
ライフサイクル特論 (Life Cycle of Structures)

種別・単位：講義・2単位（週1講時）

開講期：環境創生工学専攻・修士課程第2学期

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キーワード：Life cycle, Environmental action, Material deterioration mechanism, Material model, Structure model

主題と目標

Life cycle prediction of structures is necessary for structural design and maintenance of sustainable infrastructure. Once life cycle can be predicted, we can know the design way to prolong the life cycle of newly constructed structures and the proper way to maintain existing structures to achieve target life cycle. In order to know the life cycle we have to predict structural performance with deteriorated material under loadings. Through this course students study mechanism/model of deterioration, material/structure models under combined environmental actions and loadings and methods for structural analysis, which are related to prediction of life cycle of structures.

授業計画 項目（授業回数）／内容説明

- (1) Life cycle and structural performance (1 time)
Study chronological change of possessed structural performance and required performance in order to understand what is life cycle.
 - (2) Material deterioration mechanism and its modeling (9 times)
Study physical (including mechanical), chemical and biological deterioration mechanisms of materials, which cause chronological changes of possessed structural performances and their modeling.
 - * Chloride ion ingress with introduction of latest research paper (2 times)
 - * Carbonation with introduction of latest research paper (2 times)
 - * Alkali silica reaction (1 time)
 - * Freezing and thawing cycles with introduction of latest research paper (2 times)
 - * Cyclic and sustained loading with introduction of latest research paper (2 times)
 - (3) Material models with damages (3 times)
Study mechanical models of materials with consideration of their deterioration.
 - * Introduction of macro scale model of frost-damaged concrete (1 time)
 - * Introduction of meso scale model of frost-damaged concrete (1 time)
 - * Introduction of meso scale model of concrete with physical damages induced by loadings and freezing and thawing (1 time)
 - (4) Structural modeling, analysis and prediction of life cycle under environmental actions and loadings (1 time)
Study prediction method of life cycle of structures by applying the material mechanical/structural models in structural analysis.
 - * Introduction of analysis of structural performance of member with material deterioration (1 time)
 - (5) Special topic (1 time)
Study any related hot topic such as LCC (life cycle cost) and highly durable materials.
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評価・教材・受講条件

評価： Based on results of homework during the course (40%) and final examination (60%).

教材等： Handout is distributed and references are indicated in the handout. Other good references are as follows:

- (1) Model Code for Service Life Design, Bulletin 34, *fib*, 2006,
- (2) Subcommittee on English Translation of the Standard Specifications (Chairman and Editor: UEDA Tamon), "Standard Specifications for Concrete Structures – 2002 'Materials and Construction'", JSCE Guidelines for Concrete, JSCE, No.6, November 2005.
- (3) Subcommittee on English Translation of the Standard Specifications (Chairman and Editor: UEDA Tamon), "Standard Specifications for Concrete Structures – 2002 'Structural Performance Verification'", JSCE Guidelines for Concrete, JSCE, No.3, March 2005.
- (4) International Committee on Concrete Model Code for Asia (Chairman: UEDA Tamon), "Asian Concrete Model Code", International Committee on Concrete Model Code for Asia, June 2006.

受講条件： None