Storyboard

BLENDED LEARNING COURSE DEVELOPMENT –PHY1242: Properties of Matter and Thermodynamics

Weekly units	Intended unit learning outcomes	Activity where students engage with this unit outcome	Where and how is this unit outcome assessed?
Week 1 **Unit1: States of matter**	Explain the basic concepts and principles of the state of matter, Molecular forces and Molecular interaction	Discussion on the basic concepts and principles of the state of matter, Molecular forces, and Molecular interaction, using synchronous sessions on UR-Moodle (Team or Zoom)	The facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Analyze and Solve conceptual and numerical problems related to state of matter.	A synchronous session, discussion and solving conceptual and numerical problems related to state of matter, using a synchronous session on UR-Moodle (Team or Zoom).	Facilitator will monitor the discussion using a forum discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiments related to state of matter	Face to face will be used to perform experiments related to state of matter	Facilitator will monitor the group works for face to face experiments and check the relevance of student's works
	Draw and interpret diagrams and graphs related to Potential	Forum discussion will be used to discuss on the graphs related to	Facilitator will monitor the forum discussion group works and check the relevance of student's discussion they post on the forum

	energy of molecular interaction	potential energy of molecular interaction	
	Explain the basic concepts and principles related with atomic numbers, moles and atomic interaction.	Forum discussion will be used to discuss on the concept to atomic numbers, moles and atomic interaction.	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum.
Week2 **Unit 2. Elastic and Plastic properties of matter**	Explain the basic concepts and principles of elastic and plastic properties of matter,	Group discussion on basic concepts and principles of properties of matter, fundamental law of Elasticity, Poisson's ratio, stress and strain diagram, Young, Bulk and shear modulus.	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Analyze and Solve conceptual and numerical problems related to elastic and plastic properties of matter.	Group works on solving conceptual and numerical problems related to elastic and plastic properties of matter,	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiments related to elastic and plastic properties of matter, fundamental law of Elasticity, Poisson's ratio, stress and strain	Face to face Labs/Virtual lab and simulation will be used to perform experiments related to elastic and plastic properties of matter, fundamental law of Elasticity, Poisson's ratio, stress	Facilitator will monitor the group works for virtual lab and simulations and check the relevance of student's works

	diagram,Young, Bulk and shear modulus.	and strain diagram, Young, Bulk and shear modulus.	
Week3 **Unit3: Relation between moduli of elasticity**	Explain the different moduli of elasticity	In group of 5 discuss the different moduli of elasticity and theirs use	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Analyze and Solve conceptual and numerical problems related to moduli of elasticity	Group works on solving conceptual and numerical problems related to moduli of elasticity	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiments related to moduli of elasticity	Experimental work on determination of moduli of elasticity	Facilitator will monitor the group works for virtual lab and simulations and check the relevance of student's works
Week 4 **Unit4: Fluids at rest**	Explain the basic concepts and principles of fluids at rest	Discussion on the basic concepts and principles of fluids at rest	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Analyze and Solve conceptual and numerical problems related to fluids at rest	Group works on solving conceptual and numerical problems related to fluids at rest	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiments related to fluids at rest	Experimental work related to fluids at rest	Facilitator will monitor the group works for virtual lab and simulations and check the relevance of student's works

Week 5 **Unit5: Surface tension**	Explain the basic concepts and principles related to surface tension	Discussion on the basic concepts and principles related to surface tension	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Analyze and solve conceptual and numerical problems related to fluids at rest	Group works on solving conceptual and numerical problems related to f related to surface tension.	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiments related to surface tension	Experimental work related to surface tension	Facilitator will monitor the group works for virtual lab and simulations and check the relevance of student's works
Week 6 **Unit6: Fluids in motion**	Identify and explain different applications of Bernoulli's equation	Group discussion on Bernoulli's equation and their applications	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Explain the basic concepts and principles of fluid in motion	Group discussion on the concepts and principles of fluid in motion	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Analyze and Solve conceptual and numerical problems related to Continuity equation. motion for a fluid, Bernoulli's equation	Group works on solving conceptual and numerical problems related to Continuity equation. motion for a fluid, Bernoulli's equation	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
Week 7	Explain the basic concepts and principles of transport phenomena	Group discussion on basic concepts and principles of transport phenomena	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum

Unit7: Transport phenomena			
	Analyze and Solve conceptual and numerical problems related to transport phenomena	Group works on solving conceptual and numerical problems related to transport phenomena	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiments related to transport phenomena	In group performing experiment related to transport phenomena (experiment will be done using virtual lab)	Facilitator will provide material and protocol as well as facilitate the experiment Student will be guided about lab reporting
Week8 **Unit8: Concepts and representation of thermodynamics**	Discuss and explain the Concepts and representations of thermodynamics	Discussion on the the Concepts and representations of thermodynamics	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Solve problems related to the concepts and representations of thermodynamics	Group works on solving conceptual and numerical problems related to the concepts and representations of thermodynamics	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiment related to the concepts and representations of thermodynamics	In group performing experiment related to the concepts and representations of thermodynamics (experiment will be done using virtual lab)	Facilitator will provide material and protocol as well as facilitate the experiment Student will be guided about lab reporting

