Course Synopsis

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<tr><td>Course Code</td><td colspan="2">PHU4300</td><td>Level</td><td>4</td><td></td></tr>
<tr><td>Course Title</td><td colspan="5">Modern Physics</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">Eligibility or concurrent registration for level four Mathematical Methods for physics course.</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>Sessions X 2 = 25 x 2hrs =50 hrs</td><td>DS hrs = 4 x 3 hrs = 12 hrs</td><td>Not relevant</td><td>▪ Sessions (20 x 3hrs) = Sessions (x 3) =75 hrs
▪ Online /Audio-visual materials and other learning resources =10 hrs
▪ Recommended readings = 2 hrs</td><td>▪ Continuous Assessments (CA) = 2 hrs</td><td>151 hrs</td></tr>
<tr><td>Course Aim/s.</td><td colspan="6">Students who follow this course should be able to master set of knowledge concerning the fundamentals in modern Physics and solve conceptual and numerical problems related special relativity and quantum mechanics, demonstrating sound scientific reasoning and develop the ability to clearly express their thinking in both oral and written form and to efficiently acquire new information from many sources.</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.
PLO3: Communication - Communicate reliably, efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society.
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.
PLO5: Creativity and Problem Solving - Identify problems and argue out and analyze such problems using qualitative and/or quantitative practical approaches in scientific methodology to provide valid conclusions.
PLO6: Adaptability and Flexibility - Develop appropriate strategies to adapt to changing environments.
PLO7: Information and Communication Technology Literate: Effectively use ICT skills for numerical and statistical analysis keeping up to date with knowledge and skills.
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.
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:
• CLO-01 Comprehend the basic ideas and postulates in special theory of relativity and appreciate how they are conflict with the traditional idea of absolute nature of space and time. (PLO 1,PLO9)
• CLO-02 Develop the facts according to the Einstein's equation about the not independency of mass and energy according to the Einstein's equation. (PLO 1,PLO9)
• CLO-03 Apply basic mathematical tools commonly used in physics, including differential and integral calculus, vector calculus, ordinary differential equations, and linear algebra.(PLO 1,PLO 5,PLO9 PLO6)
• CLO-04 Develop the ability of course contents understanding and problem solving with considerable number of exercises. Apply appropriate technique to reach at a solution, compare the accuracy of the solution and interpret the results. (PLO 1,PLO 5,PLO 7,PLO9)
• CLO-05 Convert a physical situation to a mathematical formulation and then analyze it quantitatively.(PLO 5,PLO 4,PLO9)
• CLO-06 Develop analytical thinking, develop ability to clearly express their thinking in both oral and written form. (PLO 1,PLO5,PLO 7,PLO9 ,PLO6)
• CLO-07 Develop the concept of the quantum mechanics and special relativity based on historical information and discuss applications. (PLO 7,PLO 4 ,PLO3 ,PLO9 ,PLO2)
• CLO-08 Develop the idea of E.M. radiation by introducing their production properties and variety of applications in different field in day to day life. (PLO7,PLO4,PLO3,PLO9,PLO4,PLO2 ,plo8)</td></tr>
<tr><td>Content (Main topics, sub topics)</td><td colspan="6">General theory of relativity: Classical Mechanics and its limitations , Galilean transformation; Special relativity and relativistic motion ,The Lorentz transformation; Relativity of time and length; Relativistic mechanics; Special topics in relativity, Light cone.

Quantum theory of the atom: Properties of particles, wave properties, Black body radiation, The photoelectric effect ,The Compton effect, Interaction radiation with matter, The de Broglie hypothesis, The uncertainty principle ,The wave functions and properties ,Operators, The Schrodinger equation; 1-D harmonic oscillation, The nature of the atom , Atomic models ,line spectra ,The Bohr theory ,The hydrogen atom, Spin angular momentum of the electron, The Pauli exclusion principle, The Zeeman effect, X-rays, lasers and their applications</td></tr>
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<tr><td>Teaching Learning methods (TL)</td><td colspan="2">

Self-Learning/Independent learning of Self-study

Instructional Material (IL)
Online Activities (OL)
Reference Work (RE)

Compulsory contact sessions

Practical Sessions (PR)
Laboratory Training (LT)
Assessments (AS) and Feedback – MCQs (MCQ);Structured Essay (SEQ); Presentations (PS); Viva voce (VV); Reports (RE);

Non-compulsory contact sessions

Day Schools (DS)

Group Learning (GL)

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<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) (two hours)
60 % of best NBT and 40 % of other NBT</td><td>Final Evaluation
Theory: 100 % of two hour duration</td></tr>
<tr><td>Recommended Readings:</td><td colspan="2">1.Introduction to Quantum mechanics by David J.Griffiths
2.Quantum Mechanics by Leonard Schiff
3.Taylor,Zafiratos,Dubson, Modern physics for Science and engineers (2nd ed.)
4. Introduction to special relativity by Wolfgng rindler (2nd ed. .Oxford science publication)
5. Modern physics by Kenneth Krane (3rd edition)</td></tr>
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