Subject Description Form

Subject Code	CSE529
Subject Title	Seismic Design of Building Structures
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Recommended background knowledge: It is expected that students have already acquired the basic knowledge in structural mechanics and design consistent with undergraduate level study in civil or structural engineering.
Objectives	To provide students with the background knowledge to enable them to understand the principles that should be followed in the design of building structures against earthquakes.
Intended Learning Outcomes	Upon completion of the subject, students will be able: a. to apply the fundamental knowledge of earthquake engineering to develop effective solutions to the problems relevant to the seismic design in national and international settings; b. to identify and analyze diverse problems arising from the changing constraints that influence engineering design, such as, social, economical, and technological considerations; c. to work with others in group works, and take responsibility for an agreed area of a shared activity; and d. to apply creative and critical thinking to conceptual seismic design, through class discussions and project work.
Subject Synopsis/ Indicative Syllabus	**Keyword Syllabus** Topic 1: Earthquake and Ground Motion Causes of earthquake; earthquake intensity, magnitude and energy; world seismic activity; characteristics of strong ground motion; effects of local site conditions on ground motion; design earthquake; seismicity levels. Topic 2: Vibration of Structures under Ground Motion Elastic vibration of SDOF systems; elastic vibration of MDOF system; rocking vibration and torsional vibration; inelastic response analysis; devices for reducing earthquake load. Topic 3: Design Earthquake Forces

	Dynamic time-history analysis; response spectrum modal analysis: the SRSS method and the CQC method; equivalent static lateral force method; base shear force and procedures in building codes. Topic 4: Structural Form and Response Selection of structural form and classification of structural systems; structural layouts for optimum resistance; requirements for ductility and the philosophy of capacity design. Topic 5: Principles of Seismic Design for Reinforced Concrete Members Material properties under cyclic loading; benefits of confining reinforcement and ensuring ductile failure; mechanism of energy absorption; seismic requirements for structural members and connections; general principles of detailing. Topic 6: Principles of Seismic Design for Structural Steel Members Design philosophies for steel framed systems; energy dissipation mechanisms for moment and braced configurations; member and connection detailing issues.
Teaching/Learning Methodology	Lectures will provide fundamental knowledge related to seismic risk, seismic behavior, and structural design of building structures subject to earthquakes. 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 tutors to communicate and discuss any difficulties relating to the lectures. It will also provide a forum for students to discuss ongoing coursework and laboratory activities with the tutors. Laboratory work will provide students with opportunities to carry out real experimental works for performance of building structures under seismic excitations in order to facilitate their learning. Independent study and associated reading will require students to conduct some problem-solving exercises independently, analyze the experimental data obtained from laboratory classes and prepare integrated reports.

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<td>Assessment Methods in Alignment with Intended Learning Outcomes</td>
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<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a.</td><td>b.</td><td>c.</td><td>d.</td></tr>
<tr><td>1. Continuous Assessment</td><td>40%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Written Examination</td><td>60%</td><td>√</td><td>√</td><td></td><td>√</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessment (40%) will be based on three assignments (30%) and one laboratory report (10%).

Written examination is evaluated through final examination.

Students must attain at least Grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.
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<td>Reading List and References</td>
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<u>Books</u>

Code for Seismic Design of Buildings, National Standard of China, GB 50011-2010, 2016.

Dynamics of Structures-Theory and Applications to Earthquake Engineering, 5th Edition, Anil K. Chopra, Prentice Hall, New Jersey, 2020.

Passive Energy Dissipation Systems in Structural Engineering, T.T. Soong and G.F. Dargush, John Wiley& Sons, 1997.

Reinforced Concrete Structures, R. Park and T. Paulay, John Wiley and Sons, New York, 1993.

Seismic Design of Reinforced Concrete and Masonry Buildings, T. Paulay and M.J.N. Priestley, John Wiley & Sons, New York, 1992.

Seismic Design of Buildings to Eurocode 8, 2nd Edition, A.Y. Elghazouli, CRC Press, Taylor and Francis, 2017.

<u>Journals</u>

Bulletin of Earthquake Engineering
Earthquake Engineering and Structural Dynamics
Earthquake Spectra
Engineering Structures
Journal of Structural Engineering, ASCE
Journal of Earthquake Engineering
Soil Dynamics and Earthquake Engineering
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