Kurdistan Regional Government – Iraq

Council of Ministers

Ministry of Higher Education & Scientific Research

University of Salahaddin-Erbil

College of Education / Chemistry Department

**Course Book**

**Radiation & Nuclear Chemistry**

Third year Chemistry 2018-2019

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Office hours: Monday 9:30 am – 12:30 or by appointment

Class Hours:

Group 1: (Hall No.7) Thursday 8:30 – 10:30.

Group 2: (Hall No.6) Thursday 10:30 – 12:30.

**Course Overview**:

This course covers the nuclear reactions brought about by absorption of slow neutrons or by radioactive decay, and the chemical effects produced in a system by the absorption of ionizing radiation, alpha-, and beta-particles and gamma- and x-rays. Sources of radiation, collision of high energy radiation with electrons in matter, differences between photochemistry and radiation chemistry (solvent-oriented), the formation of ions and free radicals along the radiation tracks and the diffusion and chemical reaction kinetics of ions and free radicals are described at an introductory level. Nuclear reactors, accelerators, medical radioisotopes and other applications of nuclear technologies are also described.

**Exams and grading:**

Exams: There will be two closed book exams given throughout the semester.

Each test will be to take 90 minutes. Each exam carry out 20 degrees, these two exams considered = 40%.

Final Exam: The Final Exam is Comprehensive in all course outlines. Carry out 60% degrees of the grade.

**References:**

1. **J. W. T. Spinks and R. J. Woods, “An Introduction to Radiation Chemistry”**
2. **W. D. Loveland et.al., “Modern Nuclear Chemistry”**

**Syllabus of Course Program:**

**First week**

Structure of Atom, Cathode rays – The discovery of electron

MEASUREMENT OF e/m FOR ELECTRONS

DETERMINATION OF THE CHARGE ON AN ELECTRON

Mass of Electron, POSITIVE RAYS.

**Second week**

Neutrons, RUTHERFORD’S ATOMIC MODEL – THE NUCLEAR ATOM, COMPOSITION OF THE NUCLEUS.

**Third week**

RADIOACTIVITY, TYPES OF RADIATIONS, ALPHA RAYS, BETA RAYS, GAMMA RAYS.

**Fourth week**

DETECTION AND MEASUREMENT OF RADIOACTIVITY, Cloud Chamber, Ionisation Chamber, Geiger-Muller Counter.

**Fifth week**

TYPES OF RADIOACTIVE DECAY,

**Sixth week**

RADIOACTIVITY, TYPES OF RADIATIONS, PROPERTIES OF RADIATIONS.

**Seventh week**

DETECTION AND MEASUREMENT

OF RADIOACTIVITY

**Eighth week**

TYPES OF RADIOACTIVE DECAY

THE GROUP DISPLACEMENT LAW

**Ninth week**

RADIOACTIVE DISINTEGRATION

SERIES

RATE OF RADIOACTIVE DECAY

**Tenth week**

HALF-LIFE

RADIOACTIVE DATING

**Eleventh week**

NUCLEAR REACTIONS

NUCLEAR FISSION REACTIONS

NUCLEAR FUSION REACTIONS

**Twelfth week**

NUCLEAR EQUATIONS

ARTIFICIAL RADIOACTIVITY

**Thirteenth week**

NUCLEAR ISOMERISM

**Fourteenth week**

MASS DEFECT

**Fifteenth week**

NUCLEAR BINDING ENERGY

**Sixteenth week**

NUCLEAR FISSION PROCESS

**Seventeenth week**

NUCLEAR CHAIN REACTION

**Eighteenth week**

NUCLEAR ENERGY

**Nineteenth week**

NUCLEAR REACTOR

**Twentieth week**

NUCLEAR FUSION PROCESS

**Twenty first week**

SOLAR ENERGY

**Twenty second week**

FUSION AS A SOURCE OF

ENERGY IN 21st CENTURY

**Twenty third weeks**

High performance polymeric materials by irradiation

**Twenty fourth weeks**

Food irradiation

**Twenty fifth weeks**

Radiation damage to biomolecules, Chemical protection

**Twenty sixth weeks**

Radiotherapy