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|  | **Mutah University**  **Departmentof Physics**  **General Physics (2)** | Description: C:\Users\lamasat.lamasat-PC\Pictures\Picture1.png |

**Course Information:**

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| Course Number:0302742 | Course Title:Nuclear Physics |
| Credit Hours:3 hours | College:Science |
| Pre-requisite:No Prerequest | Department: Physics |
| Instructor:  Dr. Moaz Altarawneh | Semester&AcademicYear:  Spring 2017/2018 |
| The time of the lecture: | Office Hours:Sun, Tues, Thursday : 11-12 Mon, Wed: 8-11 |

**General CourseDescription**

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| The course introduces the fundamental principles that underline nuclear science and its engineering applications, as well as mathematical tools needed to grasp these concepts. Moreover, this course explores fundamentals of nuclear physics, including interaction of radiation with matter; properties of nuclear forces; nuclear structure described by shell and collective models; nuclear reactions; radioactive decay processes. |

**Course Objectives**

To introduce the students to the assorted phenomena of the world of particle and nuclear physics, and develop the framework and analytical skills necessary to understand these phenomena in Nature and in the applied context**.**

**Expected Learning Outcomes**

* Course expresses the basic concepts of nuclear physics.
* can express the radioactive decays
* can express the radioactive decays
* Can state a some quantities characterizing the decay such as half-life, decay constant.
* can list the types of decay
* able to express Successive Decays
* can tell growth of daughter activities
* can tell radioactive equilibrium
* can express the alpha decay
* can express reaction equation and Q values and Enegy of alpha particle
* can explain the alpha process by using quantum theory.
* can calculate the half-times based on quantum theory.
* can express the beta decays
* can list the types of beta decays and can express reaction equations and related Q values and enegy of beta particles
* can explain the beta decay process by using the Fermi theory.
* can express the selection rules and its applications.
* can tell about the allowed and forbidden transitions
* can express the gamma decay
* can express the types of gamma decay.
* can tell about selection rules
* can express nuclear binding energy and nuclear masses
* can write semi empirical mass formula
* can explain the terms in the semi empirical mass formula
* Can explain nuclear reactions
* can write types of reactions and conservation laws.
* can write energies of observable products
* can expess the threshold energy.
* can express reaction cross section
* can explain nuclear fission
* can write characteristics of fusion.
* can state activation and excitation energies
* can tell basic elements of nuclear reactor
* can explain nuclear fusion
* can state basic fusion processes.
* can write characteristics of fusion.
* can write cycles in solar fusion.

**PlanDistribution& Learning Resources**

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| **Course Content** | | |
| **Week** | **Topics** | **Chapter** |
|  | Nuclear Composition and Size | Ch.3 |
| Ch.3(Krane) |
| Ch.4 Bertulani |
|  | Binding Energy and the Liquid Drop Model | Ch.4 |
| Ch.3 &Ch.5(Krane) |
| Ch.4 Bertulani |
|  | The Shell Model | Ch.5 |
| Ch.5(Krane) |
| Ch.5 Bertulani |
|  | Properties of the Nucleus | Ch.6 |
|  | General Properties of Decay Processes | Ch.7 |
| Ch.6(Krane) |
| Ch.6 Bertulani |

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| Week | topic | chapter |
|  | Detecting nuclear radiation | Ch.7(Krane) |
|  | Alpha Decay | Ch.8 |
| Ch.8(Krane) |
| Ch.7 Bertulani |
|  | Beta Decay | Ch.9 |
| Ch.9(Krane) |
| Ch.8 Bertulani |
|  | Gamma Decay | Ch.10 |
| Ch.10(Krane) |
| Ch.9 Bertulani |
|  | Nuclear Reactions | Ch.11 |
| Ch.11(Krane) |
| Ch.10 & Ch.11 Bertulani |
|  | Fission Reactions | Ch.12  Ch.13(Krane) |
| Ch.11 Bertulani |
|  | Fusion Reactions | Ch.13 |
| Ch.14(Krane) |
| Ch.12 Bertulani |
|  | Accelerators | Ch.15(Krane) |

Teaching Strategies and Methods

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| **Teaching Strategies and Methods** | No |
| Normal lecturing methods using white board | **1** |
| Demonstrations drawn in the white board | **2** |

Methodsof Assessment

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| **Proportion of Final Evaluation** | **Evaluation Methods of** | **Week & Date** | **No.** |
| **25%** | First Exam |  | **1.** |
| **25%** | Second Exam |  | **2.** |
| **40%** | Final Exam |  | **3.** |
| **10%** | Homework |  |  |
| **(100%)** |  | **Total** | |

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| **Text Book** | |
| **Title** | **An Introduction to the Physics of Nuclei and Particles** |
| **Author(s)** | **Richard A. Dunlap** |
| **Publisher** | Thomson, Books/Cole |
| **Year** | 2004 |
| **References** | 1. Introductory Nuclear Physics, By K.S. Krane 2. Elements of Nuclear Physics Introductory nuclear physics, By W. E. Meyerhof. 3. Nuclear Physics in a Nutshell 1st Editionby Carlos A. Bertulani   **(very good book for grad level)** |

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| **Additional Notes** | |
| **Exams** | The final exam is a comprehensive exam. |
| **Cheating** | Cheating is prohibited  According to the regulations of the university, there is a punishment to any student tries to cheat in the exam. |
| **Attendance** | Any student misses more than 10% of the lectures without accepted excuse will fail the course. |