Programme	Bachelor of Science in Solid State Physics (BS SS Physics)	**Course Code**	**SSP-205**	**Credit Hours**	3 (2-1)
Course Title	**Modern Physics**				

Course Introduction

This course is designed to provide simple and clear explanations of main physical concepts and theories of the 20th century and to clarify these concepts and theories through a broad range of current applications and examples.

To liven up the text with brief sketches of the historical development of 20th century physics.

Develop an understanding of the current basis of broad knowledge in modern physics.

Enhance the critical thinking, analytical reasoning and problem solving skills.

Discuss the problems confronting modern physics in the 21-st century.

Learning Outcomes

By the end of this course, students will be able to:

1. Understand the intuitive ideas of the Relativity, Quantum physics, and Nuclear physics.
2. Understand the basic principles of 20th-century Physics including but not limited to Einstein theory of Relativity, Quantum theory of light, Particle nature of matter, Quantum mechanics in one dimension, Basic ideas of nuclear physics and its applications.
3. Students will develop a comprehension of the current basis of broad knowledge in Modern physics.
4. They will know about the problems confronting modern physics in the 21st century.
5. Learners will build on a critical thinking, analytical reasoning, and problem solving skills.
6. Students will know how to use interactive methods and Internet for their independent learning on "Introduction to Modern Physics I."
7. Students will be trained to prepare and make a scientific presentation

	Course Content	**Assignments/Readings**
Week 1	**Unit-I** 1.1 Introduction to quantum Physics 1.1.1 Blackbody Radiation and Planck's Hypothesis	What is black body
Week 2	**Unit-II** 2.1 Photoelectric effect, Compton effect	Thoroughly read

Week 3	**Unit-III** 1.1 production and properties of X-rays, 1.2 diffraction of X-rays	What are x-rays
Week 4	**Unit-IV** 4.1 De Broglie relationship, electrons are waves, electron diffraction, particulate nature of matter, contributions of Faraday (atoms exist)	De Broglie hypothesis
Week 5	**Unit-V** 5.1 Thomson (electron exists), Rutherford (nucleus exists) and Bohr (quantization of energies inside an atom)	
Week 6	**Unit-VI** 6.1 Wave packets and wave groups, dispersion, Heisenberg uncertainty principle	Discussion
Week 7	**Unit-VII** 7.1 Direct confirmation of quantization through Franck-Hertz experiment and spectroscopy, working of electron microscopes.	Principle of a microscope
Week 8	Mid Term Exams	
Week 9	**Unit-VIII** 1.1 Atomic Physics 8.1.1 Atomic Spectra of Gases. Early models of the atom. Bohr's model of the Hydrogen Atom	What is atom
Week 10	**Unit-IX** 9.1 The Quantum model of the hydrogen atom. The wave function for hydrogen	Features of hydrogen atom
Week 11	**Unit-X** 10.1 Physical interpretation of the Quantum numbers. The Exclusion principle and the periodic table. Spontaneous and stimulated transitions. 10.2 Lasers	What are quantum numbers
Week 12	**Unit-XI** 11.1 Molecules and Solids 11.2 Molecular bonds. Energy states and spectra of molecules. Bonding in solids. Free electron theory of metals.	Free electron theory
Week 13	**Unit-XII** 12.1 Band theory of solids. Electrical conduction in metals, Insulators, and	Band theory

	semiconductors. Semiconductor devices. Superconductivity	
Week 14	**Unit-XIII** 13.1 Particle Physics and Cosmology 13.2 The Fundamental forces in Nature. Positrons and other Antiparticles. Mesons and beginning of the particle physics	Forces in nature
Week 15	**Unit-XIV** 14.1 Classification of particles. Conservation laws. Strange particles and strangeness. Finding patterns in the particles. Quarks. Multicolored Quarks. The standard Model. The cosmic connection.	Discussion
Week 16	Final Term Exams	

Textbooks and Reading Material

1. R. A. Serway and J. W. Jewett, Physics for Scientists and Engineers with Modern Physics, 10th ed.

2. R.A. Serway, C.J. Moses and C.A. Moyer, Modern Physics, Brooks Cole, 3rd ed. 2004.

3. Paul A. Tipler and Ralph A. Llewellyn, Modern Physics, W H Freeman and Company 6th ed. 2012

4. A. Beiser, Concepts of Modern Physics, McGraw-Hill Higher Education, 6th ed.

5. R. M. Eisberg and R. Resnick, Quantum Physics of Atoms, molecules, Solids, Nuclei and Particles, John Wiley, 2nd ed. 2002.

Teaching Learning Strategies

1. Course Teaching
2. Presentations
3. Quiz

Assignments: Types and Number with Calendar

1.
2.
3.
4.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.