

## COURSE SPECIFICATIONS

### Form

Course Title: **Renewable Energy**

Course Code: **4026851-3**



Date: 14-12-2019

Institution: Umm Al-Qura University.

College: Faculty of Applied Science

Department: Department of Chemistry

### A. Course Identification and General Information

1. Course title and code: **Renewable energy / 4026851-3**

2. Credit hours: **3 hrs. (Theoretical)**

3. Program(s) in which the course is offered. **M. Sc. in Chemistry**

(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course: **Dr. Ahmed Fawzy Saad**

5. Level/year at which this course is offered: **3<sup>rd</sup> / 2<sup>nd</sup>**

6. Pre-requisites for this course (if any): **not applicable**

7. Co-requisites for this course (if any): **not applicable**

8. Location if not on main campus: **El-Abedyah, El-Azizya, and El-Zaher**

9. Mode of Instruction (mark all that apply):

- |                                     |                                     |             |                                       |
|-------------------------------------|-------------------------------------|-------------|---------------------------------------|
| a. Traditional classroom            | <input type="checkbox"/>            | percentage? | <input type="checkbox"/>              |
| b. Blended (traditional and online) | <input checked="" type="checkbox"/> | percentage? | <input type="checkbox" value="100%"/> |
| c. E-learning                       | <input type="checkbox"/>            | percentage? | <input type="checkbox"/>              |
| d. Correspondence                   | <input type="checkbox"/>            | percentage? | <input type="checkbox"/>              |
| f. Other                            | <input type="checkbox"/>            | percentage? | <input type="checkbox"/>              |

Comments:

## B Objectives

1. The main objective of this course

- 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.
- Brief introduction on fundamentals of solar energy and photovoltaic cells
- Brief introduction to fuel cells.

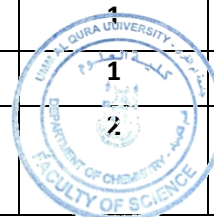
2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- Using information technology and the Internet to prepare detailed research of everything new in the course.
- Add lectures to review all new applications in the area of specialization through use of explanatory films and presentations (Video Projector), (power point)
- Workshops and scientific forums regularly for more information and training.

**C. Course Description** (Note: General description in the form used in the program's bulletin or handbook)

**Course Description:**

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Introduction to renewable energy	1	3
The main sources of energy	1	3
Problems associated with the use of conventional energy sources, including fossil fuels, chemistry of fossil foils, with regard to future supply and the environment.	1	3
<b>Solar energy:</b> An overview including principles of photovoltaics, dye sensitized solar cells and photoelectrochemical cells.	2	6
Solar cells as cost effective alternative - Impact on environment.	1	3
<b>Fuel cells:</b> The working principles of a Fuel Cell.	2	6
Mid. Term Exam.	1	3
Fuel cells types	1	3
Polymer Electrolyte Fuel Cell and Direct Methanol Fuel Cells as examples	2	6



Final exam	1	3
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## 2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	39	--	--	--	--	39
	Actual	39	--	--	--	--	39
Credit	Planned	3	--	--	--	--	3
	Actual	3	--	--	--	--	3

## 3. Individual study/learning hours expected for students per week.

3 hrs

## 4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

**First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

### Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
1.1	Know the main sources of energy	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Library visits</li> <li>• Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>• Exams</li> <li>• web-based student performance systems</li> <li>• portfolios</li> <li>• long and short essays</li> <li>• posters lab manuals</li> </ul>
1.2	To define the polymer electrolyte fuel cell and direct methanol fuel cells		
1.3	Write about types of solar cells		
1.4	Mention types of fuel cells		
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Differentiate between solar cells	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Library visits</li> <li>• Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>• web-based student performance systems</li> <li>• portfolios</li> <li>• posters</li> </ul>
2.2	Compare Fuel cells		
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Have the ability for teamwork and the distribution of tasks.	Scientific discussion	web-based student performance systems
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	Able to debate and dialogue with clear scientific	- Lectures	- web-based student

	method.	- Scientific discussion	performance systems
4.2	Able to present or explain scientific topic.	- Library visits	- individual and group presentations
5.0	<b>Psychomotor(if any)</b> NOT APPLICABLE		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Activities and Assignments.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	<b>Total</b>		<b>100%</b>

#### D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

#### E. Learning Resources

##### 1. List Required Textbooks

- Handbook of Solar Energy: Theory, Analysis and Applications, **Authors: Tiwari, G, Tiwari, Arvind, Shyam**, Springer, 2016
- Fuel cells: problems and solutions, Vladimir S. Bagotsky, Second Edition, John Wiley & Sons, 2012.

##### 2. List Essential References Materials (Journals, Reports, etc.)

- Applied Photovoltaics, Stuart Wenham, Martin Green, and Muriel Watt, Earthscan, 2007, ISBN 1- 84407-407-3

##### 3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- <http://www.chemweb.com>
- <http://www.sciencedirect.com>

##### 4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

None.

#### F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access,etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

<ul style="list-style-type: none"><li>• Classrooms capacity (30) students.</li><li>• Providing hall of teaching aids including computers and projector.</li></ul>
2. Technology resources (AV, data show, Smart Board, software, etc.) <b>Room equipped with computer and projector.</b>
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) <ul style="list-style-type: none"><li>• No other requirements.</li></ul>

## G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching <ul style="list-style-type: none"><li>• Questionnaires can be used to collect student feedback.</li><li>• Student representation on staff-student committees and institutional bodies.</li></ul>
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department <ul style="list-style-type: none"><li>• Observations and the assistance of colleagues.</li><li>• Independent evaluation for extent to achieve students the standards.</li><li>• Independent advice of the duties and tasks.</li></ul>
3. Procedures for Teaching Development <ul style="list-style-type: none"><li>▪ Workshops for teaching methods.</li><li>▪ Continuous training of staff members.</li><li>▪ Review of strategies proposed.</li><li>▪ The application of e-learning.</li></ul>
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) <ul style="list-style-type: none"><li>▪ Check marking of a sample of exam papers, or student work.</li><li>▪ Exchange corrected sample of assignments or exam basis with another staff member for the same course in other faculty.</li></ul>
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. <ul style="list-style-type: none"><li>• Periodic Review of the contents of the syllabus and modify the negatives.</li><li>• Consult other staff of the course.</li><li>• Workshops for teachers of the course.</li></ul>

**Name of Course Instructor: Dr. Ahmed Fawzy Saad**

Signature:  Date Completed: 14 /2/2019

**Program Coordinator: Dr. Ismail Ibrahim Althagafi**

Signature:  Date Received: **15 /2/2019**

