Subject Code	CSE20351
Subject Title	Applied Structural Analysis
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: CSE19100 Mechanics of Materials
Objectives	(1) To enable students to correctly analyze skeletal structures through calculations; (2) To educate students to collectively conduct experimental work on the displacement of simple structures; (3) To enable students to synthesize knowledge of loads, modeling, material strength, and structural analysis to design simple structures and evaluate structural performance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. master basic knowledge of structural analysis including the virtual work method, flexibility method, stiffness method, and influence line; b. appreciate the key differences between determinate and indeterminate structures in both analysis and behaviour; c. present structural calculations logically and lucidly through the solution of structural analysis problems; d. attain basic techniques in conducting experiments in laboratory and to acquire basic techniques in writing a proper laboratory report.
Subject Synopsis/ Indicative Syllabus	1. <u>Virtual Work Method (2 weeks)</u> Principle of virtual work. Calculation of displacements. Maxwell's reciprocal theorem. 2. <u>Flexibility Method (4 weeks)</u> Statical indeterminacy. Redundancy. Simultaneous equations of geometrical compatibility. Flexibility matrix. Analysis of beams, trusses, and frames. Determination of displacements. Effect of environmental changes. 3. <u>Stiffness Method (3 weeks)</u> Kinematic indeterminacy. Stiffness matrix. Analysis of simple beams, trusses, and frames. 4. <u>Influence Lines (2 weeks)</u> Muller-Breslau's principle. Influence lines for simple beams, trusses, and frames. 5. <u>Torsion (2 weeks)</u> Simple torsion theory. Torsion of circular shafts. Torsion of thin wall tubes. Strain energy. 6. <u>Laboratory Work</u> Test of a three-span continuous beam. Influence lines.

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<tr><td>Teaching/Learning Methodology</td><td>Fundamental concepts illustrated with examples are presented in the lectures. The students should review these and prepare themselves for the tutorials. The solution of tutorials will be discussed. In the laboratory the students would carry out experiments to verify theories, and to acquire an engineering perspective of these.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Assignments and Lab</td><td rowspan="2">30</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Mid-term Test</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>3. Final Examination</td><td>70</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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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.

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

The students will be assessed with three components, i.e., the laboratory session and assignment, a mid-term test, and an examination at the end of the semester. The students will be required to complete assignments independently. The assignments are closely related to structural analysis methods and allow the students consolidate the understanding the basic methods of structural analysis. The mid-term test is designed to check the students' learning outcome in solving simple problems. The homework and mid-term test are appropriate to achieve intended learning outcomes a). The students are required to attend the laboratory session and submit group laboratory reports. The laboratory session will enable students to acquire basic laboratory techniques and report writing. The laboratory session and the report writing are best to achieve intended learning outcomes b), c) and d). The final examination will emphasize on assessing students' basic concept of structural analysis and analytical methods of skeletal structures. It is appropriate to achieve intended learning outcomes a), b), c) and d).
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td></td><td>Average hours per week</td></tr>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures/ Tutorials/ Laboratory Sessions</td><td>3 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and Studying</td><td>3 Hrs.</td></tr>
<tr><td>▪ Completion of Assignments and Lab Reports</td><td>3 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>9 Hrs.</td></tr>
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Reading List and References	Hibbeler, R. C., *Structural Analysis*, 8th Edition in SI Units, Pearson/Prentice Hall, 2012. Coates, R. C., Coutie, M. G. and Kong, F. K., *Structural Analysis*, 3rd edition, Chapman and Hall, London, 1988. McCormac, J. C., *Structural Analysis: a Classical and Matrix Approach*, Addison Wesley, 1997.