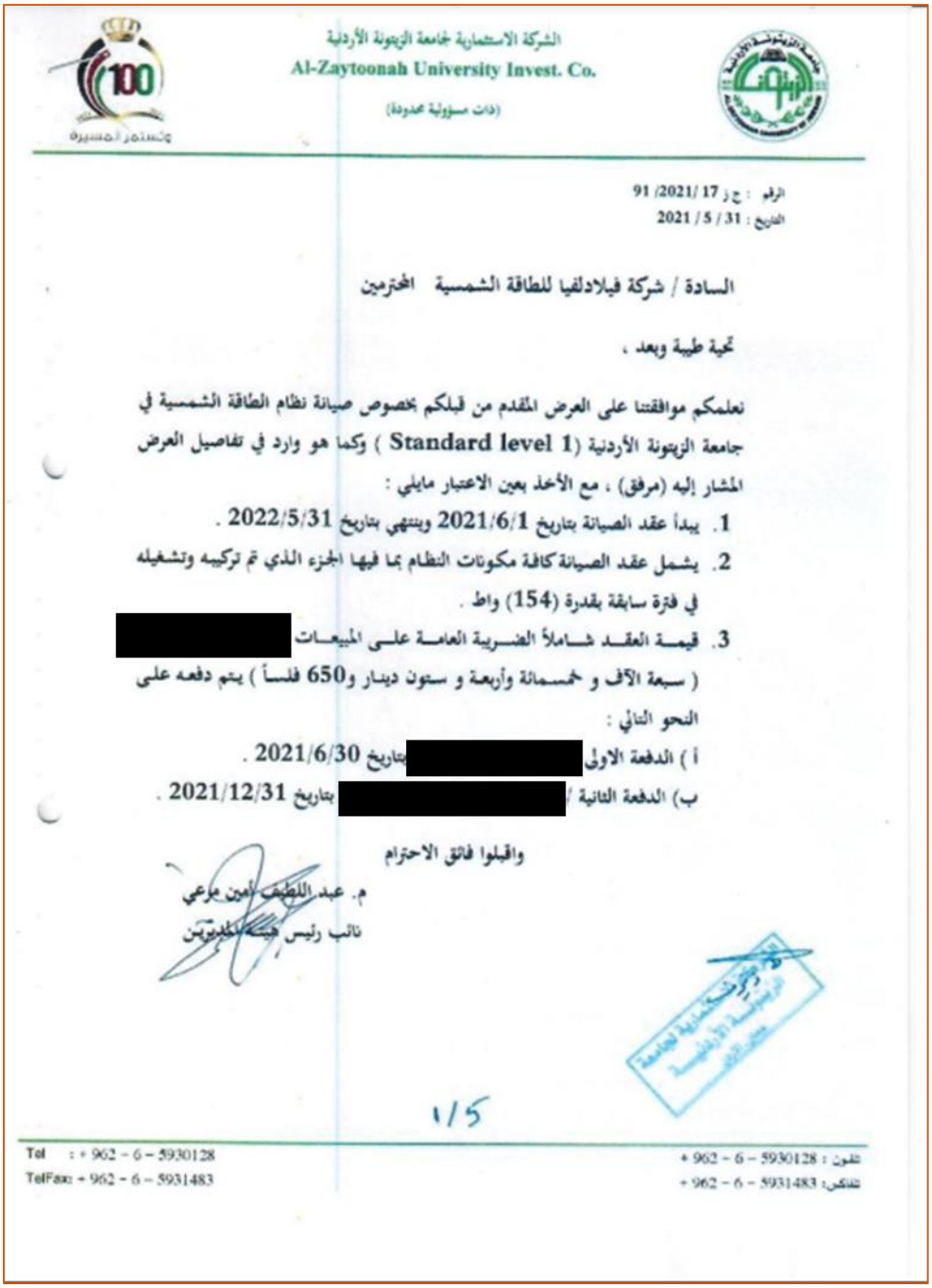
SDG 7

Affordable and Clean Energy

SDG 7.2 University measures towards affordable and clean energy

SDG 7.2.1 Energy-efficient renovation and building

A thorough set of policies developed by Al-Zaytoonah University of Jordan have been put into place on campus. Their goal is to reduce energy consumption to that end Al-Zaytoonah University of Jordan has an agreement with Philadelphia Solar to maintain the solar system (Standard level 1).



الشركة الاستثمارية لجامعة الزيتونة الأردنية
Al-Zaytoonah University Invest. Co.
(ذات مسؤولية محدودة)

الرقم : ج ز 17 /2021/ 91
التاريخ : 31 / 5 / 2021

السادة / شركة فيلادلفيا للطاقة الشمسية المحترمين

تحية طيبة وبعد ،

تعلمكم موافقتنا على العرض المقدم من قبلكم بخصوص صيانة نظام الطاقة الشمسية في جامعة الزيتونة الأردنية (Standard level 1) وكما هو وارد في تفاصيل العرض المشار إليه (مرفق) ، مع الأخذ بعين الاعتبار مايلي :

1. يبدأ عقد الصيانة بتاريخ 2021/6/1 وينتهي بتاريخ 2022/5/31 .
2. يشمل عقد الصيانة كافة مكونات النظام بما فيها الجزء الذي تم تركيبه وتشغيله في فترة سابقة بقدرة (154) واط .
3. قيمة العقد شاملاً الضريبة العامة على المبيعات [redacted] (سبعة آلاف و خمسمائة وأربعة و ستون دينار و650 فلساً) يتم دفعه على النحو التالي :

أ) الدفعة الاولى [redacted] بتاريخ 2021/6/30 .

ب) الدفعة الثانية / [redacted] بتاريخ 2021/12/31 .

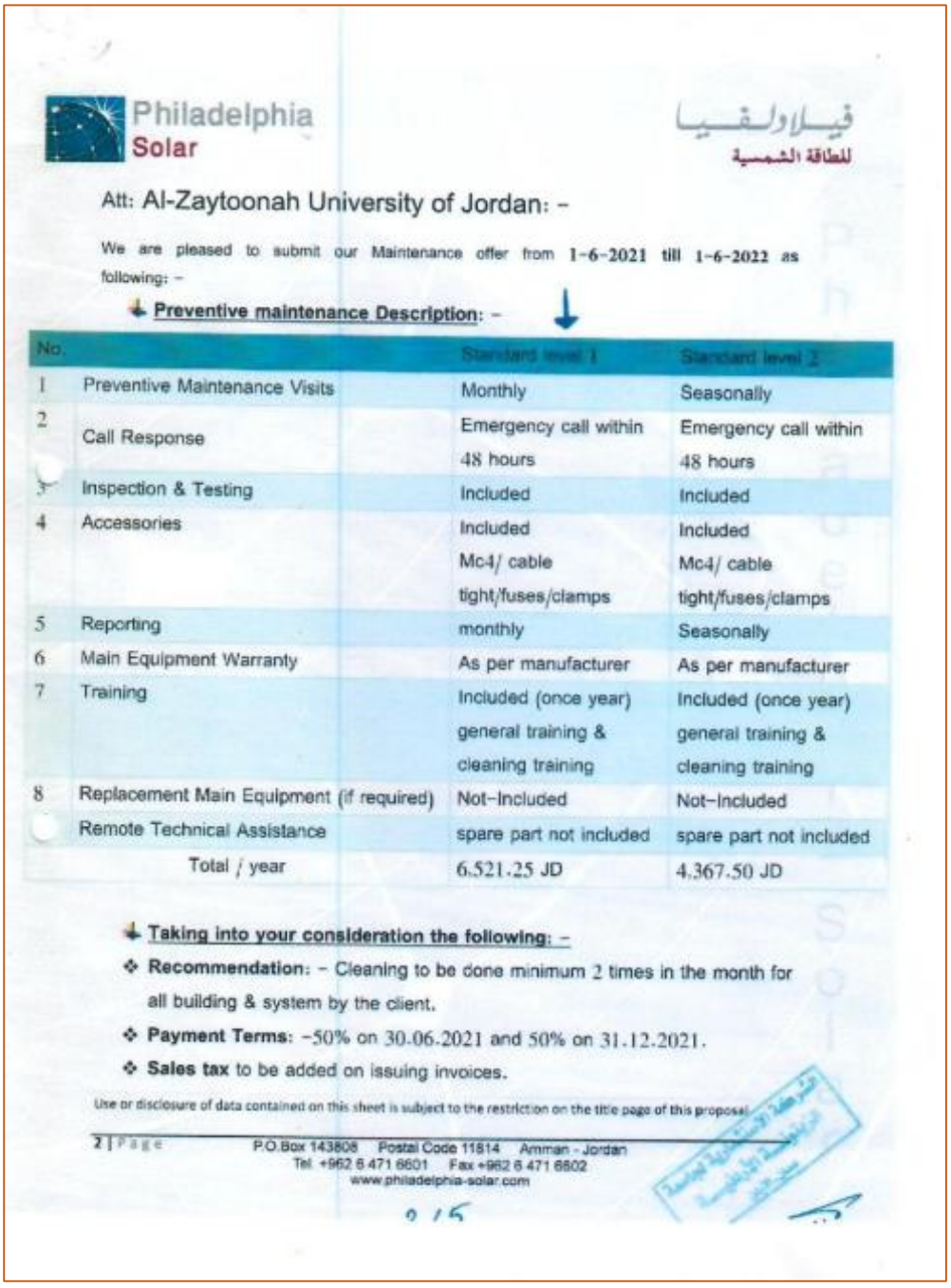
واقبلوا فائق الاحترام

م. عبد اللطيف امين مرعي
نائب رئيس هيئة المديرين

1/5

Tel : + 962 - 6 - 5930128
TelFax: + 962 - 6 - 5931483

تلفون : 5930128 - 6 - 962 +
تلفاكس: 5931483 - 6 - 962 +



Philadelphia Solar

فيلادلفيا للطاقة الشمسية

Att: Al-Zaytoonah University of Jordan: -

We are pleased to submit our Maintenance offer from **1-6-2021** till **1-6-2022** as following: -

Preventive maintenance Description: -

No.		Standard level 1	Standard level 2
1	Preventive Maintenance Visits	Monthly	Seasonally
2	Call Response	Emergency call within 48 hours	Emergency call within 48 hours
3	Inspection & Testing	Included	Included
4	Accessories	Included Mc4/ cable tight/fuses/clamps	Included Mc4/ cable tight/fuses/clamps
5	Reporting	monthly	Seasonally
6	Main Equipment Warranty	As per manufacturer	As per manufacturer
7	Training	Included (once year) general training & cleaning training	Included (once year) general training & cleaning training
8	Replacement Main Equipment (if required)	Not-Included	Not-Included
	Remote Technical Assistance	spare part not included	spare part not included
	Total / year	6.521.25 JD	4.367.50 JD

Taking into your consideration the following: -

- **Recommendation**: - Cleaning to be done minimum 2 times in the month for all building & system by the client.
- **Payment Terms**: -50% on 30.06.2021 and 50% on 31.12.2021.
- **Sales tax** to be added on issuing invoices.

