Subject Description Form

Subject Code	CSE501
Subject Title	Bridge Engineering
Credit Value	3
Level	5
Pre-requisite / Co-requisite/ Exclusion	Recommended background knowledge: It is expected that students will have a fundamental understanding of structural analysis and design consistent with undergraduate level study in civil engineering, construction management, and transportation engineering.
Objectives	To further the understanding of various aspects of bridge engineering and to provide students with an in-depth knowledge of various bridge types, methods of analysis and their limitations, and design, construction, and maintenance methods.
Intended Learning Outcomes	Upon completion of the subject, students will be able: a. to apply the fundamental knowledge of bridge engineering to formulate effective solutions to engineering problems relevant to the design, construction, and maintenance of bridges; b. to identify, structure and analyze diverse problems arising from the changing constraints that influence engineering projects, such as economic, environmental, legislative, sustainability, and technological considerations; c. to work with others as a team and take responsibility for an agreed area of a shared activity; and d. to have the ability for creative and critical thinking and the ability to work independently.
Subject Synopsis/ Indicative Syllabus	**Keyword Syllabus:** i) Bridge Types Bridge types and their relationship to modern construction materials. Structural actions of typical bridge types. ii) Bridge Deck Analysis Orthotropic plate method and design charts; grillage method; finite strip method; finite element method; semi-continuum method; influence surfaces method for local bending under wheel loads.

	iii) Bridge Substructure Bridge piers and columns and their protection; foundations. iv) Bridge Articulation Bridge bearings and expansion joints; provision of articulation. v) Concrete Bridges Reinforced and prestressed concrete bridges; slab decks; beam and slab decks; cellular decks; box girders; standard bridge beams. vi) Steel Bridges and Cable Supported Bridges Steel trusses and girders; orthotropic steel plate decks; composite decks. Evolution of cable supported bridges; cable and cable system; suspended deck structure; pylon; cable anchorage and connection; erection. vii) Bridge Construction and Maintenance Modern bridge construction methods and maintenance actions; and their influence on design and economy. viii) Application of Novel Materials in Bridge Engineering Brief introduction to emerging structural materials; applications of fiber-reinforced polymer (FRP) composites in the retrofit and construction of bridges.
Teaching/Learning Methodology	Lectures will provide fundamental knowledge relating to the mechanical behaviour and structural analysis and design of bridge structures. Students will be required to undertake various coursework activities, which will enable them to thoroughly digest the taught contents. Tutorials will provide opportunities for students and lecturer to communicate and discuss any difficulties relating to the lecture programme. They will also provide a forum for students and lecturer to discuss the ongoing coursework. Students are required to undertake independent study and associated reading to strengthen their problem-solving skills.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a.	b.	c.	d.
1. Continuous Assessment	50%	√	√	√	√
2. Written Examination	50%	√	√		√
Total:	100%				

Students must pass the final examination and achieve a passing overall score/ grade to pass the subject.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessment will be based on problem solving assignments, the design project, and group project reports.

Written examination is evaluated by final examination.

Reading List and References

References and Books:

Bridge Deck Behaviour, edited by Hambly and Edmund, 2nd Ed., Chapman and Hall, London (1991).

Bridge Design to Eurocodes Worked Examples, edited by Athanasopoulou, Poljansek, Tsionis, and Denton, EUR 25193 EN, 2012.

Bridge Engineering: Design, Rehabilitation, and Maintenance of Modern Highway Bridges, edited by Tonias and Zhao., 2nd Ed., McGrawHill (2007).

Design of Highway Bridges, edited by Barker and Puckett, John Wiley & Sons, Inc. 2007.

Eurocode 2: Design of Concrete Structures, Brussels.

Eurocode 3: Design of Steel Structures, Brussels.

Eurocode 8: Design of Structures for Earthquake Resistance, Brussels.

Structures Design Manual for Highways and Railways, Highways Department, Hong Kong Government, Hong Kong, 2013 edition (2013).

The Manual of Bridge Engineering, edited by Ryall, Parke, and Harding, Thomas Telford Limited, London (2000).