

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
HYDERABAD CAMPUS
SECOND SEMESTER 2023-2024
COURSE HANDOUT

Date : 09/1/2024

Course No : **PHY F343**
Course Title : **Nuclear and Particle Physics**
Instructor-in-Charge : Dr SARMISTHA BANIK
Instructors: Sarmistha Banik, Asrarul Haque
Tutorial: Anagh Venneti

1. Scope and Objectives of the course

The course is designed to stress the general underlying ideas of theoretical as well as experimental Nuclear and Particle physics. Quantum Mechanics I & II are pre-requisites for this course. The course includes traditional nuclear physics at elementary level, but covers the new trends of elementary particle physics so that the students could pursue advanced courses/active research either in Nuclear or Particle Physics later on.

2. Text Book

Introduction to Nuclear & Particle Physics: A. Das and T.Ferbel, World Scientific.

Reference Book

Introduction to Elementary Particle Physics: David Griffiths , 2008 (John Wiley and Sons)

3. Course Plan

Lect. No.	Topics to be covered	Learning Objectives	Chapters of Text Book
1-6	Properties and Interactions of Elementary Particles	Forces, Elementary particles, Quantum numbers, Resonances, Violation of Quantum numbers, Interactions of Elementary particles	9, 1.1-1.6(RB1) 1.7-1.8(RB1)
7-12	Symmetries and Conservation Laws	Spin & Orbital Angular momentum, Angular momentum addition	10, class notes
13	Quiz1		
14-22	Discrete Transformation	Parity, Time reversal, Charge Conjugation, CPT theorem, CP violation, Wu's experiment	11,12
Mid sem			
23	Introduction	Rutherford's Scattering of Alpha particles, Cross-section, Nuclear model of atoms.	1
23-24	General Properties of	Labeling of nuclei, Mass, size, spin, dipole moment, stability of nuclei, Nature of Nuclear	2

	Nuclei	force.	
25-29	Nuclear Models	Liquid drop model(Bethe-Weizsacker mass formula), Fermi-Gas model, Shell model, Collective model, Superdeformed nuclei.	3
30-33	Nuclear Radiation	Alpha, Beta, Gamma decay	4
Quiz2			
35-36	Application of Nuclear Physics	Fission, Fusion, Radioactive decay	5, class notes
37-40	Nuclear Force and two body problem	Deuteron	Class notes

4. Evaluation Scheme

Component	Duration	Weightage (%)	Marks	Date & Time	Remarks
Mid-sem	90 mins.	30 %	60	13/03 - 2.00 - 3.30PM	Closed Book
2 Quizzes	50 minutes each	25 %	50	TBA	Open Book
Comprehensive	180 mins.	45 %	90	11/05 AN	Open/Closed
Total			200		

5. **Chamber Consultation Hours:** by appointment through email

6. **Notices** CMS

7. **Make-up Policy** Very strict, only for genuine reasons such as hospitalization with intimation to IC before Examination.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
PHY F343