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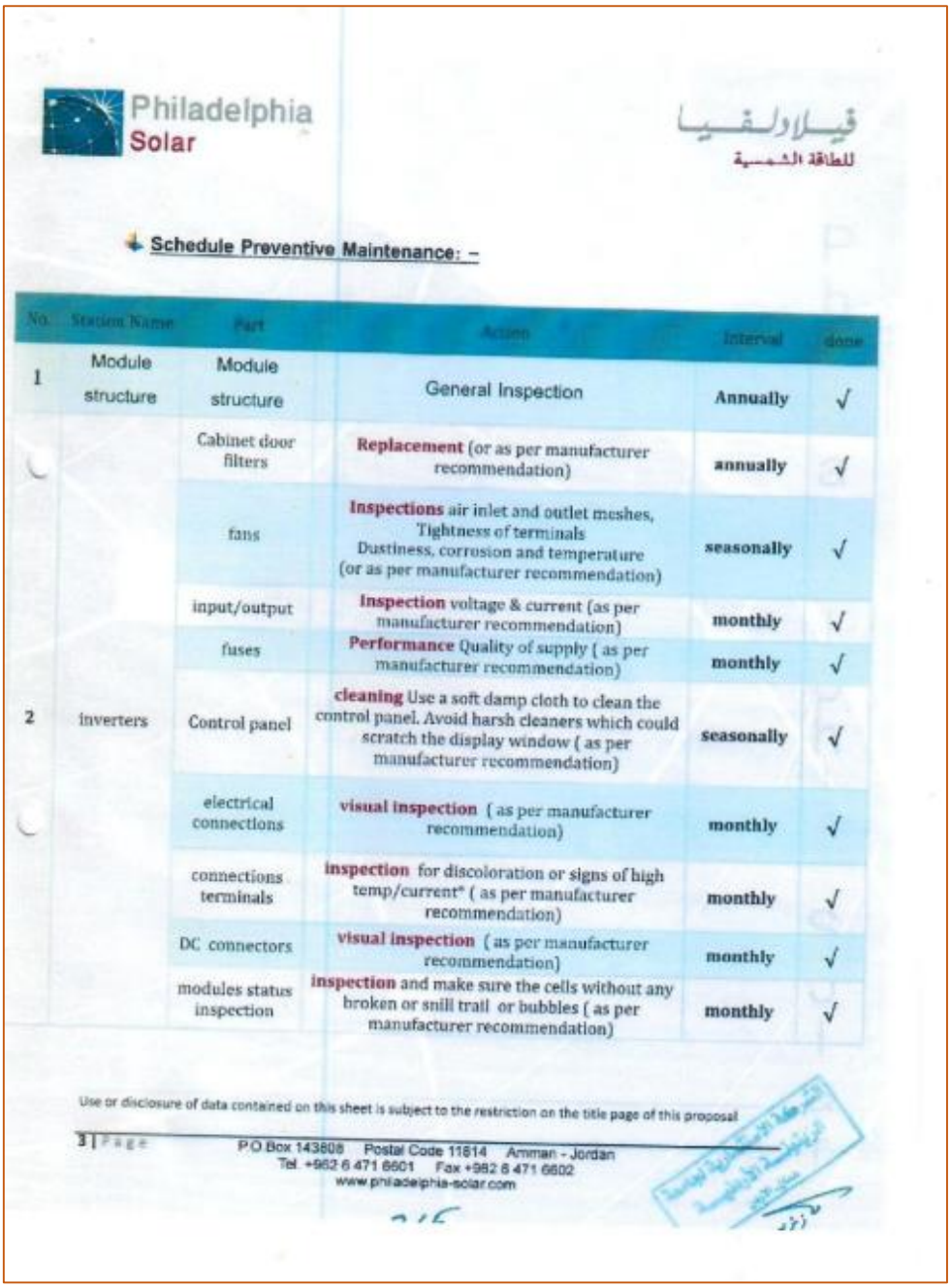
www.philadelphia-solar.com



Philadelphia Solar

فيلادلفيا للطاقة الشمسية

Schedule Preventive Maintenance: –

No.	Station Name	Part	Action	Interval	done
1	Module structure	Module structure	General Inspection	**Annually**	√
		Cabinet door filters	**Replacement** (or as per manufacturer recommendation)	**annually**	√
		fans	**Inspections** air inlet and outlet meshes, Tightness of terminals Dustiness, corrosion and temperature (or as per manufacturer recommendation)	**seasonally**	√
		input/output	**Inspection** voltage & current (as per manufacturer recommendation)	**monthly**	√
		fuses	**Performance** Quality of supply (as per manufacturer recommendation)	**monthly**	√
2	inverters	Control panel	**cleaning** Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window (as per manufacturer recommendation)	**seasonally**	√
		electrical connections	**visual inspection** (as per manufacturer recommendation)	**monthly**	√
		connections terminals	**inspection** for discoloration or signs of high temp/current* (as per manufacturer recommendation)	**monthly**	√
		DC connectors	**visual inspection** (as per manufacturer recommendation)	**monthly**	√
		modules status inspection	**inspection** and make sure the cells without any broken or snill trail or bubbles (as per manufacturer recommendation)	**monthly**	√

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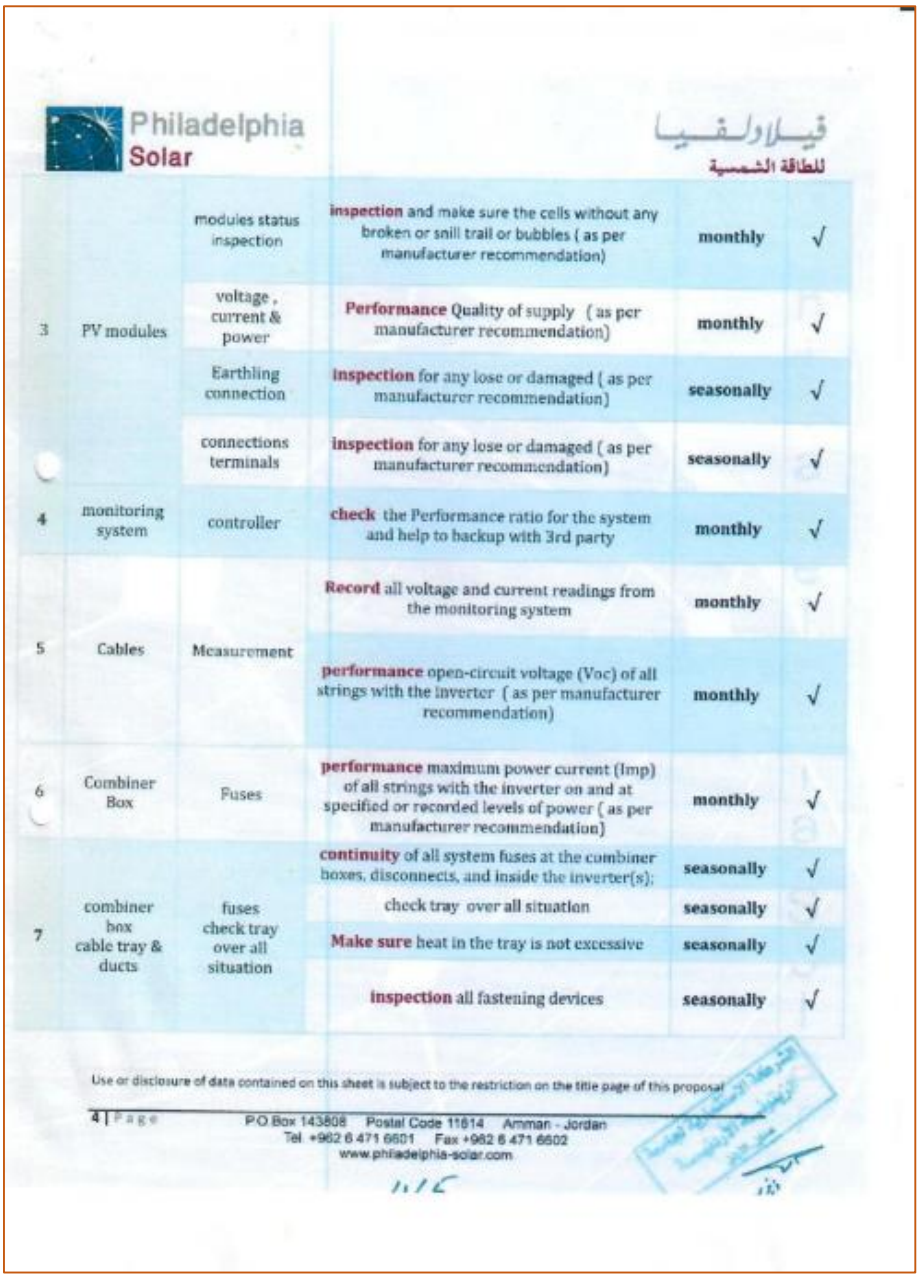

