



**UNIVERSITI TEKNOLOGI MARA**

**PHY411-2: PHYSICS II: MECHANICS II AND PROPERTIES OF MATTER**

<b>Course Name (English)</b>	PHYSICS II: MECHANICS II AND PROPERTIES OF MATTER <b>APPROVED</b>
<b>Course Code</b>	PHY411-2
<b>MQF Credit</b>	3
<b>Course Description</b>	This course will interactively engage students cognitively and scientifically in areas of mechanics and basic fundamentals of material science for physics educators. Students will define concepts, state and explain laws and theories, make predictions as to the possible outcome of an event, perform investigations via simulations and laboratory exercises and verbally and in writing, discuss the results and relationships with peers and facilitators. The designated lecture session is used to discuss results of investigations leading to its relation to the existing laws, principles or theories. Lecture sessions employ a mixture of lectures and active learning (self and peer discussions). The outcomes shall be assessed through a variety of tools which include the traditional paper examination, informal interviews and classroom engagement.
<b>Transferable Skills</b>	Problem Solving
<b>Teaching Methodologies</b>	Lectures
<b>CLO</b>	<p>CLO1 State, write and explain the concepts of mechanics which include rotational and rolling motion, equilibrium and elasticity, mechanics of fluids and several fundamental topics of material science.</p> <p>CLO2 Verbally, visually (pictures &amp; graphs) and algebraically relate and discuss the concepts of mechanics which include rotational and rolling motion, equilibrium and elasticity, mechanics of fluids and several fundamental topics of material science</p> <p>CLO3 Verify, assess &amp; employ the concepts of mechanics which include rotational and rolling motion, equilibrium and elasticity, mechanics of fluids and several fundamental topics of material science to solve qualitative &amp; quantitative problems visually, algebraically and occasionally, numerically.</p>
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<p><b>1. Rotational Motion And The Law of Gravity</b></p> <p>1.1) Angular Speed and Angular Acceleration            1.2) Centripetal Acceleration            1.3) Newton's Second Law for rotation            1.4) Work and Rotational Kinetic Energy</p>	
<p><b>2. Rotational Equilibrium And Rotational Dynamics</b></p> <p>2.1) Torque and Two Conditions For Equilibrium            2.2) Relationship Between Torque and Angular            2.3) Acceleration.            2.4) Rotational Kinetic Energy            2.5) Angular Momentum</p>	
<p><b>3. Rolling and Angular Momentum</b></p> <p>3.1) Rolling as translation and rotation combined            3.2) Kinetic Energy of rolling            3.3) Angular momentum            3.4) Newton's Second Law in angular momentum            3.5) Angular momentum of rigid body about fixed axis            3.6) Conservation of angular momentum</p>	

**4. Equilibrium**

- 4.1) Equilibrium
- 4.2) Requirements of equilibrium
- 4.3) Centre of gravity
- 4.4) Examples of static equilibrium

**5. Mechanics Of Solids**

- 5.1) Young's Modulus
- 5.2) Shear Modulus
- 5.3) Bulk Modulus

**6. Mechanics Of Fluids**

- 6.1) Fluids at Rest-Pressure
- 6.2) Measuring Pressure
- 6.3) Pascal's Principle
- 6.4) Archimedes' Principle
- 6.5) The Equation of Continuity
- 6.6) Bernoulli' Principle

**7. Properties Of Matter**

- 7.1) Liquid, Gas and Solid
- 7.2) Introduction: Historical Perspective, Classification of Materials, Advanced Materials, Modern Materials' Needs
- 7.3) Atomic Bonding: Fundamental Concepts, Electrons in Atoms, The Periodic Table
- 7.4) Bonding Forces and Energies, Primary Interatomic Bonds, Secondary Bonding or Van der Waals Bonding

**8. Structures of Materials**

- 8.1) Crystal Structures: Fundamental Concepts, Unit Cells, Metallic Crystal Structures, Density Computations
- 8.2) Crystallographic: Directions and Planes, Packed Crystal Structures

**9. Type Of Materials**

- 9.1) Metals: Type of Metals Alloys, Mechanical properties, Thermal Processing
- 9.2) Ceramics: Type and Applications of Ceramics, Structures and Properties, Optical properties,
- 9.3) Polymers: Polymer Structures, Mechanical properties, Optical properties.
- 9.4) Composites: Particle-Reinforced Composites, Fiber-Reinforced Composites

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Quiz	Quizzes	20%	CLO1 , CLO2 , CLO3
	Test	Test 2	15%	CLO1 , CLO2 , CLO3
	Test	Test 1	15%	CLO1 , CLO2 , CLO3

Reading List	Recommended Text
	• Serway, R.A., Faughn J.S., Vuille, C. & Bennett, C.A, <i>Serway's College Physics, 7th Edition Ed.</i> , Thomson Learning.

Article/Paper List
This Course does not have any article/paper resources

Other References
<ul style="list-style-type: none"> <li>• <b>Book 1.</b> W.D. Callister Jr. 2003, <i>Material Science and Engineering: An introduction</i> , John Wiley</li> <li>• <b>Book 2.</b> Jewett. J.W, Serway R 2004, <i>Serway'Principles of Physics. A calculus-Based Text</i> , Thomson Learning.</li> <li>• <b>Book 3.</b> Young H.D., Freedman. R.A 2004, <i>Sears and Zemansky's University Physics, with Moden Physics</i> , Pearson Addison Wesley</li> <li>• <b>Book 4.</b> Halliday, D. And Resnick, R., Walker J., 2005, <i>Fundamentals Of Physics</i>, John Wiley and Sons Inc.</li> </ul>