

نموذج توصيف مقرر

Course Description Form

Name of College\Faculty :

اسم الكلية:

Name of Department:

اسم القسم العلمي:

Course Name	Advanced nuclear and radiochemistry,	اسم المقرر
Course No.	CHEM 400	رقم المقرر
No. of Credits	3	عدد الوحدات
Theoretical Hours	3	عدد الساعات النظرية
Practical Hours	0	عدد الساعات المحلّية
Course topics		مواضيع المقرر
1. Introduction: definition of nuclear chemistry, nuclear mass, stability (mass defects, mass excess and binding energy). Radioactive characteristics. 2. Nuclear structure. Different models. 3. Nuclear reactions (energetics, mechanisms and models) 4. Thermonuclear reactions (nuclear chain reactions). a. Production of radionuclide b. Absorption of nuclear radiation and radiation effects on matter. 5. Application of radioactive traces. 6. Trans-uranium elements, synthesis of new elements and nuclear power.		
Text book: (Name, Author , Year , Publisher)		عنوان الكتاب : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)
Modern Nuclear Chemistry 2nd Edition		
References: (Name , Author , Year . Publisher)		عنوان المرجع : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)

Walter D. Loveland, David J. Morrissey, Glenn T. Seaborg, Wiley; 2nd edition, 2017

Prerequisites				متطلبات المقرر	
Grading	Exams		%	40	الاختبارات
	Quizzes		%	10	امتحانات قصيرة
	H.W.		%	5	واجبات
	Project (field study)		%	5	مشاريع (دراسة ميدانية)
	Final		%	40	الاختبار النهائي
	%100				آلية رصد المقرر

Chapters included:

Chapter	Topic	Sections Included
1	Introductory Concepts (Atomic Processes, Nomenclature, Properties of the Nucleus survey of Nuclear Decay)	4-8
2	Nuclear Properties (Nuclear Masses, Binding Energy Per Nucleon)	2-3
3	Radioactive characteristics. (Basic Decay Equations, Mixture of Two Independently Decaying Radionuclides, Radioactive Decay Equilibrium, Branching Decay, Radiation Dosage, Natural Radioactivity)	1-6
6	Nuclear structure. (Introduction, Nuclear Potentials, Schematic Shell Model, Independent Particle Model, Collective Model, Nilsson Model, Fermi Gas Model)	1-6
10	Nuclear reactions (Energetics of Nuclear Reactions, Reaction Types and Mechanisms)	1-3
12	Nuclear Astrophysics (Thermonuclear reactions, nuclear chain reactions), Stellar Nucleosynthesis)	1-5
13	Reactors and Accelerators	1-5
16	Interaction of Radiation with Matter	1-4
19	Radiochemical Techniques	1-7

Course objectives					
No.	Course Objectives (Learning Outcomes)	Example(s) of relevant (Topics and activities)	Recommended Level to satisfy the objectives		
			High	Medium	Low
1	Understand the language of radioactive characteristics and nuclear chemistry	Basic concepts and terminology in nuclear chemistry (e.g., isotope, nuclide, nucleon, half-life, decay constant) Types of radioactive decay (alpha, beta, gamma, positron emission, electron capture)			
2	Illustrate and describe the different models for the nuclear structure	Liquid Drop Model, Shell Model, Collective Model (Unified Model):			
3	Explain and outlines the different nuclear reactions with different mechanisms	Nuclear Fission, Nuclear Fusion			
4	Describe the thermonuclear reactions including the production of radionuclide	Thermonuclear Reactions, Production of Radionuclides:			
5	Discuss the absorption of nuclear radiation and radiation effects on matter	Types of Nuclear Radiation, Absorption of Radiation in Matter			
6	Illustrate the application of radioactive traces	Definition and Principle of Radioactive Tracers, Types of Radioactive Tracers, Applications of Radioactive Tracers			

7	Outline the properties of the trans-uranium elements	General Properties, Production Methods Applications and Significance			
8	Discuss the synthesis of new elements and nuclear power.	Neutron Capture and Beta Decay, Particle Bombardment:, Nuclear Fusion Reactions			
Fields					
Skills					
Coordinator (Name and Rank) : prof .Mousa Al-Noaimi					
Signature and stamp :					
Date:8-11-2025	/ /				