Al-Mustansiriyah University
College of Science
Physics Department

Fourth Grade
Nuclear Structure
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Semester-1 (Nuclear structure syllabus)

Chapter One (Nuclear Concepts)

1- Introduction (Definitions and Units)
2- Stability and Abundance
3- Nuclear Mass, Charge, Size and Density
4- Quantum theory of angular momentum

Chapter Two (Binding Energy)

5- Nuclear Binding Energy & Separation energy
6- Nuclear Forces, Spins and Dipole Moments

Chapter Three (Nuclear Models)

7- Liquid-Drop Model
8- Semi-empirical mass formula & Mass parabolas
9- Nuclear Shell Model, Single-particle shell model & Spin-Orbit coupling shell model
10- Other Models (Fermi Gas Model, Collective Model, Optical Model & Cluster Model)

Chapter Four (Nuclear Radiation)

11- Alpha Decay (α), Beta Decay (β) & Gamma Emission (γ)
12- Electron Capture (EC, K-capture), Internal Conversion, Isomeric Transition & Spontaneous Fission
13- Decay Schemes & Decay Chains

Chapter Five (Interaction of Radiation with Matter)

14- Alpha Interactions, Beta-Minus Interactions & Positron Interactions
15- Bremsstrahlung, Neutron Interactions, Electromagnetic (Gamma) Interactions & Shielding