Course Synopsis

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<tr><td>Course Code</td><td colspan="2">PHU5314</td><td>Level</td><td colspan="3">5</td></tr>
<tr><td>Course Title</td><td colspan="5">Thermodynamics</td></tr>
<tr><td>Credit value</td><td colspan="5">3</td></tr>
<tr><td>Core/Optional</td><td colspan="5">Core</td></tr>
<tr><td>Prerequisites</td><td colspan="5">Core for B.Sc. Honours Degree in Physics</td></tr>
<tr><td rowspan="2">Hourly breakdown</td><td colspan="2">Theory</td><td>Practical hours</td><td>Independent Learning</td><td>Assessments</td><td>Total hrs</td></tr>
<tr><td>25 Sessions x 2 hrs = 50 hrs</td><td>4 DS x 3hrs = 12 hrs</td><td></td><td>▪ 25 Sessions x 3 hrs = 75 hr<br>▪ other learning resources = 11 hrs</td><td>▪ Continuous Assessments (CA) = 2 hrs</td><td>150 hrs</td></tr>
<tr><td>Course Aim/s.</td><td colspan="6">Upon completion of this course the student will be able to, identify and use appropriately the important technical terms and definitions of physical principles and concepts in heat and thermodynamics. Explain conceptually the concepts in thermodynamics and its application. Identify the importance of thermodynamics in present day technology.Demonstrate problem solving, critical thinking and analytical skills and be able to learn new skills as needed</td></tr>
<tr><td>PLOs addressed by course</td><td colspan="6">PLO1: Knowledge - Explain the fundamental principles and broader knowledge pertaining to the chosen science disciplines offered for the BSc degree.<br>PLO3: Communication - Communicate reliably, efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society.<br>PLO4: Individual Work, Team Work and Leadership - Function effectively as an individual, and as a team member, sharing work and experiences, leading and managing assigned tasks to completion on time, demonstrating leadership to address situations in diverse and multi-disciplinary environments in day to day life.<br>PLO5: Creativity and Problem Solving - Identify problems and argue out and analyse such problems using qualitative and/or quantitative practical approaches in scientific methodology to provide valid conclusions.<br>PLO6: Adaptability and Flexibility - Develop appropriate strategies to adapt to changing environments.<br>PLO7: Information and Communication Technology Literate: Effectively use ICT skills for numerical and statistical analysis keeping up to date with knowledge and skills.<br>PLO8: Vision for Life: Identify where one wants to be and develop long term goals maintaining competency to conduct scientific investigations and proceed to undertake further studies.<br>PLO9: Lifelong Learning: Foresee new trends and recognize their impact, and update knowledge and develop new skills to meet future changes and challenges.</td></tr>
<tr><td>Course Learning Outcomes (CLO)</td><td colspan="6">Students following this course should be able to:<br>CLO1: Comprehend the basic concepts and principles in Thermodynamics, and appreciate how they are applied in science in our day-to-day life. (PLO1, PLO6)<br>CLO2: Develop competency in acquiring new knowledge and applying it in a variety of situations.(PLO1,PLO8,PLO9)<br>CLO3: Apply basic mathematical tools commonly used in physics, including differential and integral calculus, vector calculus, ordinary differential equations, and linear algebra. (PLO5)<br>CLO4: Develop the ability to clearly express their thinking in both oral and written form, and efficiently acquire new information from many sources. (PLO3, PLO5, PLO8)<br>CLO5: Convert a physical situation articulated in English language to a mathematical formulation and then analyse it quantitatively. (PLO5, PLO7)<br>CLO6: Solve problems competently by identifying the essential parts of a problem and formulating a strategy for solving the problem. Estimate the numerical solution to a problem. Apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret the results. (PLO5, PLO6, POL7, PLO9)<br>CLO7: Develop critical thinking, analytical skills and report writing skills. ( PL03, PLO4, PLO-07, PLO9)<br>CLO8: Communicate the concepts, principles and the experiences in their day to day life using effective scientific writing and oral communication skills.(PLO3, PLO8)</td></tr>
<tr><td>Content (Main topics, sub topics)</td><td colspan="6">Thermal Physics: Temperature and Heat, Quantity of heat, Ideal gas, Real gas, Equation of state, Simple kinetic theory of gases.<br>Thermodynamics: Thermodynamic variables, State of a system: The equation of state: Thermodynamic equilibrium: Zeroth law of Thermodynamics: Volume expansively, Isothermal compressibility. Work in Thermodynamics: External and internal work, Internal energy of a Thermodynamic system. First law of Thermodynamics: Thermodynamic process, Heat capacity, Equation of a hydrostatic system. The second law of Thermodynamics: Heat engine, Thermal efficiency, Reversible and irreversible engine, Carnot's engine and Carnot's cycle, Carnot's theorem, Entropy. Enthalpy: The Helmholtz function: The Gibbs function: The Maxwell's relation: The TdS equation, Application of TdS equation, Energy equation</td></tr>
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<tr><td>Teaching Learning methods (TL)</td><td colspan="2"><ul><li>Self-Learning/Independent learning of Self-study<ul><li>Instructional Material (IL)</li><li>Online Activities (OL)</li><li>Reference Work (RE)</li></ul></li><li>Compulsory contact sessions<ul><li>Assessments (AS)</li></ul></li><li>Non-compulsory contact sessions<ul><li>Day Schools (DS)</li></ul></li></ul></td></tr>
<tr><td rowspan="2">Assessment strategy</td><td>Overall Continuous Assessment Mark (OCAM): 40 %</td><td>Final Assessment: 60 %</td></tr>
<tr><td>Details: Continuous Assessment (CA) 100 %<br><br>OCAM = 60% of Best NBT + 40% of other NBT</td><td>Final Evaluation<br><br>Theory: 100 % (2 hrs)</td></tr>
<tr><td>Recommended Readings:</td><td colspan="2">1. Fundamentals of Physics, Volumes 1&2 (2013), by D. Halliday, R.Resnick,J.Walker, John Wiley &Sons,New York.<br>2. Physics, Principles with Applications, by D.C. Giancoli, (2014), Addison-Wesley, New York.<br>3. Physics for Scientists and Engineers, R.A. Serway, 9th Edition, (2013), Elsevier, USA.</td></tr>
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