Week 9 **Unit9: Concepts and representation of thermodynamics**	Discuss and explain the Concepts related to temperature, heat, specific and molar heat capacity, Thermal expansion, phase changes an mechanisms of heat transfer.	Discussion on the Concepts and representations of thermodynamics	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Solve problems related to the concepts related to temperature, heat, specific and molar heat capacity, Thermal expansion, phase changes an mechanisms of heat transfer.	Group works on solving conceptual and numerical problems related to the concepts and representations of thermodynamics	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiment related to the concepts related to temperature, heat, specific and molar heat capacity, Thermal expansion, phase changes an mechanisms of heat transfer	In group performing experiment related to temperature, heat, specific and molar heat capacity, Thermal expansion, phase changes an mechanisms of heat transfer (experiment will be done using face to face lab).	Facilitator will provide material and protocol as well as facilitate the experiment Student will be guided about lab reporting
Week 10 **Unit10: First Law of thermodynamics**	Define the concepts of work, internal energy and amount of heat in thermodynamics	Discussion on the concepts of work, internal energy and amount of heat in thermodynamics	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	State the first law of thermodynamics	Discussion on the first law of thermodynamics	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum

	Solve problems related to the first law of thermodynamics	Group works on solving conceptual and numerical problems related to the work done by a macroscopic system	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Perform experiments to prove the first law of thermodynamics	Discussion on the first law applications	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
Week 11 **Unit11: Second laws of thermodynamics**	Explain the concepts of reversible and irreversible processes	Discussion on she concepts of reversible and irreversible processes	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Explain the concept of Carnot cycle, Carnot engine and determine its efficiency	Discussion on she concepts Carnot cycle, Carnot engine and its efficiency	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	State the second law of thermodynamics and demonstrate the equivalence of different statements of the second law of thermodynamics	Discussion on the concepts related on the second laws of thermodynamics and to demonstrate the equivalence of different statements of the second law of thermodynamics.	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum On line quiz will be given for assessment
Week 12 **Unit11: Second laws of thermodynamics**	Define entropy of a system; Relate entropy of a system and second law of thermodynamics	Discussion on entropy of a system; relate entropy of a system and second law of thermodynamics.	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum

	Sketch T-S diagram and apply it to prove Carnot theorem	Work group on T-S diagram and apply it to prove Carnot theorem	The quiz related to T-S diagram to prove Carnot theorem will be given to students. Facilitator will evaluate the answers given in quiz.
	Discuss the statistical meaning of the second law of thermodynamics	Discussion on the statistical meaning of the second law of thermodynamics	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
Week 13 **Unit11: Third laws of thermodynamics**	State the third law of third law of thermodynamics	Discussion on the statement of the third law of thermodynamics	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Discuss the consequences and some applications of the third law of thermodynamics	Discussion on the consequences and some applications of the third law of thermodynamics	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Solve problems related to the third law of thermodynamics	Group works on solving conceptual and numerical problems related to the third law of thermodynamics	Facilitator will monitor the discussion using a forum discussion of the student and check the relevance of student's answers On line assignment will be given for assessment
Week 14 **Unit12: Kinetic theory of gases**	Discuss the basic principles of kinetic theory of gases	Discussion on the basic principles of kinetic theory of gases	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum
	Describe the physical meaning of thermodynamic temperature from the kinetic theory point of view	Discussion on the physical meaning of thermodynamic temperature from the kinetic theory point of view	Facilitator will monitor the discussion of the student and check the relevance of student's post on the forum

	Explain and solve problems related with the fundamental equation of kinetic theory of pressure and average kinetic energy	Group works on solving conceptual and numerical problems related to the fundamental equation of kinetic theory of pressure and average kinetic energy	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line quiz will be given for assessment
	Derive the law of equipartition of energy by degree of freedom from the Maxwell's law of distribution of molecules in an ideal gas according velocities and energies of thermal motion.	Online quiz related on the derivation of the law of equipartition of energy by degree of freedom from the Maxwell's law of distribution of molecules in an ideal gas according velocities and energies of thermal motion.	Facilitator will monitor the discussion using a forum discussion of the student and check the relevance of student's answers On line assignment will be given for assessment
	Derive the barometric formula and find Boltzmann's distribution	Online quiz related on the derivation of the barometric formula and find Boltzmann's distribution	Facilitator will evaluate students' answers On line quiz will be given for assessment
	Solve problems related on kinetic theory of gases	Group works on solving problems related to the kinetic theory of gases	Facilitator will monitor the group works discussion of the student and check the relevance of student's answers On line assignment will be given for assessment
Week 15-16 **Summative assessment**	• Self-study for revision • Final exam out of 50 percent	• Online Groups discussion and face to face • Individual works and invigilated	• Online learning and face to face explanations to prepare the final assessment. • Face to face to be done at ODEL centers.