Subject Description Form

Subject Code	CSE233
Subject Title	Structure and Applied Mathematics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject aims to provide undergraduate architecture students with a comprehensive understanding of the principles and theories behind structural components and systems. This subject also emphasizes the application of mathematics in analyzing the static and dynamic behavior of simple and representative structural components and systems. Students are expected to gain the necessary knowledge and skills to appreciate, analyze, and design structurally sound architectural solutions.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. apply the fundamentals of mathematics and mechanics to solve structural problems; b. appreciate the static behaviour of structural elements and frames; c. understand the fundamental principles in structural design; and d. apply the basic concepts in structural engineering in solving architectural design problems.
Subject Synopsis/ Indicative Syllabus	1. Foundation Mathematics Essential topics, such as linear algebra and vectors, and ordinary differential equations (ODEs) 2. Structural Systems and Components Beam, column, plane frame, and truss. Material properties and boundary conditions. External force, internal force, shear force, bending moment and torque. 3. Structural Analysis Fundamentals Force and loading. Static equilibrium and free-body diagram. Static analysis of representative structural elements, such as beam, bar, 2D plane frame. Basic concepts of dynamic analysis using the lumped structure/system as an example. 4. Structural Behavior and Performance Evaluation, and Structural Design Structural stability and safety assessment. Basics of structural design and mathematical optimization.

<table>
<tr><td>Teaching/Learning Methodology</td><td>Fundamental knowledge will be covered in lectures. Tutorials will provide opportunities for discussion of lecture materials and also will be conducted in the form of example class and problem-solving session to supplement understanding from lectures.</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 (including homework and lab report)</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Midterm Exam</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Final Exam</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>
</table>
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:

The students will be assessed with three components, i.e. assignments, midterm examination, and final examination. The assignments mainly focus on practicing specific conceptual knowledge covered in various lecture topics (ILO a, b, c, d), the lab report helps students to understand the performance of basic structural elements and to extend that knowledge to real-world architectural structures (ILO a, b, c, d). The final examination will consolidate students' learning throughout the course (ILO a, b, c, d).
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures / Tutorials / Laboratory Sessions</td><td>39 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and studying</td><td>39 Hrs.</td></tr>
<tr><td>▪ Assignments/ Reports</td><td>39 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>Durka, Morgan and Williams, (1996) Structural Mechanics, 5th Ed., Longman, 1996.

Gere, James M., (2013) Mechanics of Materials, 8th Ed., Stamford, Conn.:Cengage Learning, 2013.</td></tr>
</table>

	Hibbeler, R.C., (2014) *Mechanics of Materials*, 9th Ed., Prentice Hall, 2014. Sarkisian, M. (2016). Designing Tall Buildings: Structure as Architecture (Second edition.). Routledge. 2016. https://doi.org/10.4324/9781315714639 Shaeffer, R. E. (2007). Elementary structures for architects and builders (5th ed.). Pearson Prentice Hall. 2007 Silver, P., McLean, Will., & Evans, Peter. (2013). Structural engineering for architects : a handbook. Laurence King Pub. 2013