne : RIBA Publishing 2015, ISBN: 9780429347535 9. *BIM-Based Collaborative Building Process Management*, Daniotti Bruno; Pavan Alberto; Lupica Spagnolo Sonia; Caffi Vittorio; Pasini Daniela; Mirarchi Claudio, Cham: Springer International Publishing AG 2019, ISBN: 9783030328887 10. *BIM and Construction Management: Proven Tools, Methods, and Workflows*, Hardin Brad; McCool Dave, New York: John Wiley &Sons, Incorporated 2015, ISBN: 9781118942765 11. *BIM for Facility Managers, IFMA; Teicholz Paul, New York: Wiley 2013, ISBN: 9781118382813* 12. Construction Industry Council. (2021). *CIC BIM Standards for Underground Utilities (Version 2 – 2021)* 13. Construction Industry Council. (2021). *CIC BIM Dictionary 2021* 14. Construction Industry Council. (2020). *CIC BIM Standards - General (Version 2 - December 2020)*	