Philadelphia Solar

فيلادلفيا للطاقة الشمسية

3	PV modules	modules status inspection	**inspection** and make sure the cells without any broken or snill trail or bubbles (as per manufacturer recommendation)	**monthly**	√
		voltage , current & power	**Performance** Quality of supply (as per manufacturer recommendation)	**monthly**	√
		Earthling connection	**inspection** for any lose or damaged (as per manufacturer recommendation)	**seasonally**	√
		connections terminals	**inspection** for any lose or damaged (as per manufacturer recommendation)	**seasonally**	√
4	monitoring system	controller	**check** the Performance ratio for the system and help to backup with 3rd party	**monthly**	√
5	Cables	Measurement	**Record** all voltage and current readings from the monitoring system	**monthly**	√
			performance open-circuit voltage (Voc) of all strings with the inverter (as per manufacturer recommendation)	**monthly**	√
6	Combiner Box	Fuses	**performance** maximum power current (Imp) of all strings with the inverter on and at specified or recorded levels of power (as per manufacturer recommendation)	**monthly**	√
7	combiner box cable tray & ducts	fuses check tray over all situation	**continuity** of all system fuses at the combiner boxes, disconnects, and inside the inverter(s);	**seasonally**	√
			check tray over all situation	**seasonally**	√
			Make sure heat in the tray is not excessive	**seasonally**	√
			inspection all fastening devices	**seasonally**	√

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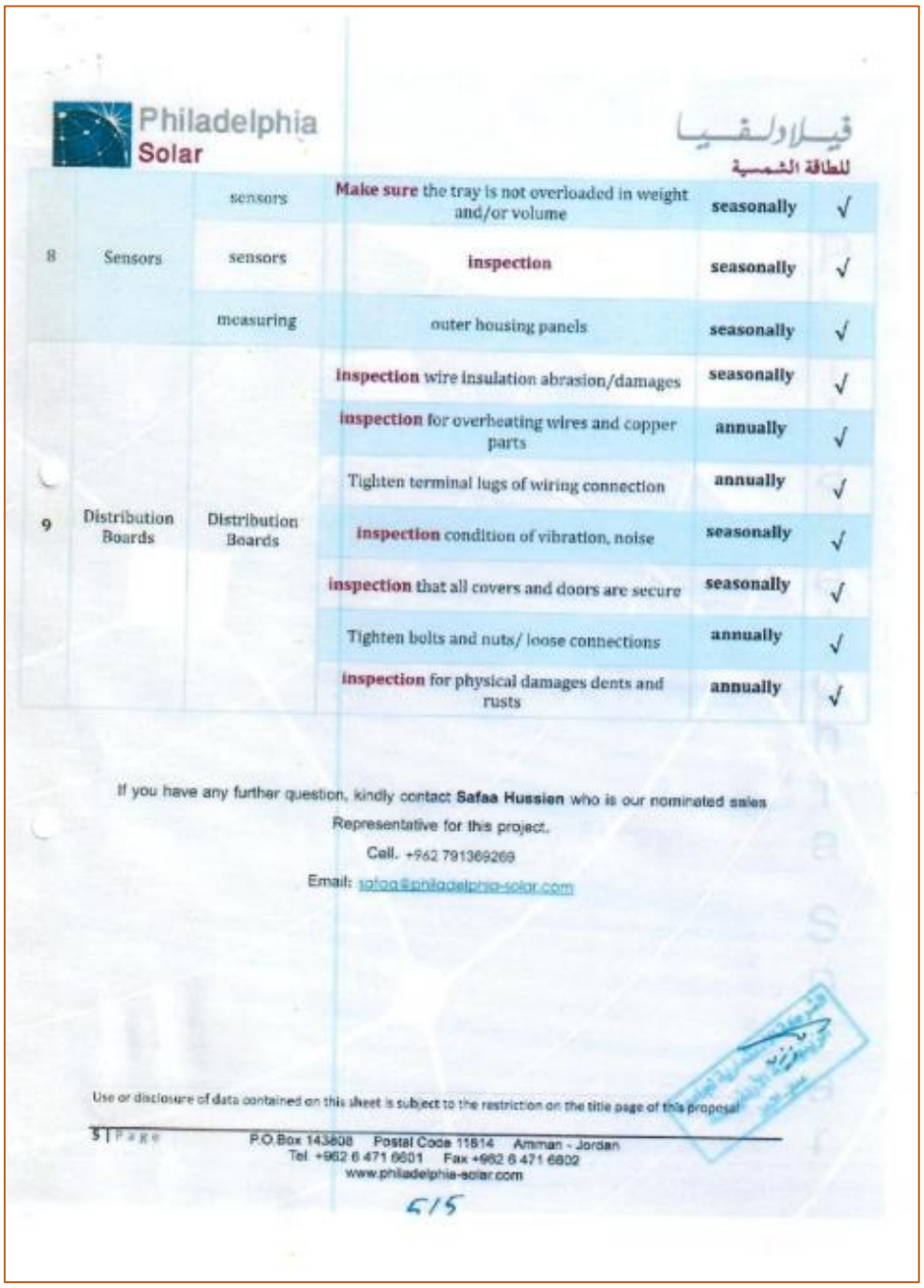

Philadelphia Solar

فيلادلفيا للطاقة الشمسية

		sensors	**Make sure** the tray is not overloaded in weight and/or volume	**seasonally**	√
8	Sensors	sensors	**inspection**	**seasonally**	√
		measuring	outer housing panels	**seasonally**	√
			inspection wire insulation abrasion/damages	**seasonally**	√
			inspection for overheating wires and copper parts	**annually**	√
			Tighten terminal lugs of wiring connection	**annually**	√
9	Distribution Boards	Distribution Boards	**inspection** condition of vibration, noise	**seasonally**	√
			inspection that all covers and doors are secure	**seasonally**	√
			Tighten bolts and nuts/ loose connections	**annually**	√
			inspection for physical damages dents and rusts	**annually**	√

If you have any further question, kindly contact **Safaa Hussien** who is our nominated sales Representative for this project.

Cell. +962 791369269

Email: safaa@philadelphia-solar.com

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5/5

SDG 7

Affordable and Clean Energy

SDG 7.2 University measures towards affordable and clean energy

SDG 7.2.2 Upgrade buildings to higher energy efficiency

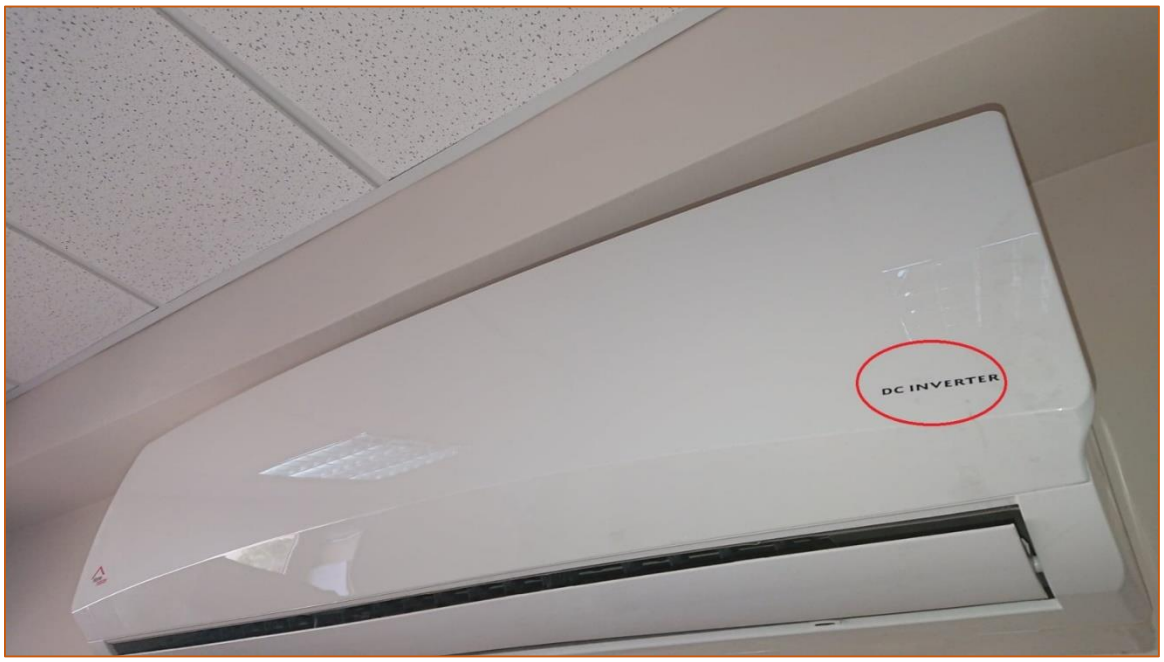
Al-Zaytoonah University of Jordan has developed extensive policies and regulations to ensure all renovations or new builds are following energy efficiency standards within these buildings, as well as energy-saving and carbon-reduction practices to be followed by all users of the buildings, facilities, and equipment on campus. Further details are mentioned below.

When renovating existing buildings or creating new ones on campus, strict adherence to government rules regarding environmental protection, energy efficiency, and water conservation must be maintained. These include, but are not limited to, the following points:

75% of our University's lightning system is energy efficient; LED Lights are used in most of the university's buildings with motion sensor.

LED Light with motion detector

1.2 Split-type air-conditioners are purchased in accordance with the latest environmental regulations and are inverter air-conditioners.



Air-conditioners with DC inverter

1.3 Al-Zaytoonah University of Jordan is naturally renovated; as seen in the pictures all the offices and the lecture rooms have windows where sunlight and wind can naturally occur.

