



UNIVERSITI TEKNOLOGI MARA

BCT431: STATICS AND STRENGTH OF MATERIALS

Course Name (English)	STATICS AND STRENGTH OF MATERIALS APPROVED
Course Code	BCT431
MQF Credit	3
Course Description	The main aim of the course is to give an understanding of the principles underlying engineering mechanics in particular with respect to construction material. Students will be taught the fundamentals associated with the materials properties and the reactions of the materials and components made from them to an applied load. This will include topics on stress and strain, torsion, moments, and deformations. The main structural components covered in this course will be beams, columns and simple trusses.
Transferable Skills	<ol style="list-style-type: none">1. Apply basic knowledge in mechanics of materials especially for simple constructions associated with wood and bio-composites.2. Describe and discuss the fundamentals of material properties and various principles of engineering mechanics associated with construction materials, especially solid wood and bio-composites.3. Identify, illustrate and explain the various types of loads and the reactions of structural materials or components, such as those of natural fibres, to these loads.4. Identify, employ, and explain the basic concepts, laws and theories in mechanics of materials in the analysis of common structural components such as simple beams, columns and trusses.5. Analyze, discuss, and conclude on simple scientific investigations or case studies in areas of the mechanics of materials, especially, of solid wood and bio-composites.
Teaching Methodologies	Lectures, Discussion, Directed Self-learning
CLO	<p>CLO1 Recall and explain basic knowledge in mechanics of materials especially for constructions associated with wood and bio-composites.</p> <p>CLO2 Understand, describe and discuss the fundamentals of material properties and various principles of engineering mechanics associated with construction materials, especially solid wood and bio-composites.</p> <p>CLO3 Identify, illustrate and explain the various types of loads and the reactions of structural materials or components, such as those of natural fibres, to these loads.</p> <p>CLO4 Identify, employ, and explain the basic concepts, laws and theories in mechanics of materials in the analysis of common structural components such as simple beams, columns and trusses.</p> <p>CLO5 Analyze, discuss, and conclude on simple scientific investigations or case studies in areas of the mechanics of materials, especially, of solid wood and bio-composites.</p>
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction 1.1) Principles of Statics 1.2) Fundamental Concepts 1.3) Force Vectors 1.4) Law of Equilibrium of Forces and Moments 1.5) Co-Planar Force System 1.6) Three Dimensional Force System	

2. Stress and Strain 2.1) Stress and Strain 2.2) Internal Reactions 2.3) Thermal Stress and Strain 2.4) Stress-Strain Diagrams 2.5) Basic Joints 2.6) Centroids and Centre of Gravity
3. Axial Deformation 3.1) Elastic Deformation 3.2) Inelastic Deformation 3.3) Stress-Strain Diagrams 3.4) Thermal Stresses and Axial Deformation
4. Torsion 4.1) Torsional shear stress and deformation in circular shaft in elastic range 4.2) Angle of twist, polar moment of area for elastic range 4.3) Torsion of hollow shaft, non-prismatic shaft, and stepped shaft. 4.4) Shearing stress and deformation in circular shaft in the inelastic range.
5. Simple Trusses and Frames 5.1) Analysis of Simple Trusses 5.2) Method of Joints 5.3) Methods of Sections 5.4) Frame Analysis
6. Stresses In Beams 6.1) Types of Loadings 6.2) Types of Beams 6.3) Shear and Bending Moment Diagrams 6.4) Shear Stresses in Beams 6.5) Shear and Stress Limitation in Beams
7. Deflection In Beams 7.1) Introduction 7.2) Deflection of Statically determinate beam: 7.3) a. Integration Method 7.4) b. Superposition Method 7.5) c. Moment Area Method
8. Buckling of Columns 8.1) Critical Load 8.2) Columns with Various Types of Supports 8.3) Inelastic Buckling
9. Combined Stresses 9.1) Thin Walled Pressure Vessels 9.2) Thick Walled Pressure Vessels 9.3) Combined Loading
10. Energy Methods 10.1) Work of A Force 10.2) Work of A Couple Moment 10.3) Strain Energy 10.4) Theories of Failures

Assessment Breakdown	%
Continuous Assessment	70.00%
Final Assessment	30.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment No. 1	1%	CLO2 , CLO3
	Assignment	Assignment No. 2	1%	CLO3 , CLO4
	Assignment	Assignment No. 3	2%	CLO4 , CLO5
	Assignment	Assignment No. 4	2%	CLO3 , CLO4 , CLO5
	Quiz	Quiz No. 1	1%	CLO1
	Quiz	Quiz No. 2	1%	CLO3
	Quiz	Quiz No. 3	1%	CLO4
	Quiz	Quiz No. 4	1%	CLO5
	Test	Test No. 1	20%	CLO1 , CLO2 , CLO3
	Test	Test No. 2	20%	CLO2 , CLO3 , CLO4
	Test	Test No. 3	20%	CLO3 , CLO4 , CLO5

Reading List	Recommended Text	<ul style="list-style-type: none"> R. C. Hibbeler 2013, <i>Engineering Mechanics</i>, 13th Ed., Prentice Hall [ISBN: 9780132915540] R. C. Hibbeler 2013, <i>Statics and Mechanics of Materials</i>, 4th Ed., Prentice Hall [ISBN: 9780133451603]
	Reference Book Resources	<ul style="list-style-type: none"> D.S. Rao 2002, <i>Introduction to Strength of Materials</i>, Universities Press India [ISBN: 8173714053] Thomas Burns 2009, <i>Applied Statics and Strength of Materials</i>, Delmar Pub [ISBN: 9781435413313]
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	