

Course Name	Lifetime Engineering for Civil Infrastructure		
Semester, Year	Second Semester, 2018 (Fall Term)	Number of Credits	2 credits
Course level	5000	Course Number	27101
Instructor(s) (Institution)	Hiroshi YOKOTA (大学院工学研究院)		
Course Objectives	Lifetime engineering deals with consistent management of civil infrastructure from commencing with the identification of the need until terminating with the decommissioning. This course outlines the basic concepts and methods of the life-cycle management including conceptual/basic design, detailed design including service life design, and maintenance and rehabilitation for civil infrastructure. Firstly, objectives, functions and performance requirements for infrastructure will be discussed including selection of types and materials, performance verification and service life prediction at the basic/conceptual and detailed design stages. Then, maintenance procedures after construction will be covered including inspection, prediction, assessment, and interventions. Finally, the management methodologies are focused on how structural performance is ensured with the coordination of design and maintenance and how decision is made on interventions. Life-cycle cost analysis and environmental impact analysis will be dealt with as the sustainability indicators for decision making. Through this course, students study how to practically manage our civil infrastructure considering its associated performance, risks and expenditures over their life cycle in order to realize more sustainability.		
Course Goals	Students acquire basic knowledge on ensuring structural performance of civil infrastructure during its design service life through service life design and maintenance after construction. Fundamental key technologies on structural design, service life design, and maintenance methodologies will be learnt, which should be applicable for practical work.		
Course Schedule	(1) Introduction to lifetime engineering (1 time): Concept of lifetime engineering for civil infrastructure (2) Performance of civil infrastructure (2 times): Objectives, functions and performance requirements of civil infrastructure (including one-day visit to a construction project site if a worth-visiting site is available) (3) Conceptual/basic design of structure (1 time): Performance-based design and procedure of design, and material selection (4) Detailed design (1 time): Design specifications, structural performance verification, and structural details (5) Service life design (2 times): Deterioration, durability design, environmental action, and prediction (6) Maintenance and rehabilitation (3 times): Assessment, inspection, evaluation, and intervention (7) Life-cycle management (3 times): Coordination of design and maintenance work, strategy of management with assessment, prediction, performance evaluation, life-cycle cost analysis, and benefit/cost evaluation (8) Environmental impact analysis (1 time): Life cycle assessment of CO2 emission, recycle, and reuse (9) Special topic (1 time): Any related hot topic		
Homework	Read through the handout before each class and make clear the points in each class (about 2 hours). After each class, review the handout together with new information acquired during lecture and discussion (about 2 hours). Refer to the note of Textbooks below.		
Grading System	Class activities including discussion, presentation and in-class reports (30%), assignment (20%), and final examination (50%). The assignment will evaluate the depth of understanding of the course topics and the final examination will evaluate basic knowledge and applied skill based on the basic knowledge on life cycle management.		
Textbooks / Reading List	Class handout will be delivered via email a few days before each class. In the handout, reference books, papers, websites, etc. may be indicated. These materials are sometimes useful for students to well understand the contents of respective classes. コンクリート構造物のサステナビリティ設計 ―地球環境と人間社会の不確実性への挑戦 堀 孝司・横田 弘 技報堂出版 2016		
Websites			
Website of Laboratory	<a href="http://www.eng.hokudai.ac.jp/labo/lifetime/index_e.html">http://www.eng.hokudai.ac.jp/labo/lifetime/index_e.html</a>		
Additional Information	PARE Core Cluster Subject		