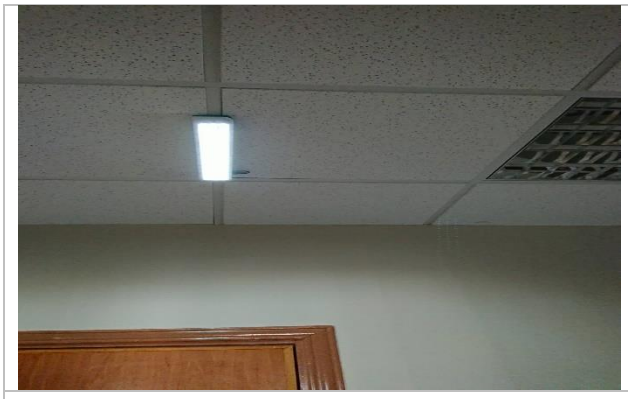
The electricity box that is shown above, is a controller box which can control the timing of when the electricity is turned off or on to have more electricity efficiency.

SDG 7

Affordable and Clean Energy

1.4 Al-Zaytoonah University of Jordan has the automatic fire alarms sensor, emergency lights system where both are turned on automatically if a fire occurred or the electricity went down.

As well as the heating system that is provided in all the buildings in the university

	
Emergency lights	The Automatic Fire Alarm Sensor System
	
The Automatic Heating System	SMART DOOR
	
Smart Board Screen Saver	Photovoltaic Cells

SDG 7

Affordable and Clean Energy

SDG 7.2 University measures towards affordable and clean energy

SDG 7.2.3 Carbon reduction and emission reduction process

Al-Zaytoonah University of Jordan is adamant in developing gas emission reducing program and providing a green campus. To that extent Al-Zaytoonah University of Jordan has done the following:

1. Al-Zaytoonah University of Jordan has constructed a charging parking for the private electric vehicle.

2. Al-Zaytoonah University of Jordan used a renewable energy for electricity.

3. Al-Zaytoonah University of Jordan has established the first Jordanian solar park, which consists of different components; a solar tree where the leaves are PV panels (M36s-100Wp), a hybrid system (PV/wind), and solar umbrellas fitted with electricity outlets for students.

4. Al-Zaytoonah University of Jordan has encouraged rideshare to adopt healthy and sustainable transportation options, (Carpool). Furthermore, Al-Zaytoonah University of Jordan promotes eco-friendly commuting options such as cycling, walking, and public transportation by providing bike-sharing programs, pedestrian-friendly infrastructure, and discounted public transit passes.

5. Al-Zaytoonah University of Jordan Develop a clear plan to become a carbon-neutral institution by a specified target year, taking into account energy efficiency, renewable energy adoption, and carbon offsetting strategies.

6. Al-Zaytoonah University of Jordan Invest in on-campus renewable energy projects, such as solar panels and wind turbines, to reduce dependence on fossil fuels and lower greenhouse gas emissions.

7. Al-Zaytoonah University of Jordan commits to sustainable building practices by adhering to green building standards like LEED (Leadership in Energy and Environmental Design) for all new construction and renovations.

8. Al-Zaytoonah University of Jordan integrates sustainability and climate change-focused courses and programs across various disciplines, encouraging students to explore solutions to environmental challenges.

9. Al-Zaytoonah University of Jordan funds and support research initiatives focused on climate change, renewable energy, and sustainability, facilitating innovation in these areas.

10. Al-Zaytoonah University of Jordan implements comprehensive waste reduction and recycling programs on campus, with a goal to minimize landfill waste and maximize recycling rates.

11. Al-Zaytoonah University of Jordan sources goods and services locally and sustainably, prioritizing eco-friendly products and supporting fair trade practices.

12. Al-Zaytoonah University of Jordan engages with the local community and collaborate on sustainability initiatives, knowledge-sharing, and outreach programs to extend sustainability efforts beyond campus boundaries.

13. Al-Zaytoonah University of Jordan allocates resources and grants to support student-led sustainability projects and initiatives, empowering students to drive change and apply their knowledge in practical ways.

Charge Parking

Renewable Energy using Solar System

These steps have produced a total carbon footprint (CO2 emission in the last 12 months, in metric tons) of:

Co2 (electricity) = (945000/1000) x 0.84 =793.8 metric ton (according to explanation provided in evidence 2.6)

Co2(bus) = (Zero) metric ton (no Buses within the campus)

Co2(cars) = (Zero) metric ton (just the electrical cars are allowed)

Co2(motorcycle) = (Zero) metric ton (no motorcycle within the campus)

Co2(total) = 793.8 metric ton

Description

Carbon Footprint: 793.8 metric ton

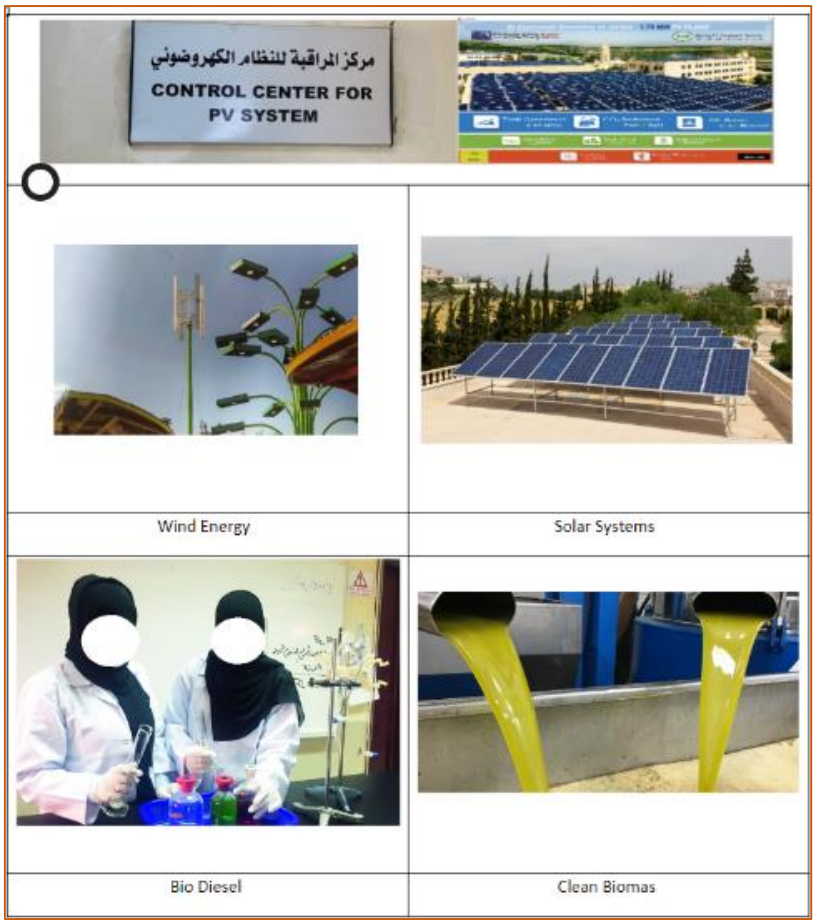
Zero Emission car entering the campus

Total estimated electricity use per year	
Total energy used	945000 kwh
University floor space	72993 m^2

SDG 7.2 University measures towards affordable and clean energy

SDG 7.2.4 Plan to reduce energy consumption

Al-Zaytoonah University of Jordan has four systems to reduce electricity usage: wind, solar, clean Biomass and Bio Diesel systems. The four systems are used to generate enough power to supply the university buildings to be 100% depending on these sources.



SDG 7

Affordable and Clean Energy

SDG 7.2 University measures towards affordable and clean energy

SDG 7.2.5 Energy wastage identification

Al-Zaytoonah University of Jordan try to identify energy wastage and implement policies to diminish these wastage, as described below:

1. All the papers used in our university in all departments are shredded and recycled.
2. Papers and cardboard are put in a special can to be collected and recycled.
3. The weekly deans' meetings are newly paper free, everything is being done through computers and emails to reduce the usage of papers.
4. The university has three types of garbage cans; one for plastic, one for papers and the third one is for anything else, to help students be part of saving the environment.
5. One way to treat organic waste in the university is taking all the chopped trees and woods to a local chopper or shredder and turn it to wood veneer and reuse it or even sell it.
6. The university operate its own sanitary treated plants resulting sewerage (sludge) being recirculated within the treated plants due to the small amounts resulted.
7. Al-Zaytoonah university of Jordan uses recycled water for irrigation, and to reduce water usage; the university uses the dripping methodology.
8. Collage of Pharmacy, Collage of Nursing and the university's clinic use containers with international specifications to get rid of toxic content, to be disposed of in the most proper ways.

