Annex A

COURSE CONTENT

Academic Year	AY2019-20,	**Semester**	1
Course Coordinator	Prof Tan Kang Hai		
Course Code	CV6107		
Course Title	Behaviour and Design of Steel and Composite Structures		
Pre-requisites	CV3012 Steel Design		
No of AUs	3		
Contact Hours	Total : 39 Hours (Lectures: 39 hrs)		
Proposal Date	25 January 2019		

Course Aims

The aim of this course is to equip you with detailed understanding of the behaviour of steel and composite structural elements and to develop your skills to conduct analysis and practical design of real-life steel and composite structures.

Course Learning Outcomes (Course LO)

By the end of this course, the students would be able to:

1. Analyse and design both non-slender and slender steel compression members.
2. Evaluate the bending moment resistances for steel beams susceptible to both in-plane and out-of-plane failure.
3. Apply interaction formulae in the design of steel beam-columns susceptible and insusceptible to torsional deformations.
4. Interpret the concept of plastic hinge and apply plastic design of steel frames.
5. Calculate the capacities of both bolted and welded steel connections.
6. Analyse and design simply-supported and continuous composite beams.
7. Evaluate the compressive load-carrying capacities of different types of composite columns.
8. Interpret the design requirements for composite slabs and conduct design.

Course Content

Propose Course outline:

S/N	Topic	Lecture Hrs
1.	Compression members	6
2.	Local buckling of thin plate elements	3
3.	In-plane bending of beams	3
4.	Lateral buckling of beams	3
5.	Beam-columns	3
6.	Frames	3
7.	Joints	3
8.	Simply-supported composite beam	4
9.	Continuous composite beam	5
10.	Composite column	3
11.	Composite slab	3
	Total:	39

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/Individual	Assessment Rubrics
1. Final Examination	1, 2, 3, 4, 5, 6, 7, 8	EAB SLO* a,b,c	60%	Individual	
2. Continuous Assessment 1 (CA1): Quiz	1, 4, 5, 6	EAB SLO* a,b,c	20%	Individual	
3. CA2: Assignment 1	1, 4	EAB SLO* a,b,c	10%	Individual	
4. CA3: Assignment 2	5, 7	EAB SLO* a,b,c	10%	Individual	
Total			100%		

* EAB SLO stands for the Engineering Accreditation Board Student Learning Outcomes.

Related Programme LO or Graduate Attributes

a. **Engineering knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems;

b. **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences;

c. **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

d. **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

e. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. **The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. **Environment and Sustainability:** Understand the impact of the professional engineering

solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.

h. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

j. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l. **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Formative feedback

Quiz and assignment feedbacks will be given to you for the common mistakes during lecture class.

Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
Lecture	Weekly lectures to provide you with the necessary knowledge to achieve the learning outcomes

Reading and References

Gardner, L., Nethercot, D. Designers Guide to Eurocode 3: Design of Steel Buildings, 2nd edition, ISBN 10: 0727741721 ISBN 13: 9780727741721, Publisher: ICE Publishing, 2011.

Trahair, N.S., Bradford, M.A., and Nethercot, D.A., Gardner, L. The Behaviour and Design of Steel Structures to EC3: Part 1. Spon Press, 4th edition, 2006. Available from Popular Bookshop in NTU.

Steel Designers' Manual, edited by Buick Davidson and Graham Owens, 7th Edition, Steel Construction Institute, Wiley-Blackwell, 2012.

Lam, D., Ang, T.C. and Chiew, S.P. Structural Steelwork Design to Limit State Theory, 3rd Edition, Elsevier Butterworth-Heinemann, Oxford, 2003.

Johnson, R.P., Composite Structures of Steel and Concrete, Vol. I – Beams, Slabs, Columns and Frames for Buildings, 2nd Edition, Blackwell Scientific Publications, Oxford, 1994.

Chen, W.F., and Lui, E.M., Structural Stability – theory and implementation, PTR Prentice Hall, Englewood Cliffs, New Jersey, 1987.

Course Policies and Student Responsibilities

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.

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. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors AY2019/20

Instructor	Office Location	Phone	Email
Tan Kang Hai	N1-01c-97	6790 4104P/ 5297	CKHTAN@ntu.edu.sg
Zhao Ou	N1-01b-49	6790 6934	ou.zhao@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Introduction to Eurocode	1	Tutorial and lectures
2	Compression members	1	Tutorial and lectures
3	Local buckling of thin plate elements	1	Tutorial and lectures
4	In-plane bending of beams	2	Tutorial and lectures
5	Lateral buckling of beams	2	Tutorial and lectures
6	Beam-columns	3	Tutorial and lectures
7	Frames	4	Tutorial and lectures
8	Joints	5	Tutorial and lectures
9	Introduction to composite structures	6	Tutorial and lectures
10	Simply-supported composite beam	6	Tutorial and lectures
11	Continuous composite beam	6	Tutorial and lectures
12	Composite column	7	Tutorial and lectures
13	Composite slab	8	Tutorial and lectures