

**LOK JAGRUTI UNIVERSITY (LJU)**  
**INSTITUTE OF ENGINEERING & TECHNOLOGY**

**Department of Chemical Engineering (708)**

**Bachelor of Engineering (B.E.) – Semester – III**

<b>Course Code:</b>	<b>017083303</b>	<b>Teaching Scheme</b>				
<b>Course Name:</b>	<b>Chemical Engineering Mechanics</b>	<b>Lecture (L)</b>	<b>Tutorial (T)</b>	<b>Practical (P)</b>	<b>Credit</b>	<b>Total Hours</b>
<b>Category of Course:</b>	Professional Core Course (PCC)	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>30</b>
<b>Prerequisite Course:</b>	HSC Physics					

<b>Syllabus</b>					
<b>Unit No.</b>	<b>Topic</b>	<b>Prerequisite Topic</b>	<b>Successive Topic</b>	<b>Teaching Hours</b>	
<b>01</b>	<b>Introduction to Physics</b>				
	1.1 Definition of Space, Time, Particle, Rigid Body, Deformable Body	---	---	<b>3 (10 %)</b>	
	1.2 Force, Type of Forces	Thermodynamics of Materials (017082101- Unit-3)	Units and Dimensions (017083401- Unit-1), Newton's Law of Viscosity(017083501-Unit-2)		
	1.3 Characteristics of Forces- <b>Newton's Law</b>	Thermodynamics of Materials (017082101- Unit-3)	---		
1.4 System of Forces, Composition and Resolution of Forces	---	---			
<b>02</b>	<b>Properties of Matter</b>				
	2.1 Concept of Load, Stress and Strain	Stress-strain Response (017082101- Unit-2)	---	<b>4 (13.3 %)</b>	
	2.2 Hook's Law, Stress-Strain Diagram	Mechanical Properties of Polymer (017082101- Unit-2)	---		
	2.3 Ductility, Brittleness and Plasticity	Mechanical Properties of Polymer (017082101- Unit-2)	---		
	2.4 Elastic Behavior of Solids, Working Stress and Factor of Safety	Stress-strain Response (017082101- Unit-2)	---		
	2.5 Factors Affecting Elasticity, Types of Elasticity- <b>Young's Modulus, Shear Modulus, Bulk Modulus, Poisson's Ratio-Numericals</b>	Stress-strain Response (017082101- Unit-2)	---		
	2.6 Density and Density Measurement Devices	Thermodynamics of Materials (017082101- Unit-3)	---		
2.7 Viscosity and Viscosity Measurement Devices	---	---			
<b>03</b>	<b>Diffraction and Polarisation</b>				
	3.1 Introduction to Interference and Example, Concept of Diffraction – <b>Classification of diffraction, Method of producing diffraction, Defects of optical mages- Numericals</b>	Introduction(017082101- Unit-9)	---	<b>4 (13.3 %)</b>	
	3.2 Introduction to Polarization	---	---		
	3.3 Polarisation by Reflection, Polarisation by Double Refraction	---	---		
	3.4 Scattering of Light, Circular and Elliptical Polarisation	---	---		
	3.5 Optical Activity	---	---		
3.6 Pyrometers: Radiation Pyrometer, Optical Pyrometers	---	Pyrometers(017083504- Unit-6)			
<b>04</b>	<b>Introduction to Fiber Optics</b>				
	4.1 Introduction of Fiber-Optic System	---	---	<b>3 (10 %)</b>	
	4.2 Principle and Construction of Fiber Cable	---	---		
	4.3 Types of Optical Fiber	---	---		
4.4 Application of Optical Fiber	---	---			
<b>05</b>	<b>Ultrasound and Its Applications</b>				
	5.1 Introduction to Ultrasonic Waves and Properties of Ultrasound	---	---	<b>3 (10 %)</b>	
	5.2 Production and Detection of Ultrasound	---	---		
5.3 Application of Ultrasound	---	Indirect level measurement methods (017083504- Unit-10)			
<b>06</b>	<b>Electrostatics</b>				
	6.1 Work and Energy, Conductors, Capacitors	---	Electrical Capacitance(017083504- Unit-10)	<b>Electrostatics</b>	
	6.2 Laplace Equation (Basics)	Laplace transform of elementary functions (017081291-unit-6)	---		
6.3 Electric Displacement	---	---			
<b>07</b>	<b>Introduction to Mechanics</b>				<b>2</b>