	
Paper shridder	Paper and hard paper recycling can
	
Paper free meetings	Three different typrd of cans to resort trash

Example of Organic Waste Treatment

Treated water consumed

Example of Toxic Waste Handled (Mahidol University, Thailand)

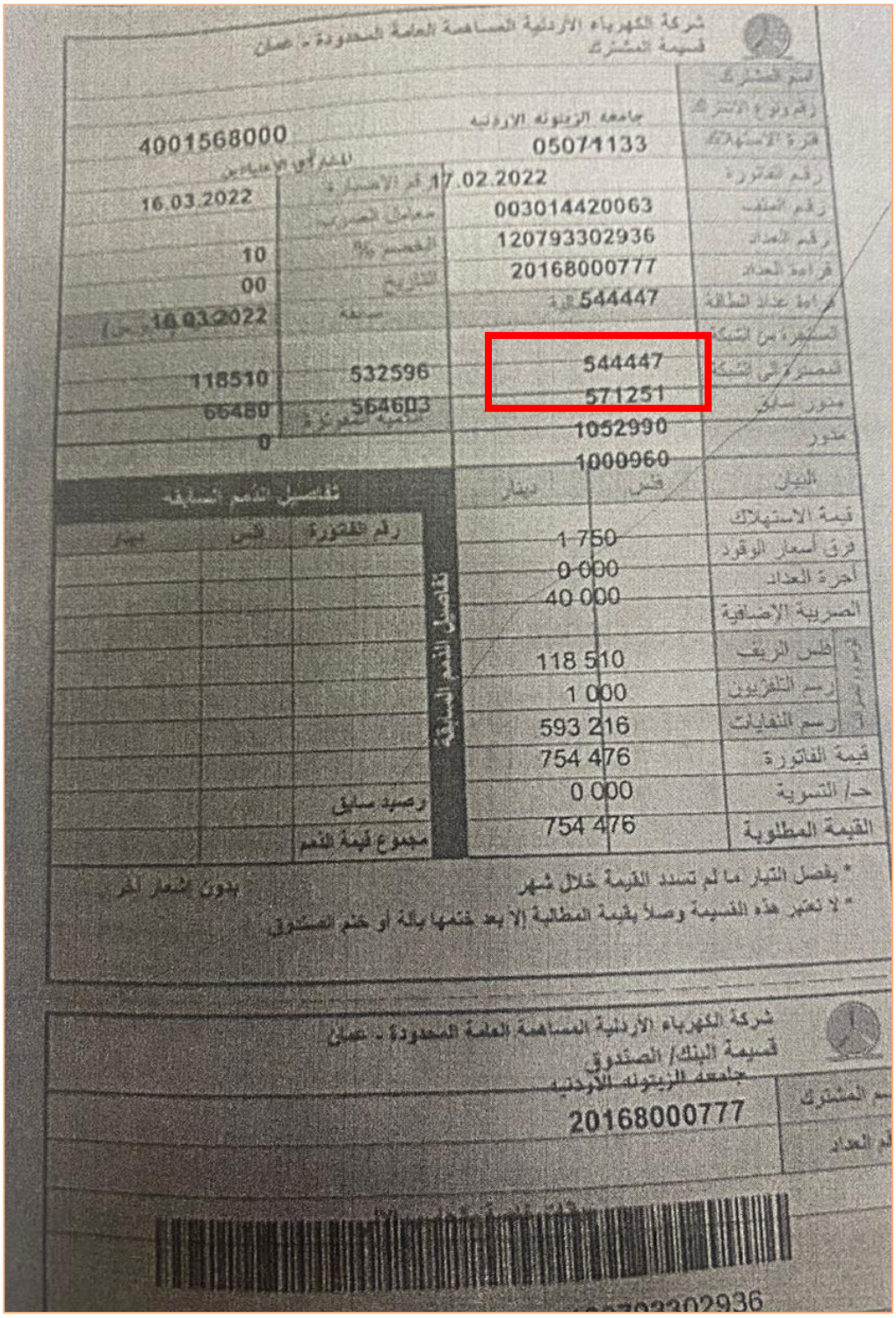
SDG 7

Affordable and Clean Energy

SDG 7.2 University measures towards affordable and clean energy

SDG 7.2.6 Divestment Policy

Al-Zaytoonah University of Jordan recognize the important of divestment, in order to promote green energy and help spread the benefit of green energy as well as provide green energy to the community and not just the campus. To that purpose, Al-Zaytoonah University of Jordan has an agreement with Jordan Electricity Company in which the University provides the excess amount of its solar energy.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قسيمة المشترك
جامعة الزيتونة الاردنية
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تفاصيل القيم السابقة
رقم الفاتورة
رصيد سابق
مجموع قيمة القيم
* يفصل التيار ما لم تسدد القيمة خلال شهر
* لا تعتبر هذه القسيمة وصلاً بقيمة المطالبة إلا بعد ختمها بالة او ختم الصندوق
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قسيمة البنك/ الصندوق
جامعة الزيتونة الاردنية
20168000777

SDG 7

Affordable and Clean Energy

SDG 7.3 Energy use density

SDG 7.3.1 Energy use per sqm

Energy usage per sqm	12.95
Total energy used per year	945000 kwh
University floor space	72993 m^2

SDG 7

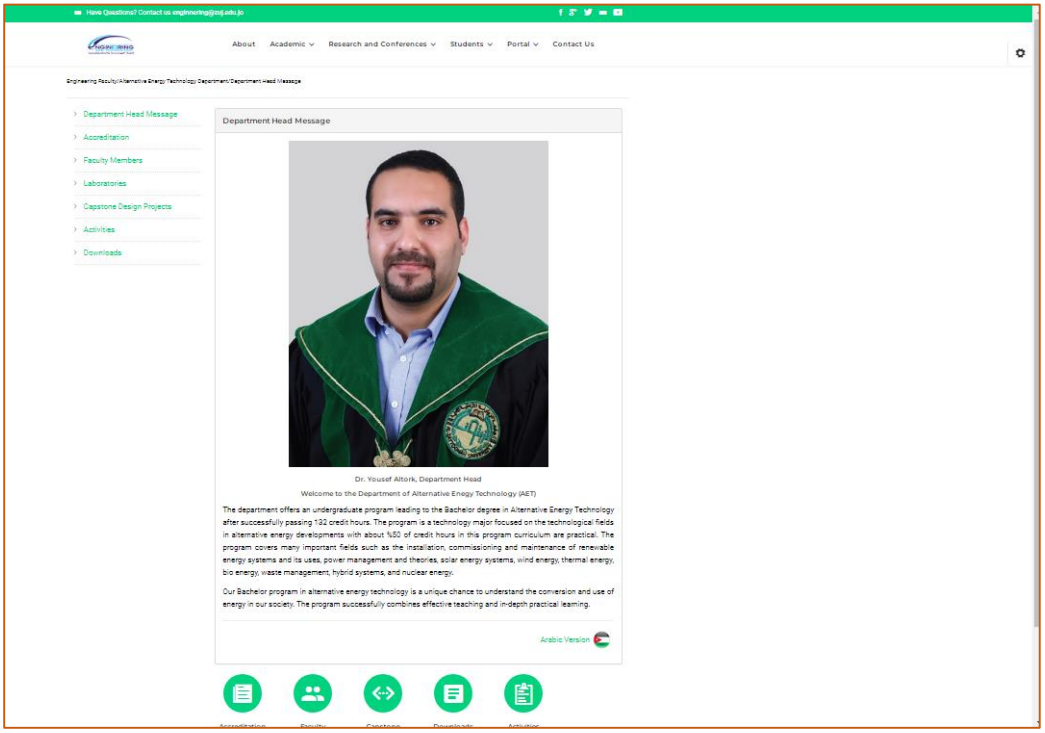
Affordable and Clean Energy

SDG 7.4 Energy and community

SDG 7.4.1 Local community outreach for energy efficiency

Al-Zaytoonah University of Jordan acknowledge the important of being energy efficient as well as spreading the knowledge to the community on how to be energy efficient as it is part of its vision as part of its vision. In order to achieve that goal ZUJ provides programs for local community to learn about importance of energy efficiency and clean energy, as follows:

1. Al-Zaytoonah University of Jordan developed an Alternate Energy Department, which offers an undergraduate program leading to the Bachelor degree in Alternative Energy Technology after successfully passing 132 credit hours. Click Here (Link)



SDG 7

Affordable and Clean Energy

جامعة الزيتونة الأردنية
Al-Zaytoonah University of Jordan
كلية الهندسة والتكنولوجيا
Faculty of Engineering and Technology

"الجودة والتميز"
"Quality and Excellence"

"عراقة وجودة"
"Tradition and Quality"

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department | **QF09/0409-3.0E**

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906230	3	Conventional energy resources	0120131

This course covers the following topics: Introduction to energy source and Quality of energy, Types of most common conventional fuels: coal, natural gas, oil shale and petroleum products, gasification processes. Current proven reserves of fossil fuels. Economy of fossil fuels. Environmental impacts of fossil fuels and calculating the heating value.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906316	3	Electronics circuits	0905111

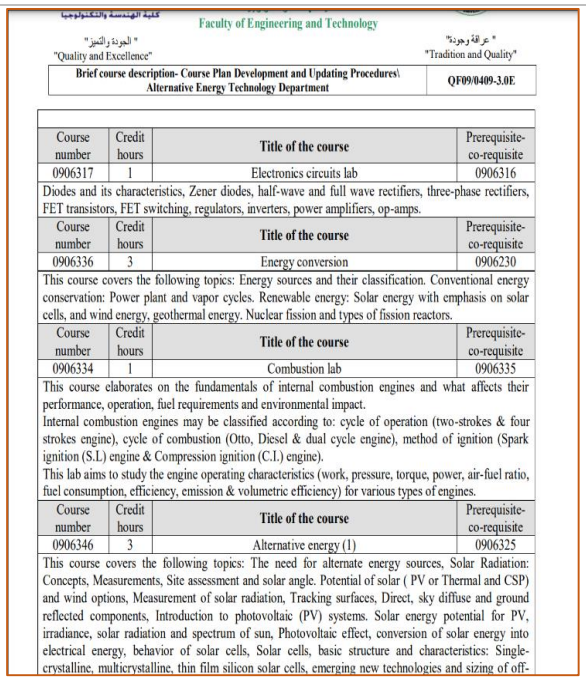
Semiconductors and PN junctions, diodes and applications, special purpose diodes, single and three phase rectifiers, field-effect transistor (FET) and biasing, regulators, single and three phase inverters, bipolar junction transistors (BJTs) and bias circuits, power amplifiers, op-amps.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906335	3	Combustion processes	0906225

The course discuss the principal concepts of combustion theory, the chemical combustion reactions, the boilers combustion, the Internal combustion engine, the four stroke engine , the two stroke engine, the Wankel engine, the Otto cycle, the Diesel cycle , the actual engine cycle, the engine performance characteristics, the turbocharged and compound Diesel, the engine exhaust and intake

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906344	3	Solar thermal energy workshop	0906325

carry out experiments in Solar thermal circuits , Study solar angles, heat balance , thermal efficiency, control of thermal circuits , irradiance, heat exchanger , pumps, effect of coating material, control of the thermal circuits, evacuated tubes design , CSP system design.



