Course Specifications

Course Title:	Chemistry of Energy Resources
Course Code:	**4024585-2**
Program:	Chemistry - Industrial Chemistry
Department:	Department of chemistry
College:	Faculty of Applied Science/
Institution:	Umm Al-qura University

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ■ Department ☐ Others ☐ **b.** Required ☐ Elective ■
3. Level/year at which this course is offered: **8th Level-Fourth year**
4. Pre-requisites for this course (if any)**: Electrochemistry- 4022143-3**
5. Co-requisites for this course (if any)**:----------**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	30	
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	30
Other Learning Hours*		
1	**Study**	20
2	**Assignments**	2
3	**Library**	8
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	
	Total	40

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

Course Description: This course the **future energy demand of world and nation regarding the available renewable energy resources such as, solar and nuclear energy.**

2. Course Main Objective

- **Students know renewable energy resources as alternative sources for finite sources.**
- **To understand and analyze the present and future energy demand of world and nation regarding the available renewable energy resources such as, solar and nuclear energy.**
- **Students familiar with Nuclear chemistry including terminology, Radioactivity and the nature of atoms, Radioactive Decay modes, Radioactive Decay Kinetics and nuclear reactions.**
- **Brief introduction on fundamentals of solar energy and photovoltaic cells**
- **Brief introduction to fuel cells.**

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	**To know types of radiation emitted by radioactive isotopes.**	K2
1.2	**To know the relation between the stability of nucleus from the ratio of neutrons to protons**	K2
1.3	**To define binding energy**	K2
1.4	**To know about the energy accompany nuclear reactions**	K3
1.5	**To mention types of nuclear reactions**	K3
1.6	**To know instruments for measuring radiation**	K2
1.7	**To mention some applications of radioactive isotopes in medicine, agriculture …etc.**	K3
1.8	**To write about types of solar cells**	K2
1.9	**To mention types of fuel cells**	K2
2	**Skills :**	
2.1	**To predict the stability of radioactive isotope**	S1
2.2	**To compare types of nuclear reaction**	S1
2.3	**To compare the types of radioactive emissions**	S1
2.4	**To differentiate between solar cells**	S2
2.5	**To compare Fuel cells**	S1
3	**Competence:**	
3.1	**The ability for teamwork and the distribution of tasks.**	C2
3.2	**The ability to debate and dialogue with clear scientific method.**	C3
3.3	**The ability to present or explain scientific topic.**	C4

C. Course Content

No	List of Topics	Contact Hours
1	• **The main sources of energy** • **Problems associated with the use of conventional energy sources, including fossil fuels, chemistry of fossil fuels, with regard to future supply and the environment.**	2

2	- Nuclear energy: o -The atomic nuclei, atomic structure and composition of nuclei. - Nuclear masses and stability of nucleus.	2
3	- Radioactive decay processes, alpha, beta and gamma decays.	2
4	- Radioactive decay and growth. - Equations of transformation during nuclear reactions	4
5	First exam	1
6	- Fission, charge and mass distribution. - Radioactive decay, Half-life, First order reaction, Source strength – Alpha, beta, gamma-radiation, x-rays, high-energy particles – Accelerators, Synchrotron	4
7	Solar energy - An overview including principles of photovoltaics, dye sensitized solar cells and photoelectrochemical cells.	4
8	- Solar cells as cost effective alternative - Impact on environment .	2
9	Second exam	1
	Fuel cells: The working principles of a Fuel Cell.	4
	- Fuel cells types	2
	Polymer Electrolyte Fuel Cell and Direct Methanol Fuel Cells as examples	2
	Final exam	

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge		
1.1	To know types of radiation emitted by radioactive isotopes.		Quiz
1.2	To know the relation between the stability of nucleus from the ratio of neutrons to protons		Exam
1.3	To define binding energy		Exam
1.4	To know about the energy accompany nuclear reactions		Quiz
1.5	To mention types of nuclear reactions		Exam
1.6	To know instruments for measuring radiation		Quiz
1.7	To mention some applications of radioactive isotopes in medicine, agriculture …etc.		Exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.8	**To write about types of solar cells**		Quiz
1.9	**To mention types of fuel cells**		Exam
2.0	**Skills**		
2.1	**To predict the stability of radioactive isotope**	Lectures	Exam
2.2	**To compare types of nuclear reaction**	Lectures Scientific discussion	Quiz
2.3	**To compare the types of radioactive emissions**	Lectures	Exam
2.4	**To differentiate between solar cells**	Lectures Scientific discussion	Quiz
2.5	**To compare Fuel cells**	Lectures	Exam
3.0	**Competence**		
3.1	**The ability for teamwork and the distribution of tasks.**	Scientific discussion	long and short essays posters lab manuals
3.2	**The ability to debate and dialogue with clear scientific method.**	Scientific discussion	long and short essays
3.3	**The ability to present or explain scientific topic.**	Scientific discussion	posters lab manuals

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class activities, Attendances and Duties	Throughout the Term	10%
2	Mid-Term Exam (s)	5-14	40%
4	Final Exam.(2 hours exam)	End of the Term	50%
5	Total	100%	

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : Office hours for Faculty member

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Textbook of Nuclear Chemistry, A. Singh, R. Singh, Campus Publishers, 2006**

Essential References Materials	• **Applied Photovoltaics, Stuart Wenham, Martin Green, and Muriel Watt, Earthscan, 2007, ISBN 1- 84407-407** • **Fuel cells: problems and solutions, Vladimir S. Bagotsky, Second Edition, John Wiley & Sons, 2012.**
Electronic Materials	Power point lectures.
Other Learning Materials	Web sites

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms, laboratories
Technology Resources (AV, data show, Smart Board, software, etc.)	data show
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Program Leaders	Direct
Extent of achievement of course learning outcomes	Faculty	Indirect
Quality of learning resources	Faculty	Direct

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Received by: Dr. Ismail Althagafi **Department Head**

Signature: **Date: 20/12/2019**