	7.1 Scalar and Vector Quantities	---	---	<b>(6.7 %)</b>
	7.2 Scope of Engineering Mechanics	---	---	
<b>08</b>	<b>Principle of Mechanics</b>			<b>2 (6.7 %)</b>
	8.1 Principle of Transmissibility	---	---	
	8.2 Principle of Superposition	---	---	
	8.3 Law of Gravitation, Law of Parallelogram of Forces	---	---	
<b>09</b>	<b>Vector Mechanics with Applications</b>			<b>3 (10 %)</b>
	9.1 Definition and Representation of Vectors	Vector and its properties (017081191-Unit-9)	---	
	9.2 Force Vector and Its Types	---	---	
	9.3 Dot Product, Cross Product and Scalar Triple Product- Numericals	---	---	
<b>10</b>	<b>Friction</b>			<b>4 (13.3 %)</b>
	10.1 Definition of Friction	---	---	
	10.2 Law of Friction	---	---	
	10.3 Coefficient of Friction, Angle of Friction, Angle of Repose - Types of Friction- Numericals	---	Shell Momentum Balance and Velocity Distribution in Laminar Flow (017083501-Unit-3)	

**Proposed Theory + Practical Evaluation Scheme by Academicians  
(% Weightage Category Wise and it's Marks Distribution)**

<b>L:</b>	<b>3</b>	<b>T:</b>	<b>0</b>	<b>P:</b>	<b>0</b>	
<b>Note: In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject. Each Test will be of 25 Marks. Each Test Syllabus Weightage: Range should be 20% - 30%</b>						
Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage	
Theory	<b>3</b>	<b>3</b>	MCQ	40%	<b>40</b>	
Theory			Theory Descriptive	30%	<b>30</b>	
Theory			Formulas and Derivation	0%	<b>0</b>	
Theory			Numerical	30%	<b>30</b>	
<b>Expected Theory %</b>	<b>100%</b>			<b>Calculated Theory %</b>	<b>100%</b>	<b>100</b>
Practical	<b>0</b>		Individual Project	0%	<b>0</b>	
Practical			Group Project	0%	<b>0</b>	
Practical			Internal Practical Evaluation (IPE)	0%	<b>0</b>	
Practical			Viva	0%	<b>0</b>	
Practical			Seminar	0%	<b>0</b>	
<b>Expected Practical %</b>	<b>0%</b>		<b>Calculated Practical %</b>	<b>0%</b>	<b>0</b>	
<b>Overall %</b>	<b>100%</b>			<b>100%</b>	<b>100</b>	

**Course Outcome**

1	Gain comprehensive knowledge of fundamental physics principles including forces, properties of matter, elasticity, and viscosity, with practical applications in engineering contexts.
2	Able to acquire a thorough comprehension of diffraction, polarization, light scattering, optical activity, and fiber optics, along with their practical engineering applications.
3	To understand concepts of interference, ultrasound waves, electrostatics principles, and mechanics concepts, with practical applications in engineering.
4	To understand concepts of mechanics principles, vector mechanics, and friction concepts, with proficiency in numerical analysis techniques for engineering applications.

**Suggested Reference Books**

1	University Physics Volume 1 by, Samuel j. Ling, Jeff Sanny, William Moebs.
2	General Physics I: Classical Mechanics by David G. Simpson & Larry L. Simpson
3	Engineering Physics by Dattu R Joshi, McGraw hill Publications
4	Engineering Physics by Shatendra Sharma & Jyotsan Sharma, Pearson Publication
5	Engineering Mechanics by R S Khurmi
6	Engineering Mechanics statics by R. C. Hibbeler, McMillan Publication.
7	Physics by Dr T V S Arun Murthy, Dr M N Avadhanulu & J J Chaudhary
8	Engineering Physics by R K Kar
9	Engineering Physics by G Vijaykumari
10	University Physics, 13 <sup>th</sup> edition by Hugh D. Young, Roger A. Freedman

**List of Open Source Software/Learning website**

1	<a href="https://nptel.ac.in/courses/112/106/112106286/">https://nptel.ac.in/courses/112/106/112106286/</a>
2	<a href="https://nptel.ac.in/courses/122/107/122107035/">https://nptel.ac.in/courses/122/107/122107035/</a>

3	<a href="https://nptel.ac.in/courses/115/104/115104094/">https://nptel.ac.in/courses/115/104/115104094/</a>
4	<a href="https://www.coursera.org/learn/engineering-mechanics-statics">https://www.coursera.org/learn/engineering-mechanics-statics</a>
5	<a href="https://www.coursera.org/learn/mechanics-particles-planets">https://www.coursera.org/learn/mechanics-particles-planets</a>
6	<a href="https://www.edx.org/course/introductory-physics-part-1-mechanics-and-waves">https://www.edx.org/course/introductory-physics-part-1-mechanics-and-waves</a>
7	<a href="http://www.iitg.ernet.in/rkbc/me101/me101.htm">www.iitg.ernet.in/rkbc/me101/me101.htm</a>