Faculty of Engineering and Technology

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"Quality and Excellence"

"عراقة وجودة"
"Tradition and Quality"

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department | **QF09/0409-3.0E**

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906317	1	Electronics circuits lab	0906316

Diodes and its characteristics, Zener diodes, half-wave and full wave rectifiers, three-phase rectifiers, FET transistors, FET switching, regulators, inverters, power amplifiers, op-amps.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906336	3	Energy conversion	0906230

This course covers the following topics: Energy sources and their classification. Conventional energy conservation: Power plant and vapor cycles. Renewable energy: Solar energy with emphasis on solar cells, and wind energy, geothermal energy. Nuclear fission and types of fission reactors.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906334	1	Combustion lab	0906335

This course elaborates on the fundamentals of internal combustion engines and what affects their performance, operation, fuel requirements and environmental impact.
Internal combustion engines may be classified according to: cycle of operation (two-strokes & four strokes engine), cycle of combustion (Otto, Diesel & dual cycle engine), method of ignition (Spark ignition (S.I.) engine & Compression ignition (C.I.) engine).
This lab aims to study the engine operating characteristics (work, pressure, torque, power, air-fuel ratio, fuel consumption, efficiency, emission & volumetric efficiency) for various types of engines.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906346	3	Alternative energy (1)	0906325

This course covers the following topics: The need for alternate energy sources, Solar Radiation: Concepts, Measurements, Site assessment and solar angle. Potential of solar (PV or Thermal and CSP) and wind options, Measurement of solar radiation, Tracking surfaces, Direct, sky diffuse and ground reflected components, Introduction to photovoltaic (PV) systems. Solar energy potential for PV, irradiance, solar radiation and spectrum of sun, Photovoltaic effect, conversion of solar energy into electrical energy, behavior of solar cells, Solar cells, basic structure and characteristics: Single-crystalline, multicrystalline, thin film silicon solar cells, emerging new technologies and sizing of off-

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"Tradition and Quality"

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department | **QF09/0409-3.0E**

Faculty	Engineering and Technology	Academic Department	Alternative Energy Technology	Number of the course plan ( )
Number of Major requirement courses	31	Date of plan approval		

This form is just for the major requirement courses

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906100	3	Principles of energy sciences	-

This course aims to teach the students the traditional energy sources: coal, oil shale, oil and its derivatives. Renewable energy sources: solar energy, wind energy, hydrogen production, groundwater energy, biomass energy, and nuclear energy. Energy conservation in buildings appliances and other different sectors.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906201	3	Workshop and occupational safety	-

This course concentrates on safety management as it relates to hazard identification, accident investigation and training, enabling the safety manager to reduce costs to business, industry, and government. This course also covers labor laws in general and the Jordanian labor law in specific.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906210	3	Electrical machines and power systems	0905111

Newton's law of rotation, magnetic fields and circuits, Faraday's law, real reactive and apparent power, three-phase circuits, delta wye connections, one-line diagrams, power triangle, ideal transformers, per-unit system, three-phase transformers, magnetomotive force, stator, rotor, synchronous generators and

جامعة الزيتونة الأردنية
Al-Zaytoonah University of Jordan
كلية الهندسة والتكنولوجيا
Faculty of Engineering and Technology

"الجودة والتميز"
"Quality and Excellence"

"عراقة وجودة"
"Tradition and Quality"

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department | **QF09/0409-3.0E**

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906225	2	Thermodynamics	0120131

This course covers the following topics: Defining and describing systems and their behavior, Energy and the first law of thermodynamics. Ideal gas law & ideal gas properties. First law Analysis for a control volume: Development of equations for conservation of mass and energy. Introduction to second law of thermodynamics. Gas power cycles and Refrigeration Cycle.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906211	1	Electrical machines and power systems lab	0906210

Delta-star connections, measurement of voltage-current-power, single phase transformers, autotransformers, three phase transformers, synchronous transformers, three phase induction motors, shunt DC motors, series DC motors, transmission lines.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906223	2	Fluid mechanics	0120131

This course covers the following topics: General Introduction – Introduction – Fluid Properties – Fluid Statics - Flowing Fluids and Pressure Variation - Control Volume Approach and Continuity Equation – Momentum Equation – Energy Equation - Dimensional Analysis and Similitude - Flow in conduits: Laminar and Turbulent pipe flow -Turbomachinery

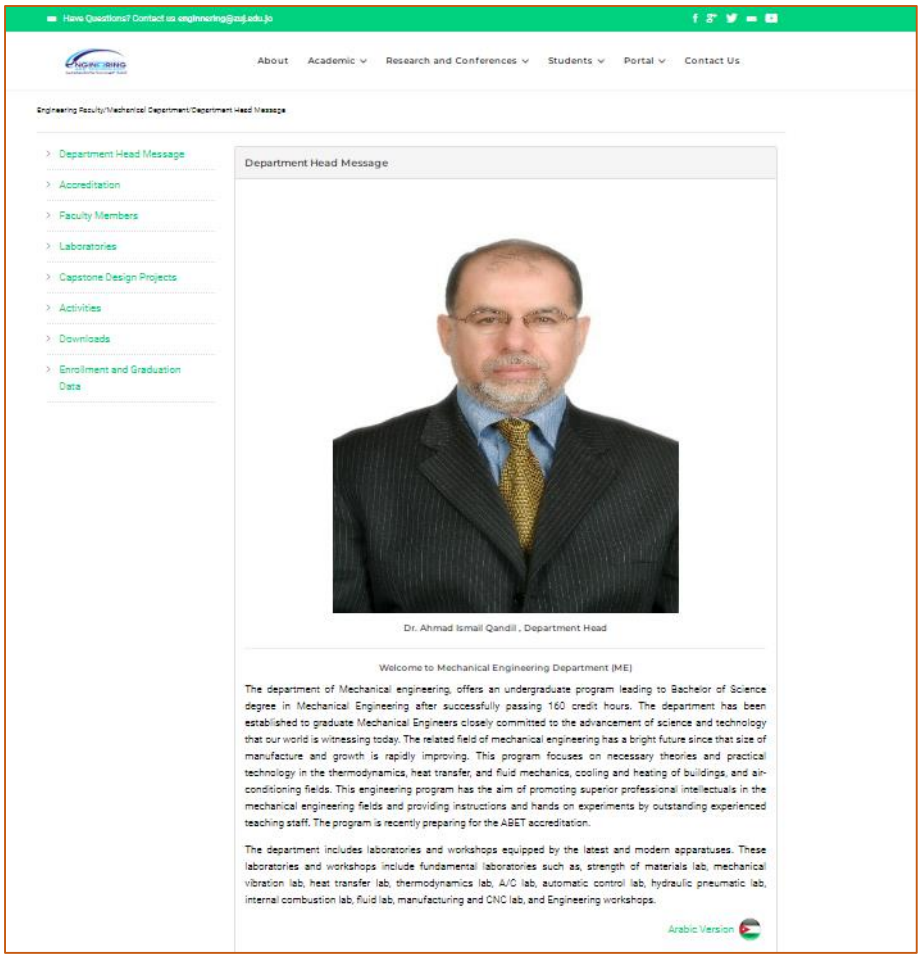
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906314	3	Instrumentations and measurements	0906223 0905111

Units, dimensions and standards, uncertainty analysis, error measurements, statistical analysis, sensor calibration, noise sources, signal conditioning, amplifiers, op-amps, low pass and high pass filters,

Course Plan of Alternative Energy Technology

Total number of specialty courses on Alternate Energy are 52 courses including labs and workshops, as seen in this link, Click Here (Link)

2.A new program under the mechanical engineering's department entitled sustainable energy engineering was established. Click Here (Link)



Total number of specialty courses on sustainable energy engineering is about 30% of the total courses which is equivalent to about 48 hours.

3. Al-Zaytoonah University also offers different courses that address energy efficiency and clean energy in different programs, as follows

a. Civil and Infrastructure Engineering, there are 25 courses Click Here (Link).

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Course Plan for Bachelor program - Course Plan Development and Updating Procedures/ Civil and Infrastructure Engineering Department	QF09/0407-3.0E

Course Plan for Civil and Infrastructure Engineering (Bachelor Program) No.: (20171)
Approved by Deans Council by decision (07/72/2016/2017) dated (30/08/2017)
(160) Credit Hours

No.	Goals and learning outcomes
PEO 1 / SO	**Implement technical, collaborative, and communication skills with leadership principles, to pursue careers in Civil and Infrastructure Engineering.**
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline.
5	An ability to function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
8	An ability to understand and explain the key concepts used in management, business, public policy, public administration, leadership principles and licensure.
PEO 2 / SO	**Seek higher degrees in Civil and Infrastructure Engineering and embark on continuing education**
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2	An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and global, cultural, social, environmental, economic, and other factors as appropriate to the discipline.
3	An ability to communicate effectively with a range of audiences.
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Couse Plan of Civil and Infrastructure Engineering

b.Mechanical Engineering offers one course on Mechanical Systems in green buildings, Click Here (Link).

