

# ICPY473 Nuclear Physics

## Course Syllabus

**Instructor:** Dr.Udom Robkob, Department of Physics, Faculty of Science, Mahidol University  
E-mail: [udom.rob@mahidol.ac.th](mailto:udom.rob@mahidol.ac.th)

**MUIC Trimester:** 3/2020-21

### Objectives:

1. In order to understand nuclear structure, processes, and theoretical descriptions.
2. To learn about theories of nuclear decays, reactions, and interaction of nuclear radiations with matter.
3. To explore the range of applications in the other field of physics and the modern world technology.
4. To understand subnuclear particles, their classification and interactions, and something more beyond our today vision.

### Course description:

Nuclear structure, nuclear strong force, decay and activity, nuclear decay processes, nuclear reaction, fission and fusion, nuclear radiations interaction with matter, detection and measurement, elementary particles, interactions and classification by additional quantum numbers, isospin, symmetries, conservation laws, quark model

### Lecture topics (weekly):

1. Nuclear phenomenology
2. Nuclear force, potential and models
3. Nuclear decay processes
4. Nuclear reactions (cross section and rate)
5. Interaction of nuclear radiations with matter
6. Experimental nuclear physics
7. Relativistic kinematics of energetic particle
8. Particle classification and additional quantum numbers
9. Symmetry principle in quantum mechanics
10. Quark model of hadrons
11. Fundamental interactions
12. Discrete symmetries, quark masses and flavor oscillations

### Reference materials:

1. Krane, *Introductory Nuclear Physics* (Wiley)
2. Wong, *Introductory Nuclear Physics* (Wiley)
3. Bertulani, *Nuclear Physics in a Nutshell* (Princeton UP)

4. Kane, *Modern Elementary Particle Physics* (Cambridge UP)
5. Martin and Shaw, *Nuclear and Particle Physics* (Wiley)
6. Course web page: <http://physics.sc.mahidol.ac.th/udom/icpy473.html>

**Course policy:**

1. Accumulation: homework 40%, 2 exams 60%
2. Grading: MUIC score