Subject Description Form

Subject Code	CSE40422
Subject Title	Infrastructure Management
Credit Value	3
Level	4
Pre-requisites / Exclusions	Pre-requisites: CSE303 Construction Management I or CSE30303 Construction Management Exclusions: CSE414 Construction Management II or CSE422 Infrastructure Management
Objectives	To provide students with basic knowledge related to the development and management of civil infrastructures. Students should be able to integrate the knowledge of civil engineering with consideration of practical management constraints, including feasibility study, life-cycle cost analysis, asset management, and performance of analysis and design within the environment, time, quality, and cost constraints.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (i) Apply life-cycle management techniques to the management of modern civil infrastructures with considerations of constraints in fiscal requirements, time requirements, and quality standards; (ii) Apply contemporary construction management knowledge in project delivery systems, innovative contracting and financing methods to infrastructure project development; (iii) Apply analytical techniques for critically analyzing infrastructure management related data in a practical setting and using the data to make managerial decisions; (iv) Apply computer-based techniques including Building Information Modelling (BIM) for project management, optimization, and simulation to cope with the complexities and uncertainties in managing infrastructure projects; (v) Develop critical thinking, lateral thinking, and systematic thinking in perceiving, understanding and solving practical infrastructure management problems; (vi) Develop basic mathematical, statistical, and modeling skills needed for evaluating engineering and management alternatives subject to technological, economic, environmental, and social constraints.
Subject Synopsis/ Indicative Syllabus	1. Economic Appraisal of Projects (3 weeks) Annual equivalent costs and present worth; discount cash flow and internal rate of return; inflation and depreciation, comparison of multiple alternatives; project feasibility study. 2. Decision Tools (2 weeks) Introduction to decision analysis tools such as AHP, ANP, goal programming, etc.

	3. Life-cycle Management of Infrastructure Systems with BIM (1 week) Analysis of the typical life-cycle of civil infrastructure systems using BIM and introduction to the concepts and techniques of asset management. 4. Infrastructure Performance Prediction (2 weeks) Performance prediction of infrastructure system through stochastic techniques. 5. Infrastructure Performance Monitoring, Maintenance, and Rehabilitation (1.5 weeks) Techniques for monitoring the performance of built infrastructures and development of management decisions in maintaining and rehabilitating infrastructures. 6. Infrastructure Project Delivery Systems and Financing (1.5 weeks) Introduction to different types of project delivery systems for infrastructure development and innovative financing schemes. 7. Quality Management (1 week) Basic concept; common methods used and their procedures, Quality Assurance, ISO9000, Total Quality Management. 8. Sustainability Considerations in Infrastructure Planning and Operation (1 week) Consideration of social, environmental, and economic dimensions in infrastructure planning and operation.
Teaching/Learning Methodology	Lectures will be delivered to serve as an introduction to the topics, to provide overview knowledge, and to define significant areas. Case studies, specific application of the knowledge will be demonstrated. Students will be given handouts on the main contents of the lectures and are required to read the relevant chapters in the recommended reference books as well as articles and research papers in related journals. Students will be provided with infrastructure dataset based on which they can perform various analyses.
Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		(i)	(ii)	(iii)	(iv)	(v)	(vi)
1. Coursework	30	√	√	√	√	√	√
3. Final Examination	70	√	√	√		√	√
Total	100 %						

	Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result. Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: Students will be assessed with two components: various assignments and a final examination at the end of the semester. During the course of this class, various assignments will be provided to assess students' learning outcomes of (i) to (vi). The examination will help students consolidate knowledge learned in lectures and tutorials and thus achieving intended learning outcomes of (i) to (vi).	
Student Study Effort Expected	Class contact:	Average hours per week
	▪ Lectures / Tutorials	3 Hrs.
	Other student study effort:	
	▪ Self Study	6 Hrs.
	Total student study effort	9 Hrs.
Reading List and References	Textbooks: "Engineering Economic Analysis" by Donald G. Newnan, Ted G. Eschenbach, and Jerome P. Lavelle, Oxford University Press; 13th edition, 2017. "BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors," by Rafael Sacks, Chuck Eastman, Ghang Lee, and Paul Teicholz, WILEY; 3nd edition, 2018. References: "Public Infrastructure Management: Tracking Assets and Increasing System Resiliency, " by Frederick Bloetscher, 2019. Journal of Management in Engineering, American Society of Civil Engineers Journal of Construction Engineering and Management, American Society of Civil Engineers. Journal of Infrastructure Systems, American Society of Civil Engineers.	