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Brief course description- Course Plan Development and Updating Procedures\ Mechanical Engineering Department	QF09/0409-3.0E

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0911322	3	Thermodynamics (2)	Thermodynamics (1)
This course covers the following topics: Review of thermodynamic basic laws and principles. Thermodynamic cycles analysis, energy analysis of both closed and open systems, irreversibly, exergy analysis for both control mass and volume systems, vapor cycles, gas power cycles, refrigeration and air thermodynamic cycles			
0911324	3	Fluid Mechanics (1)	Dynamics
Introduction, Fluid properties, Basic units, Fluid statics, Pressure and its measurements, Forces on plane and curved submerged surfaces, buoyancy & floatation, Fluids in motion, Flow kinematics and visualization, Basic control volume approach, Differential and integral continuity equation, Pressure variation in flowing fluids, Euler's and Bernoulli's equations, Applications of Bernoulli equation, Momentum principle and its applications, Navier-Stokes equations, Energy equation, Hydraulic and energy grade lines, Dimensional analysis and similitude, Surface resistance and introduction to boundary layer theory, Flow in conduits, laminar and turbulent flows, Frictional and minor losses, Piping systems.			
0911361	3	Engineering Numerical Methods	Calculus (2) For Engineering students

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Brief course description- Course Plan Development and Updating Procedures\ Mechanical Engineering Department	QF09/0409-3.0E

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0911323	1	Thermodynamics Lab.	Co Thermodynamics (1)
Experimental methods in the following : Mechanical equivalent of heat; The adiabatic exponent; Marcet boiler; Bomb calorimeter; Flow through nozzle; Refrigeration system; Air conditioning system; Heat pump and air cooler; single stage air compressor; cooling tower; Thermic unit (steam turbine power plant).			
0911325	1	Fluid Mechanics Lab.	Co. Fluid Mechanics (1)
Experimental methods in the following systems: center of pressure; impulse momentum principle; pumps, friction losses in pipes, stream lines and flow fields, buoyancy and boundary layer theory. Radial flow fan, Water turbine, Flow measurement.			
0911331	3	Heating and Air Conditioning	Thermodynamics (1)
Review of psychrometry; thermal comfort; air conditioning processes; inside and outside design conditions;			

Course Plan of Mechanical Engineering

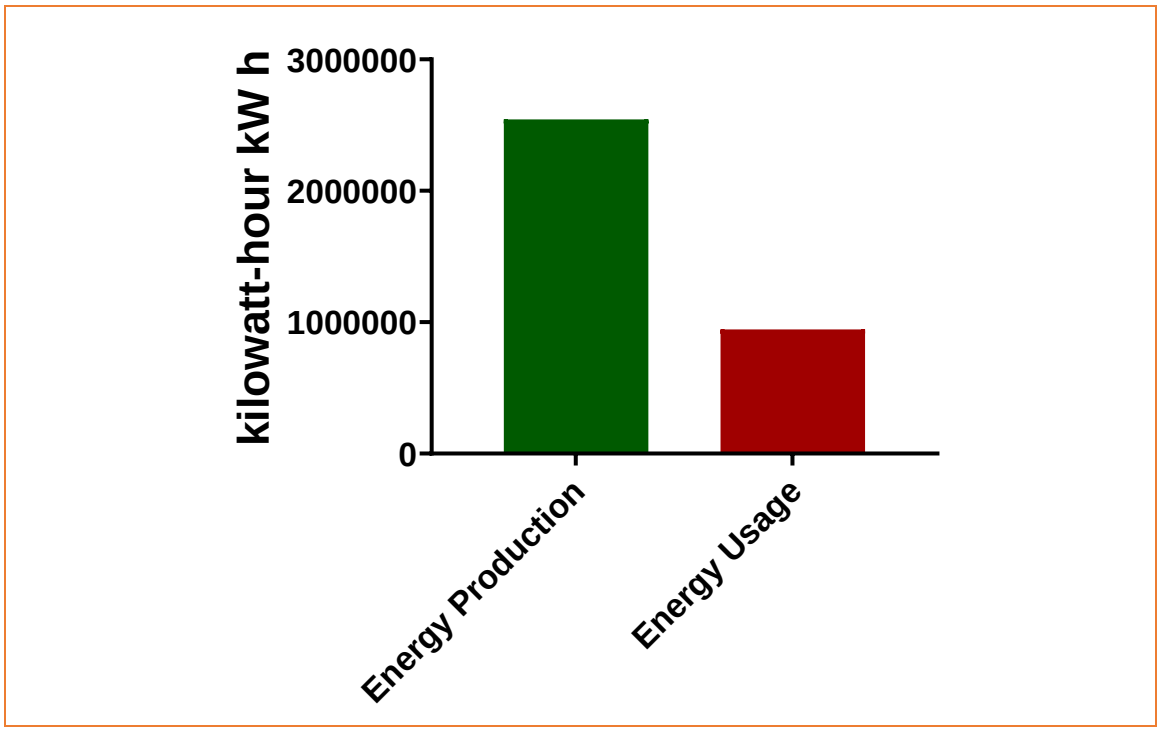
SDG 7

Affordable and Clean Energy

SDG 7.4 Energy and community

SDG 7.4.2 100% renewable energy pledge

Al-Zaytoonah University of Jordan take pride in producing enough green energy to supply the university buildings to be 100% depending on green energy. Importantly, Al-Zaytoonah University of Jordan increase the production of renewable energy, as Al-Zaytoonah University of Jordan produced 2,544,000 kwh this year with a total Energy Usage of 945000kwh. Also, Al-Zaytoonah University of Jordan took different measurement to ensure 100% renewable pledge, as follows:



1. Using electrical charging parking for the private electric vehicle.
2. Using renewable energy for electricity.
3. The first Jordanian solar park consists of different components; a solar tree where the leaves are PV panels (M36s-100Wp), a hybrid system (PV/wind), and solar umbrellas fitted with electricity outlets for students.
4. Rideshare is designed to encourage commuters to adopt healthy and sustainable transportation options, (Carpool). Furthermore, Al-Zaytoonah University of Jordan promotes eco-friendly commuting options such as cycling, walking, and public transportation by providing bike-sharing programs, pedestrian-friendly infrastructure, and discounted public transit passes.
5. Encouraged rideshare to adopt healthy and sustainable transportation options, (Carpool).
6. Developed a clear plan to become a carbon-neutral institution by a specified target year, taking into account energy efficiency, renewable energy adoption, and carbon offsetting strategies.
7. Invested in on-campus renewable energy projects, such as solar panels and wind turbines, to reduce dependence on fossil fuels and lower greenhouse gas emissions.
8. Commited to sustainable building practices by adhering to green building standards like LEED (Leadership in Energy and Environmental Design) for all new construction and renovations.
9. Integrated sustainability and climate change-focused courses and programs across various disciplines, encouraging students to explore solutions to environmental challenges.
10. funded and support research initiatives focused on climate change, renewable energy, and sustainability, facilitating innovation in these areas.
11. Implemented comprehensive waste reduction and recycling programs on campus, with a goal to minimize landfill waste and maximize recycling rates.

12. Sourced goods and services locally and sustainably, prioritizing eco-friendly products and supporting fair trade practices.
13. Engaged with the local community and collaborate on sustainability initiatives, knowledge-sharing, and outreach programs to extend sustainability efforts beyond campus boundaries.
14. Allocated resources and grants to support student-led sustainability projects and initiatives, empowering students to drive change and apply their knowledge in practical ways.

Charge Parking

Renewable Energy using Solar System

SDG 7

Affordable and Clean Energy

SDG 7.4 Energy and community

SDG 7.4.3 Energy efficacy service for industry

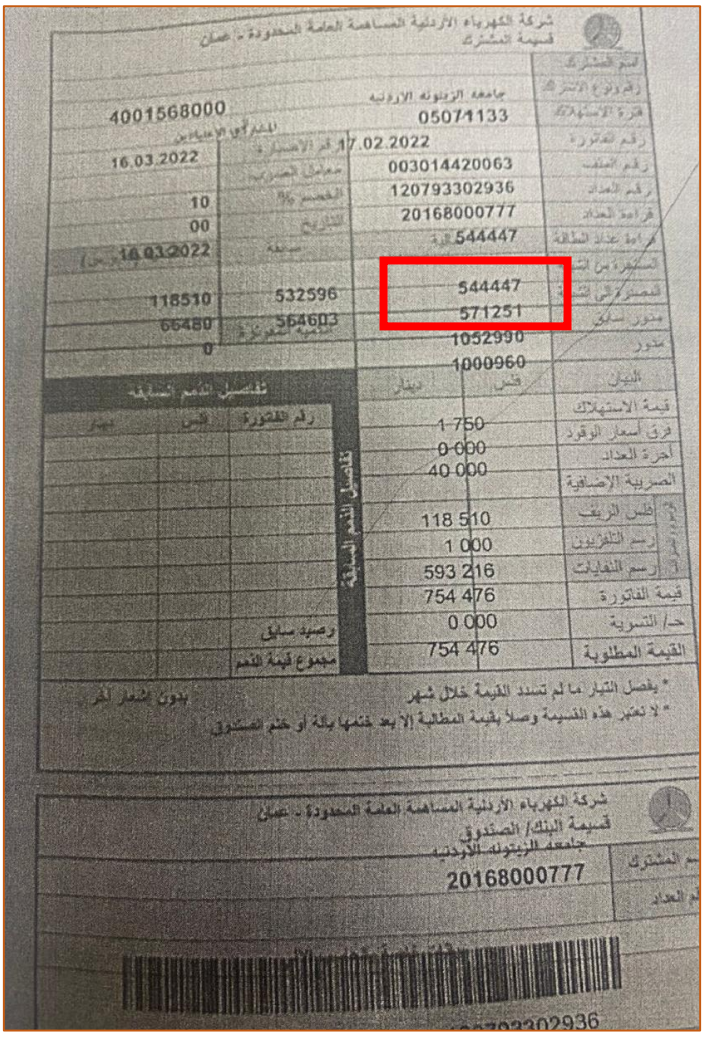
Al-Zaytoonah University of Jordan take a pride in providing free direct services to local industry aimed at improving energy efficiency and clean energy (energy efficiency assessments, workshops, and research renewable energy options).

Examples of Events Related to Environment (Al-Zaytoonah University of Jordan, Amman)

SDG 7.4 Energy and community

SDG 7.4.4 Policy development for clean energy technology

1. Al-Zaytoonah University of Jordan recognize the importance of establishing clean energy technology as well as developing policies for clean energy technology. For that purpose, Al-Zaytoonah University of Jordan has an agreement with Jordan Electricity Company in which the University provides the excess amount of its solar energy.



