



**COURSE DESCRIPTIONS**

<b>Faculty</b>	College of Engineering				
<b>Department</b>	Renewable Energy Engineering			<b>NQF level</b>	7
<b>Course Title</b>	Energy Conversion	<b>Code</b>	704363	<b>Prerequisite</b>	Differential & Integral (2) & Circuits (2)
<b>Credit Hours</b>	3	<b>Theory</b>	3	<b>Practical</b>	0
<b>Course Leader</b>	Dr. Jamal Alsadi	<b>email</b>	<a href="mailto:j.alsadi@jadara.edu.jo">j.alsadi@jadara.edu.jo</a>		
<b>Lecturers</b>	Dr. Amer Canaan Eng. Saif Bani Hani	<b>emails</b>	<a href="mailto:a.canaan@jadara.edu.jo">a.canaan@jadara.edu.jo</a>		
<b>Lecture time</b>		<b>Classroom</b>		<b>Attendance</b>	On Campos
<b>Semester</b>	Summer 2021/2022	<b>Production</b>	2021	<b>Updated</b>	

**Short Description**

This course provides fundamentals of thermodynamics, chemistry, and transport physics applied to energy conversion systems. Analysis of energy conversion and storage in thermal, mechanical, nuclear, chemical, and electrochemical processes in power systems, with emphasis on efficiency, performance and environmental impact. Topics include fossil and nuclear power systems, solar energy, wind energy, geothermal energy, biomass energy, fuel cell and thermoelectric systems, CO<sub>2</sub> separation and capture.

**Course Objectives**

Upon successful completion of this course, student should be able to:

1. Understand the basic types of energy.
2. Understand the fundamental energy conversion from type to another, focusing on electrical energy at the end.
3. Understand the classification of energy, sources, utilization, economics, and terminology.
4. Understand the principal fuels for energy conversion
5. Able to know the different types production for thermal energy, fossil fuel.
7. Identify regular fossil fuel and renewable types of energy based on their environmental impact.

**Learning Outcomes**

**A. Knowledge - Theoretical Understanding**

**a.1 Describe/understand** basic analysis principles of carbon and non-carbon energy systems, environmental hazardous emissions, as well as the applications of Energy Conversion. (K1)

**B. Knowledge - Practical Application**

**a.2. Compare** various energy conversion systems in terms of cost, social acceptability as well as environmental consequences (K2)

**C. Skills - Generic Problem Solving and Analytical Skills**

<b>b.1.</b> Calculate energy conversion parameters, such as the high heating value of fuel. (S2).
<b>D. Skills - Communication, ICT, and Numeracy</b>
<b>b.3</b> Write technical <b>report</b> and perform <b>oral presentations</b> of group work related to the application of engineering analysis techniques to the emerging energy conversion technologies of the 21st century (e.g., wind turbines, combined cycle power plants), and to understand the context in which the design of energy systems takes place.
<b>E. Competence: Autonomy, Responsibility, and Context</b>
<b>Teaching and Learning Methods</b>
A variety of learning methods will be used including the following: 1. Lecture, explanation, and readings 2. In-class discussion and cooperative learning activities 3. Solve problems 4. Quizzes & Homework
<b>Assessment Methods</b>
<ul style="list-style-type: none"> <li>Lecture, discussion</li> <li>Midterm exam (35), Final exam (50), Class Assignment, HW and attendance (15)</li> </ul>

Course Contents					
Week	Hours	CLOs	Topics	Teaching & Learning Methods	Assessment Methods
1, 2	6	a1	Syllabus, Course Schedule; Energy classifications	The lectures, Discussions	Assignment #1 Week2
3,4,5	9	a1, a2, b1	Principal fuels for energy conversion	The lectures, Discussions	Quiz #1 Week4
6,7	4.5	a1, a2, b1, b3	Production of thermal energy	The lectures, Discussions	Assignment #2 Week7
7,8	4.5	a1, a2, b1	Production of thermal energy	The lectures, Discussions	
9	3	a1, a2, c1, b1	Mid-Exam + Review		Written exams
10	3	a1, a2, b1	Fossil-fuel systems	The lectures, Discussions	
11	3	a1, a2, b1, b3	Production of mechanical energy	The lectures, Discussions	Assignment #3

12,13	6	a1, a2, b1	Production of electrical energy	The lectures, Discussions	
14,15	6	a1, a2, b1	Energy storage	The lectures, Discussions	Quiz #3 Week14
16	3	a1, a2, b1	Review, and final exam	The lectures, Discussions	Written exams

Infrastructure	
<b>Textbook</b>	Principles of Energy Conversion, Archie W. Culp, Jr
<b>References</b>	1. Energy Conversion, Edited by D.Y. Goswami and F. Kreith, CRC Press, 2018. 2. G.N. Tiwari and R.K. Mishra, Advanced Renewable Energy Sources, RSC Publishing, 2020
<b>Required reading</b>	
<b>Electronic materials</b>	
<b>Other</b>	<b>Recommended to be</b> General Chemistry, Thermodynamics, and Economics and Management of Energy Systems as a <b>Prerequisite</b>

Course Assessment Plan						
Assessment Method		Grade	CLOs			
			a1	a2	b1	b3
First (Midterm)		30%	10	5	10	5
Second (if applicable)						
Final Exam		50%	10	10	20	10
Coursework		20%				
Coursework assessment methods	Assignments			2.5	2.5	
	Case study					
	Discussion and interaction					
	Group work activities					10
	Lab tests and assignments					
	Presentations					
	Quizzes			20	17.5	2.5
<b>Total</b>		<b>100%</b>	<b>25</b>	<b>15</b>	<b>35</b>	<b>25</b>

Plagiarism, Attendance and Expectations, Make-up Exam Policy
<p><b>Plagiarism:</b> Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code).</p> <p>Plagiarism is different from group work in which a number of individuals share ideas on how to carry out the</p>

coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. In order to allow proper assessment that this is indeed the case, you must adhere strictly to the course work requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.

**Attendance and Expectations:** Attendance is expected, it is extremely important that students attend the class regularly. Irregular attendance always results in poor or mediocre performance. Excused absences will be given for documented medical reasons, OF related travel or job interview travel. Documentation must be in the form of a doctor's note, or letter from the sponsor of the travel.

**Make-up Exam Policy:** There will be no make-up exams. Unless there is a documentable extreme medical or family emergency, you must contact the instructor prior to the exam or no credit will be given for a missed exam. It is the student's responsibility to make sure he/she is available to take the exam.