The Hong Kong University of Science and Technology
Department of Civil and Environmental Engineering

CIVL 4320 Structural Steel Design
Spring 2023

Instructor: Professor Chun-Man CHAN
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Office hours: Wednesday 6:00 – 7:30 pm or by appointment

Teaching Assistants: TBD

Class Schedule: Lecture 1: Wednesday 1:30 pm – 4:20 pm (LTA)
Tutorial 1: Monday 6:00 pm – 7:50 pm (Room 2406)
Tutorial 2: Monday 4:00 pm – 5:50 pm (Room 2406)

Course Description:

Introduction to the behaviour and design of steel structures. Stability analysis and applications of limit states design methods to tension members, columns, beams, plate girders, beam-columns, and structural connections.

Prerequisite: CIVL 3310 Structural Analysis

Course Objectives:

This course will enable students to

1. Understand the fundamental principles behind modern steel design code of practice.
2. Develop a basic understanding of various modes of failure of skeletal steel members and a comprehension of how these behaviors affect the performance of steel structures.
3. Demonstrate technical competency in designing steel members and connections using Hong Kong Steel Code of Practice.
4. Develop critical thinking skills in an open-ended design process with practical applications to real-world steel buildings.

Required Textbooks and References:

Code of Practice for the Structural Use of Steel 2011 (2021 Edition), Buildings Department, Hong Kong Special Administrative Region, August, 2021 (Required).

Lam D, Ang T.C. and Chiew S.P., *Structural Steelwork - Design to Limit State Theory,* Elsevier, 3rd Ed., 2004.

Nethercot, D.A., *Limit States Design of Structural Steelwork,* Chapman & Hall, 3nd Ed., 2001.

Trahair, N.S. and Bradford, M.A. and Nethercot, D.A., *The Behaviour and Design of Steel Structures to BS5950*, Chapman & Hall, 3rd Ed., 2001.

Owen, G.W., Knowles, P.K. and Dowling, P.J., *Steel Designers' Manual*, Blackwell Scientific Publications, 1992.

Topics Covered:

1. Introduction (*1.5 weeks*)

   Aims of structural design; design of structural systems vs structural members; Limit state design concepts; steel as structural material; standard steel sections and section classifications

2. Tension members (*1 week*)

   Behaviour of tension members - gross yielding vs net section fracture; tensile strength; effects of eccentricity of end connections.

3. Compression members (*2.5 weeks*)

   Column behaviour and modes of failure; overall flexural buckling analysis of slender columns; Perry column formula and multiple column curves; Influence of end conditions

4. Beam members (*2.5 weeks*)

   Beam behaviour and modes of failure; beams with lateral restraints; moment and shear capacity of beams; web buckling and web bearing; beams without lateral restraints; lateral torsional buckling (LTB) analysis; general and simplified design procedures

5. Plate girders (*2 weeks*)

   Behaviour of a plate girder; web shear buckling, post-buckling tension field action; web stiffener and end post design

6. Beam-Column members (*2.5 weeks*)

   Beam-column behaviour; combined tension and moment; combined compression and moment; buckling analysis with second-order effects; concept of effective length and equivalent moment; interaction formulae

7. Structural connections (*1 week*)

   Introduction of welded connections and bolted connections; design strength of welds; analysis and design of welded connections; design strength of bolts; analysis and design of bolted connections.

Mark Allocation:

	%
Assignments (3 sets)	15
Pop quizzes	5
Mid-term examination (TBD)	30
Final examination	50

In order to prepare you for the real world, only clean and neat assignments will be allowed for submission. No late work (including assignments and project submittals) will be accepted after the due date. Sloppy assignments will be returned with zero mark.