Course Title	Course Code	Number of Study Hours			Year	Level	Prerequisites
		Theoretical	Laboratory	Credit			
Nuclear physics 1	461PHYS	3	--	3	4th	7th	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: 40%
- Oral, Student Activity and Essays: 10%
- 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).