Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates UG OBTL+ or PG OBTL+
If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to Data Transformation Status for more information.

Expected Implementation in Academic Year	
Semester/Trimester/Others (specify approx. Start/End date)	
Course Author * Faculty proposing/revising the course	Lee-Chua Lee Hong
Course Author Email	clhlee@ntu.edu.sg
Course Title	Steel Design
Course Code	CV3012
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	CV2011 – Structural Analysis I
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course aims to:

i) develop an understanding of Limit State Design as applied to structural steel members and connections based on the Eurocode 3 – Design of Steel Structures with Singapore Annexes;

ii) equip students in applying the knowledge learned to design standard steel beams, columns, and connections commonly found in steel structures.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Determine the basis of design, ultimate and serviceability limit states, actions and its combinations, characteristic values and partial factors.
ILO 2	Carry out cross-section classification of standard hot-rolled and welded sections.
ILO 3	Perform design procedures for fully restraint beams under in-plane bending; obtain moment and shear resistances; and calculate serviceability deflection check.
ILO 4	Perform design procedures for unstrained beams; calculate elastic critical moment, buckling resistances, imperfection factors; and check lateral-torsional buckling resistance using three alternative approaches.
ILO 5	Check web bearing and buckling resistances of beams under transverse actions.
ILO 6	Analyse the behaviour of compression members, Euler buckling, effective lengths, non-dimensional slenderness, buckling curves; and calculate buckling resistance of a column under axial compression.
ILO 7	Perform design procedures for columns under axial compression and nominal moments in simple frame construction.
ILO 8	Perform design procedures for columns under axial compression and large moments in continuous construction using two alternative methods of getting the interaction factors.
ILO 9	Analyse roof truss and lattice girder construction; use simplified rules to design angle, channel and T-section members.
ILO 10	Describe the basic concepts of joint design in structural steelwork, and commonly used bolted and welded connections.
ILO 11	Analyse pinned and moment connections, beam-to-column connections using non-preloaded and preloaded bolts and beam-to-beam splices.
ILO 12	Calculate minimum fillet welds sizes used in welded connections; check baseplate, plain and block shear resistances.
ILO 13	Take into count buildability, serviceability and maintainability plans in the design.

Course Content

S/N	Topic
1	Introduction, material properties, limit state design, loading, section classifications.
2	Behaviour of compression members, local and overall buckling, column slenderness and effective length concept.
3	Design of laterally restrained beams.
4	Design of lateral-torsional buckling of unrestrained beams.
5	Introduction and design of column in simple structures.
6	Simplified and more exact methods for members with axial force and moments.
7	Introduction to lattice roof construction and simplified rules for lattice truss members.
8	Introduction and basic concepts of joints design.
9	Simple beam-to-beam and beam-to-column connections.
10	Introduction to moment connections of bolted end plate connections, beam and column splices.

Reading and References (if applicable)

1. Lam, D., Ang, T.C. and Chiew, S.P., “Structural Steelwork: Design to Limit State Theory”, 4th Edition, CRC Press, Taylor & Francis Group, London, UK, 2014.
2. Luís Simões da Silva, Rui Simões, Helena Gervásio and Graham Couchman, “Eurocode 3: Design of Steel Structures – Part 1-1: General Rules and Rules for Buildings”, U.K. Edition, ECCS and Ernst & Sohn, 2014.
3. Gardner, L. and Nethercot, D.A., “Designers’ Guide to Eurocode 3: Design of Steel Structures – Designers’ Guide to EN 1993-1-1 Eurocode 3: Design of Steel Structures General Rules and Rules for Buildings”, Thomas Telford, London, UK, 2005.
4. Wald, F., Tan, K.H. and Chiew, S.P.,”Design of Steel Structures with Worked Examples to EN 1993-1-1 and EN 1993-1-8”, Research Publishing, Singapore, 2011.
5. BS EN 1993-1-1:2005+A1:2014, Eurocode 3: Design of Steel Structures – Part 1-1: General Rules and Rules for Buildings, British Standards Institution, London, UK, 2014.
6. BS EN 1993-1-5:2006, Eurocode 3: Design of Steel Structures – Part 1-5: Plated Structural Elements, British Standards Institution, London, UK, 2006.
7. BS EN 1993-1-8:2005, Eurocode 3: Design of Steel Structures – Part 1-8: Design of Joints, British Standards Institution, London, UK, 2005.
8. SCI – P363, Design Data (“The Blue Book”), Steel Construction Institute, Ascot, UK, 2009.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Basis of design, ultimate and serviceability limit states, actions and combinations, characteristic values, partial factors, example on actions and effects on beam; local buckling & classification of cross-sections	1		In-person	Lectures & Tutorial
2	In-plane bending of beams, shear and moment resistances of cross-sections, serviceability deflection check; design procedures for fully restraint beams	2, 3		In-person	Lectures & Tutorial

