

Course Title	Course Code	Number of Study Hours			Year	Level	Prerequisites
		Theoretical	Laboratory	Credit			
Nuclear physics 1	461PHYS	3	--	3	4 <sup>th</sup>	10 <sup>th</sup>	352PHYS

### (1) **Brief Course Description**

This course is to provide knowledge and understanding of the basics of nuclear physics like nuclear properties, force, structure, radioactivity, reactions and power production to enable progression to a postgraduate course or to provide a platform for entering industry.

### (2) **Course Objectives**

**This course is designed to provide students with:**

- The fundamental of the nuclear physics and its scale.
- The basic properties of the nuclear force.
- The structure of the nucleus under different nuclear models.
- The stability of nuclei and their decay.
- The fission process and the basics of nuclear reactor.
- The fusion process and how intermediate and heavy elements are created in the stars.

### (3) **Course Contents**

- **Nuclear Properties:** Nuclear scale, units, constants, size and density, components, Notation, isotopes, The nuclear chart (Nuclear landscape), how to write a nuclear reaction, Binding Energy BE, Average Binding Energy BE/A, Q-value.
- **Nuclear forces:** Nuclear properties, charge distribution, potential proton and neutron potential wells, force.
- **Nuclear models:** Fermi gas model, Liquid drop model, Shell model, deformation.
- **Radioactivity:** Types of radiation, - Alpha , - Beta+ , Beta-, - Gamma, Electron capture, decay chains, Uses of Radioactivity, Radioactivity decay law, Half-life, life time, nuclear dating, Carbon, Rock dating
- **Nuclear reactions:** The conservation laws, types of reaction, Elastic, Inelastic, Transfer, Compound, Fission, why fission happens, spontaneous, induced (controlled), nuclear reactor., Fusion, p-p cycle, CNO cycle, nucleosynthesis.

### (4) **Assessment Criteria**

- Periodic Exams: 20%
- Oral, Student Activity and Essays: 30%
- Final Exam: 50%

### (5) **Course Teaching Strategies**

Lectures, Reports and Essay Assignments, Homeworks, and Web-based Assignments.

### (6) **Text Book**

- Introductory Nuclear Physics, Krane K.S. Wiley, New York, (1987).

### (7) **Reference Books**

- Nuclear and Particle Physics, Williams W.S.C Clarendon Press, Oxford, (1991).

**Approved by:**

**Head of Physics Department**

Dr. Hussain Alathlawi

