Subject Description Form

Subject Code	CSE20201
Subject Title	Structural Mechanics
Credit Value	3
Level	2
Prerequisite/ Exclusion	Nil
Objectives	(1) To offer students fundamental principles of structural mechanics; (2) To enable students to apply the theory of structural mechanics to analyze the physical behavior of simple structures under loads; (3) To train students with basic laboratory techniques of material and structural member testing; (4) To train students to logically analyze and interpret the testing results.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply the basic principles in structural mechanics, e.g. equilibrium conditions, to effectively analyze the behavior of simple structures; b. Provide simple and logical solutions to structural problems using basic structural concepts; c. Compare the performance of various simple structures under different loading conditions; d. Express the characteristics of simple structures logically and lucidly; e. Interpret experimental data correctly and apply the experimental results to structural applications; and f. Recognize the need for, and to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	1. Philosophy of Structural Engineering (1 week) Structural engineering. Structural analysis. Loading conditions. Load combinations. Building materials. Numerical computations. Static determinacy. Support conditions. 2. Equilibrium (1 week) Statics. Free-body diagram. Equations of equilibrium. Support reactions. Internal loadings. 3. Analysis of Statically Determinate Trusses (3 weeks) Static determinacy and stability. Support reactions. Method of joints. Method of sections. 4. Analysis of Statically Determinate Beams and 2-D Frames (3 weeks) Determinacy. Bending moment and shear force diagrams.

Relationship between bending moment, shear force and external loading. Internal forces in plane frames. Internal forces in arches.

5. Simple Stress and Strain (2 weeks)
Normal stress and strain. Shear stress and strain. Tensile tests. Mechanical properties of materials.

6. Stresses in Beams – Part 1 (3 weeks)
First moment of area. Second moment of area. Bending stresses in beams. Shear stresses in beams. Deflection of simple beams by double integration.

7. Laboratory Work
Tensile test of steel bar. Simple bending of beams.

Teaching/Learning Methodology

Fundamental knowledge will be covered in lectures. Tutorials will provide opportunities for discussion of lecture materials and will also be conducted in the form of example class and problem-solving session to strengthen the understanding from lectures. Laboratory work will help students appreciate the basic principles and train them with basic laboratory techniques.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Assignments and lab reports	18	√	√	√	√	√	
2. Mid-term test	10	√	√				
3. Seminar report	2						√
3. Final examination	70	√	√	√	√		
Total	100 %						

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 by four components, i.e. the assignments and lab reports, the mid-term test, the seminar report, and the final examination. Assignments are intended to provide a timely assessment of lecture contents. The assignments include homework and tutorial question sheets. All the assignments need to be answered and submitted on time. The students will be required to attend laboratory

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<tr><td></td><td colspan="2">sessions and submit group laboratory reports. These laboratory sessions will enable students to acquire basic laboratory techniques of material testing and structural member testing. The work in the laboratory sessions provides a supplement to the lectures. In particular, the assignments will be designed to achieve the learning outcomes a, b, c and d, and the laboratory reports will be designed to achieve the learning outcome e.
Students will also be required to attend a technical seminar closely relevant to the subject and submit a seminar report. This will help students to enhance their life-long learning ability and achieve the intended learning outcomes f. The final examinations will provide a comprehensive assessment to students' learning in lectures, tutorials and laboratories, and it will examine all the learning outcomes except e and f.</td></tr>
<tr><td rowspan="6">Student Study Effort Expected</td><td>Class contact:</td><td>Average hours per week</td></tr>
<tr><td>▪ Lectures / Tutorials / Laboratory</td><td>3 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and Study</td><td>3 Hrs.</td></tr>
<tr><td>▪ Completion of assignments and laboratory reports</td><td>3 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>9 Hrs.</td></tr>
<tr><td>Textbook</td><td colspan="2">Hibbeler, R.C. (2016) "Mechanics of Materials", 10th SI Edition, Pearson.

Hibbeler, R.C. (2017) "Structural Analysis", 10th Edition, Pearson.</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Leet, K.M., Uang, C.M. and Lanning J. (2017) "Fundamentals of Structural Analysis", 5th Edition. McGraw-Hill Eduction.

Goodno, B.J. and Gere, J.M. (2017) "Mechanics of Materials", 9th Edition, Cengage Learning.

Beer, F.P., Johnston, E.R., Dewolf, J.T., and Mazurek, D.F. (2014) "Mechanics of Materials", 7th Eedition, McGraw-Hill Education.

Schodek, D.L. and Bechthold, M. (2013) "Structures", 7th edition, Pearson.

Durka, F., Al Nageim, H., Morgan, W. and Williams, D. (2010) "Structural Mechanics: Loads, Analysis, Materials and Design of Structural Elements", 7th Edition, Trans-Altantic.

Hulse, R. and Cain, J. (2000) "Structural Mechanics", 2nd Edition, Palgrave.</td></tr>
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