Course Code	**CIVL 4340**
Title of Course	Prestressed Concrete Design
Instructor	Dr. Barry KW Lee Dr.-Ing, MPhil, BEng, CEng, FICE Chief Resident Engineer, AECOM Adjunct Associate Professor, HKUST
Course catalog, description, prerequisites, and credit	This course focuses on design and detailing of prestressed concrete structures. It covers various prestressing methods, e.g. pre-tensioning, post-tensioning, partially prestressing, bonded, and unbonded tendons. Besides, the effects and behavior of prestressing member under creep, shrinkage and relaxation are discussed. Crack width control in partially prestressed members, ultimate moment and shear resistance capacity design of prestressing member are also covered in this course. <u>Prerequisite:</u> 1. Basic knowledge of concrete structures design 2. Structural Analysis
Textbook(s) and Reference books	1. Gilbert, R.I. and Mickleborough, N.C., Design of Prestressed Concrete to Eurocode 2 2. Edward G. Nawy, Prestressed Concrete: A Fundamental Approach 3. T. Y. Lin and Ned H. Burns, Design of Prestressed Concrete Structures
Course Objectives	Upon successful completion of this course, you should: 1. be capable to design and propose an appropriate prestressing system to a structural concrete member; 2. be able to understand and predict the behavior of prestressed concrete members; 3. be able to demonstrate the influence of time dependent effects on loss of prestressing of forces
Topics	1. Background of prestressed concrete 2. Introduction to basic principle of prestressed concrete 3. Materials' behavior a. Concrete b. Reinforcement Steel & Prestressing Steel 4. Materials' behavior according to Eurocode 5. Fundamental of Limit State Design 6. Loss of prestress force 7. Design for Serviceability Limit State 8. Design for Deflection 9. Ultimate Behavior 10. Design for shear and Torsion 11. Prestressing System and Design of Anchorage zones

Class Schedule	Lecture: 3 hours/week
Contribution to the professional component	100% engineering topics Design content: 3 hours
Relationship to program objectives	POE1 Provide students with professional skills in the design, construction and management of the civil infrastructure, as well as an awareness of environmental sustainability. This course included practical engineering design in civil engineering industry. POE3 Challenge students with research-type and open-ended design problems to stimulate self-learning and innovative problem solving skills. Design examples used in this course are open-ended with different alternative solutions. POE4 Expose students to real world engineering projects as well as cutting edge research to improve their understanding of the profession and technological advancements that can improve current practice. Current state of the art of prestressing industry are discussed in the course.
Relationship to program outcomes	PO4. Acquire an ability to apply modern engineering and IT tools effectively and efficiently for engineering analysis, design and communication Some of the design examples and assignment are based on excel spreadsheet in which the student can practice how the engineer work in the design office. PO5. Develop an ability to identify and formulate civil engineering problems, and propose feasible solutions with an appreciation of their underlying assumptions, uncertainties, constraints, and technical limitations Assignments and examinations are formulated in an open-ended type which allow the student to make assumptions when they are solving the problem. PO6. Develop technical competency to design civil engineering components and systems, with an understanding of the principles behind the design methodologies. This is the core object of this course and it is self-explanatory from the description in the previous sections. PO8. Obtain in-depth knowledge in at least one major area of specialization within civil engineering This course provides an in-depth knowledge in prestressed concrete design, which is one of the most important design knowledge in bridge engineering.

Assessment of Outcomes	This course contributes to the assessment of program outcomes as follows: 1. In class discussion of practical design examples allows for assessment of student's professional knowledge. (5% - in the form of attendance in tutorial) 2. Weekly tutorial questions allow for assessment of all outcomes listed above. (5% - weekly tutorial submission) 3. 2 assignments (literature review and programming of design question) allow for assessment of all outcomes listed above. (20% - 10% each) 4. Mid-term examination and final examination allow for detailed assessment of all outcomes listed above. (70%, 30% mid-term and 40% final)
Prepared by	Barry Ka Wai LEE
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