2. Al-Zaytoonah University of Jordan encourages its academics to be a part of different originations both nationally and internationally to shape and participate in policy development for clean energy

2.1 Prof. Safwan Al-Qawabah from Mechanical Engineering Dept./ Faculty of Engineering worked as:

2.1.1 A member in the board directors of Cigre – Jordan

2.1.2 A member in Cigre – Paris

2.1.3 the Head of steel committee in Jordan Standards of Metrology Organization

2.1.4 a member of International Advisory Board of Jordan Journal of Mechanical and Industrial Engineering Click Here (Link)

THE HASHEMITE UNIVERSITY

JORDAN JOURNAL OF MECHANICAL AND INDUSTRIAL ENGINEERING (JJMIE)

CERTIFICATE OF INTERNATIONAL ADVISORY BOARD MEMBERSHIP

This certificate is gratefully presented to

Professor Safwan Al-Qawabah

in recognition of your valuable contributions to

JORDAN JOURNAL OF MECHANICAL AND INDUSTRIAL ENGINEERING (JJMIE)

as member of 2022 international advisory board

Professor Ali Jawarneh
Editor In Chief

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2.1.5 a Member of board of directors of EPPM Association EPPM-Association: Officers 2018 - 2020 (ppml.url.tw)

2.1.6 a Member of the technical committee of the 4th International Conference on Mechanical Design and Engineering (ICMDE 2018)-EI Compendex, Scopus, ICMDE--EI, Scopus 2018 : 2018 the 4th International Conference on Mechanical Design and Engineering (ICMDE 2018)--EI Compendex, Scopus (wikicfp.com)

2.1.7 a Member of the technical committee of the First Conference in Mechanical Engineering Science and Applications Click Here (Link)

2.1.8 a Member of the technical committee of The 7th International Conference on Advanced Materials Research Click Here (Link)


Jan.22, 2016, Visit to Politecnico di Torino | ICAMR 2016


Session 2- Alloy Material

2.1.9 a Member in the steering committee of the IEEE Middle East & North Africa Communications Conference Advancing the Communication Vision Click Here (Link)

2.1.10 an Industrial Consultant for Jordan Engineer Association

SDG 7

Affordable and Clean Energy

SDG 7.4 Energy and community

SDG 7.4.5 Assistant to low-carbon innovation

Al-Zaytoonah University of Jordan has three innovative programs-based solar energy namely:

1. Sustainable Students Park (SSP) program**:** in this program, a solar photovoltaic system has been installed outdoors (in the university park), benefiting more than 10000 students and visitors who can enjoy charging their devices, connecting to the internet, lighted park at night, and free-smoke area.

2. Electronic Cars Charging Stations (ECCS) program: this program was launched by Al-Zaytoonah University of Jordan in 2019 to provide convenient and affordable charging for electronic cars.

3. University Solar Photovoltaic (USVP) Program: This program aims to provide the university with 2,544,000 kwh of solar-powered electricity for buildings lighting, heating, operating all electrical devices in the university such as operating air-conditioners and operating computers in labs.

4. Green Area Program aims to limit and decrease the parking area on campus(increasing the green area)

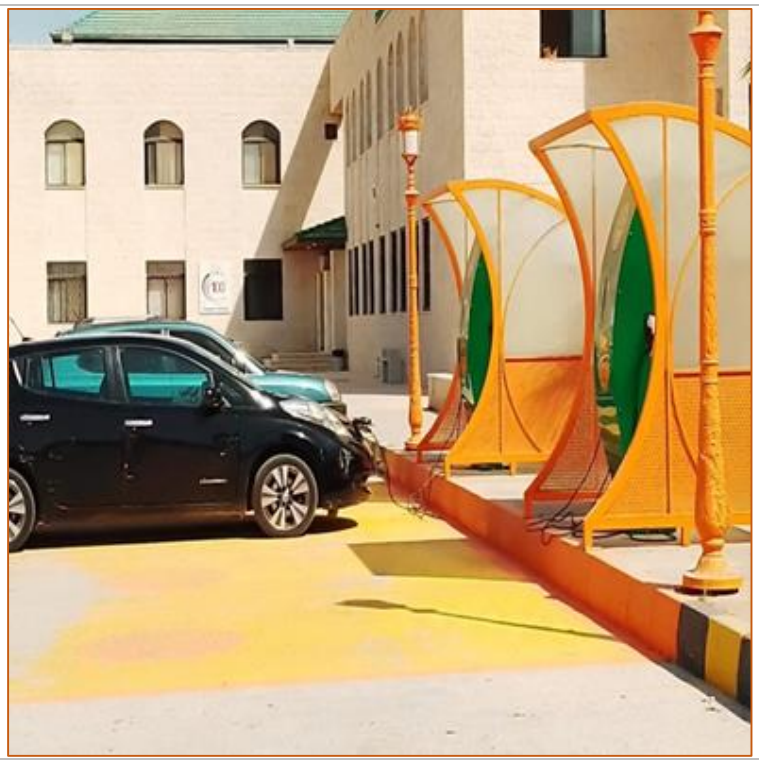
5. Sustainable Ecological System: This program has been funded by the Al-Zaytoona University of Jordan to overcome the complex chronic problem of water scarcity for freshwater drinking and agriculture. This program has developed an innovative, sustainable and Ecological system as a solution to the water scarcity problem by

designing a Renewable Energy Driven Vapor Absorption System (RE-VAS) for water harvesting from atmospheric air.

6. Forest Fire System: This program has been funded by Al-Zaytoona University of Jordan to develop a reliable system that can detect wildfire before it is too late; Provide a fire behavior analysis and some important parameters using machine learning (such as the fire spreading rate, the spreading direction, the slop…etc.) for the firefighter department to reduce the faulty alarm and help the firefighter to plan the right teamwork for fire extinguishing. 3- Fire prediction using multiple inputs, such as WSN input, from sensor readings, sensor behavior, weather condition …etc.

Sustainable Students Park (SSP)

University Solar Photovoltaic (USVP)



Electronic Cars Charging Stations (ECCS)


Green Area Program aims to limit and decrease the parking area on campus (increasing the green area)



Sustainable Ecological System

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Initial fire-detection experiment held in Barqash forests

Roaa Rayyan, Jordan News •
last updated: Sep 08,2022

(Photos: Handou Al-Khatib)

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AMMAN – An init t on early fire-detection was conducted in the plantations of Barqash in Ajloun, a project

anniversary

Jordan, Hungary tackle cooperation

kely Competencies in civil service

Initial fire-detection experiment held in Barqash forests

Stavros Niarchos Foundation to support | Flat6Labs holds demo

TRY OUR NEW E-PAPER

tor res financial duals' future

Forest Fire System

	
Dedicating E-learning Center to Help and Support Students for E-Learning	Virtual Workshops
	
A Chatbot Had Been Built to Help and Support the University's Students in the e-learning System and Process	E-learning Mobile Application to Help and Guide the Students in the E-Learning
	
E-learning Youtube Channel	E-learning Portal Connected to Facebook, Youtube, Virual Labs , and Whatsup Channels

	
http://icit.zuj.edu.jo/icit2021/Index.html	http://sicb.zuj.edu.jo/sicb/sicb2021/

Like many countries, Jordan has resorted to lockdown in an attempt to contain the outbreak of coronavirus (Covid-19). A set of precautions such as quarantines, isolations, and social distancing were taken in order to tackle the rapid spread of it. However, the authorities were facing a serious issue with how to enforce quarantine instructions and social distancing among its people. In this work, a social distancing mentoring system has been designed to help Al-Zaytoonah University of Jordan to implement the precautionary measures that prevent the spread of infection among students and staff in order to return to work from the campus, making it one of the leading and pioneering institutions in Jordan that use an automated "Social Distancing" system as part of its risk management plan. This real-time object tracking system utilizes the widespread of surveillance cameras that already located within the university campus. The results showed the efficiency of this system in tracking people and determining the distances between them in accordance with public safety instructions. This work is the first approach to handle the classification challenges for moving objects using multi-core techniques.

E-Learning Center

The e-Learning Center at Al Zaytoonah University has been operating as the core of distance learning, online courses, online training, educational support, and open educational resources. The center is one of the main operating units in the university.

The Center Main Goals are as following:

- Support and help the student in the learning era.
- Solve all problems of the students related to the e-learning process.

- Create a basis of multiple eLearning platforms and services to students, professors, and staff.
- Promote and improve the methods of eLearning among youth and adult learners.
- Enable the opportunities for research and innovation in the eLearning field.
- Provide professional training in e-Learning to strengthen the overall learning outcomes and teaching techniques.

E-Learning Portal and Different Social Media Pages, Helpdesk Groups, and Softwares

E-Learning portal, Facebook Page, WhatsApp, and Chatbot's tools' main mission is to keep in contact with locked students at home and comfort them and their families about the destiny of the courses. However, teachers were not ready to move to full remote learning, and others did not know eLearning platforms and tools. To detect demands extremely fast and offer distance courses for Professors for e-learning discovery, the University established a dedicated e-learning center. A Facebook group, WhatsApp Help Group, Hotline, Chatbot and YouTube Channel facilitated fast communication to support students and professors. All the software needed for Professors (Moodle, Microsoft Team, social media, Zoom, Simulators, Virtual Labs, VR labs etc.) to reduce technological constraints and cope with Covide-19 Pandemic.

Virtual Workshop

In the course of the health crisis of COVID-19 that is speeding the digital transition from higher education, the world of higher education is profoundly altering. In higher education institutions globally, this quiet revolution is happening. Not just what should be taught but how best to teach it, these basic tendencies are shifting. In the dynamic worldwide environment of higher education, we consider it necessary to reflect on and discuss experiences and problems. This seminar and workshop seek to determine strategies to ensure that our students enjoy the best

learning experiences possible. Al Zaytoonah University focuses on its core strengths. It challenges the long-standing assumptions of teaching and learning based on a wide spectrum of change, such as active study, philosophy and hybrid courses, and green skills. It also challenges addressing the urgent need for students to gain new and highly specialized skills to achieve the Sustainable Development Goals in more broad terms. Industry and university experts from throughout the globe will share their experiences and explore new developments in disruptive learning.