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
3	Lateral-torsional buckling, buckling resistances, beam curves, imperfection factors, elastic critical moment for lateral-torsional buckling; the three alternative methods to determine lateral-torsional buckling resistances; design procedures for unstrained beams.	4		In-person	Lectures & Tutorial
4	Behaviour of compression members, flexural buckling and non-dimensional slenderness, column curves, buckling resistances.	5		In-person	Lectures & Tutorial

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
5	Introduction to web bearing and buckling, stiff bearing length and effective length for resistance; design procedures for resistance of the webs under transverse forces.	5		In-person	Lectures & Tutorial
6	Section resistance, buckling resistance, Euler buckling, imperfection factor, buckling lengths and European buckling curves; design procedures for columns under axial force.	5,6		In-person	Lectures & Tutorial
7	Introduction to simple structures; column in simple structures with worked examples.	5,6		In-person	Lectures & Tutorial
8	General method design procedure of columns subjected to bending and axial compression.	6		In-person	Lectures & Tutorial

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
9	Comparison between the two alternative methods with examples.	6		In-person	Lectures & Tutorial
10	Introduction to roof truss and lattice girder construction; simplified rules for lattice truss members with worked examples.	7		In-person	Lectures & Tutorial
11	Baseplate design with worked examples; bolted and welded connections and concepts of joint design in structural steelwork.	8		In-person	Lectures & Tutorial
12	Introduction to moment connections - bolted end plate connections, beam and column splices; plain and block shear resistances.	9		In-person	Lectures & Tutorial
13	Introduction of fillet and welded connections; calculation of minimum weld leg length.	10		In-person	Lectures & Tutorial

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	Weekly lectures to provide you with the specific knowledge and techniques to achieve the learning outcome stated above.
Tutorials	Weekly tutorials to enable you to apply the knowledge to solve structured problems. We encourage you to explore alternative approaches and techniques.
Quizzes	Two quizzes to test your understanding on the knowledge learned to design fully restraint beams, unrestrained beams and columns under nominal moments in simple frame construction.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Summative Assessment (EXAM): Others([final examination])	All	a, b, c, d, g	60	Team	Holistic	Relational
2	Continuous Assessment (CA): Others([quiz/test] Quiz 1: To design a fully restraint or unrestraint beam)	1,2,3,4	a, b, c, d, e, g, j	20	Team	Analytic	Multistructural
3	Continuous Assessment (CA): Others([quiz/test] Quiz 2: To design a column in simple frame construction)	5,6	a, b, c, d, e, g, j	20	Team	Analytic	Multistructural

Description of Assessment Components (if applicable)

Formative Feedback

Feedback will be through the dissemination of the student's performance in quizzes as well as review of the quiz questions in class.
We encourage you to initiate an individual consultation sessions on your particular learning needs.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Decision Making	Basic
Problem Solving	Intermediate
Critical Thinking	Basic
Design Thinking	Basic

Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

As a student of the course, you are required to abide by both the University Code of Conduct and the Student Code of Conduct. The Codes provide information on the responsibilities of all NTU students, as well as examples of misconduct and details about how students can report suspected misconduct. The university also has the Student Mental Health Policy. The Policy states the University's commitment to providing a supportive environment for the holistic development of students, including the improvement of your mental health and wellbeing. These policies and codes concerning students can be found in the following link.
http://www.ntu.edu.sg/SAO/Pages/Policies-concerning-students.aspx

Policy (Absenteeism)

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Policy (Others, if applicable)

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Last Updated Date: 10-07-2024 05:04:37

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