

The study plan of a diploma degree in Solar Energy Technology (SET)

The study plan for the intermediate university certificate (diploma degree) of Solar Energy Technology Diploma Program consists of (72 credit hours) as follows:

Serial No.	Requirements	Credit Hours
First	University Requirements	12
Second	Program Requirements	17
Third	Specialty Requirements	43
Total		72

The study plan of a diploma degree in Solar Energy Technology (SET)

First: University requirements (12 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
22001101	Arabic Language	3	3	-	
22002101	English Language	3	3	-	
21901100	Islamic Culture	3	3	-	
21702101	Computer Skills	3	1	4	
Total		12	10	4	

Second: Program requirements (17 credit hours) as follow:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20201111	Engineering Workshops	1	-	3	-
20204111	AutoCAD	2	-	6	21702101
20506111	Occupational Safety	2	2	-	-
21301111	General Mathematics	3	2	2	-
21302111	General Physics	3	2	2	-
21302112	General Physics Laboratory	1	-	3	-
21702111	Communication Skills and Technical Writing	3	2	2	22002101
21701121	Engineering Materials	2	2	-	-
Total		17	10	18	

Third: Specialty Requirements (43 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20209111	Thermal Engineering	3	3	0	21302111*
20209112	Thermal Engineering Lab	1	0	3	20209111*
20207111	Fluid mechanics and Hydraulics Machines	3	3	0	21302111*
20207112	Fluid mechanics and Hydraulics Machines Lab	1	0	3	20207111*
20301111	electricity & electronics	2	2	0	21302111*
20301112	electricity & electronics Lab	1	0	3	20301113*
20209251	Instrumentation & Control	2	2	0	20209241
20209252	Instrumentation & Control Lab	1	0	3	20209251*
20129111	Energy Conversion and Alternatives	2	2	0	20209111
20129211	Building Energy Audit Technology	2	2	0	20209111
20129112	Introduction to Solar Energy Technology	3	3	0	20209111
20129221	Jordan Building Codes and Legislations	2	2	0	-
20129113	Piping Technology and plumbing workshop	1	0	3	20204111
20129114	Sheet Metals workshop	1	0	3	20201111
20129231	Solar Thermal Systems I	2	2	0	20209111
20129232	Solar Thermal Systems Workshop I	1	0	3	20129231*
20129233	Solar Thermal Systems II	2	2	0	20129231
20129234	Solar Thermal Systems Workshop II	1	0	3	20129233*
20129241	Photovoltaic system I	2	2	0	20209111
20129242	Photovoltaic system workshop I	1	0	3	20129241*
20129243	Photovoltaic system II	2	2	0	20129241
20129244	Photovoltaic system workshop II	1	0	3	20129243*
20129291	Field Training	3	0	140	
20129292	Graduation Project	3	0	9	
Total		43	27	179	

*-Co-requisite

Guiding Plan

First Year					
First Semester			Second semester		
Course No.	Course Title	Credit Hours	Course No.	Course Title	Credit Hours
21301111	General Mathematics	3	20129111	Energy Conversion and Alternatives	2
22001101	Arabic Language	3	20129112	Introduction to Solar Energy Technology	3
21702101	Computer Skills	3	20301111	electricity and Electronics	2
20201111	Engineering Workshop	1	20301112	Electricity and Electronics Lab.	1
21302111	General Physics	3	20209111	Thermal Engineering	3
20204111	Auto CAD	2	20209112	Thermal Engineering Lab	1
22002101	English Language	3	20129113	Piping Technology and plumbing workshop	1
			20207111	Fluid Mechanics and Hydraulic Machines	3
			20129114	Sheet Metals workshop	1
			21302112	General Physics Lab.	1
Total		18	Total		18

Second Year					
First Semester			Second semester		
Course No.	Course Title	Credit Hours	Course No.	Course Title	Credit Hours
21901100	Islamic Culture	3	20506111	Occupational Safety	2
21702111	Communication Skills and Technical writing	3	20129211	Building Energy Audit Technology	2
20209251	Instrumentation & Control	2	20129233	Solar Thermal Systems II	2
21701121	Engineering Materials	2	20129243	Photovoltaic system II	2
20209252	Instrumentation & Control Lab	1	20129234	Solar Thermal Systems Workshop II	1
20207112	Fluid Mechanics and Hydraulic Machines Lab	1	20129244	Photovoltaic system workshop II	1
20129231	Solar Thermal Systems I	2	20129292	Graduation Project	3
20129241	Photovoltaic system I	2	20129291	Field Training	3
20129232	Solar Thermal Systems Workshop I	1	20129221	Jordan Building Codes and Legislations	2
20129242	Photovoltaic system workshop I	1			
Total		18	Total		18

Brief Description for Courses of the Study Plan of Solar Energy Technology Diploma Program

Course Title	Course No	Credit Hours (Theoretical /Practical)
لغة عربية	22001101	3 (3,0)
<p>تتضمن هذه المادة مجموعة من المهارات اللغوية بمستوياتها المختلفة و صرفها و نحوها و في مستواها البلاغي و مستواها المعجمي و مستواها الكتابي، بالإضافة إلى تطبيقات عملية على استخدام المعاجم العربية و تطبيقات على بعض المهارات الكتابية التي لا يستغني عنها الدارسون في حياتهم العملية، و لكي يتصل الدارسون بالنصوص العربية الراقية، يجب أن تتضمن هذه المادة تدوقاً لمجموعة من النصوص القرآنية و الأحاديث و بعض النصوص الشعرية و القصصية.</p>		
لغة إنجليزية	22002101	3 (3,0)
<p>The course intends to give additional practice leading to more language proficiency. The student is expected to use English as a second language in academic training and future work.</p>		
ثقافة إسلامية	21901100	3 (3,0)
<p>تتضمن هذه المادة مفهوم الثقافة و الثقافة الإسلامية و بعض المفاهيم الأساسية المرتبطة بها، وبالتالي خصائصها و مصادرها، مجالاتها، و من ثم دورها في تكوين الشخصية الإسلامية، و تتناول مفهوم الغزو الثقافي و أساليبه و آثاره على الأمة.</p>		
مهارات حاسوب (1)	21702101	3 (1,4)
<p>تدريب الطالب على استخدام البرامج الحاسوبية الجاهزة لمعالجة النصوص و إدخال البيانات المالية و الإحصائية لإعداد الجداول الإحصائية و الرسوم البيانية لإجراء التحليلات و المحاكاة و التنبؤات مع التركيز على ما هو مستخدم في المؤسسات المصرفية و المالية.</p>		
Engineering Workshop	20201111	1 (0,3)
<p>Development of basic manual skills in Mechanical and Electrical works. Use of manual tools and measuring devices. Hand filing, welding, metal cutting and forming. Electrical wiring.</p>		
AutoCAD	20204111	2 (0-6)
<p>Introduction to AutoCAD, application of AutoCAD, commands, geometric entities. Geometric construction. Dimensioning, free -hand sketching, object representation, orthographic drawing and projections.</p>		
Occupational Safety	20506111	2 (2,0)

Role of technicians in economic development job organization and hierarchy. Management of environment in industrial plants First Aid Accident Prevention. Protective devices and equipment industrial Safety Standards .Nature of fire hazards sand fire regulations. Physiological effects of electrical shock on human body .first and treatment for the effects of elects shock Rules of spare and chemicals storage and handing Issues related to national law of labor. Social security benefits and regulations.

Communication Skills & Technical Reporting	21702111	3 (2,2)
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The main goal of this course is to equip the students with the necessary communication skills in everyday life & work situations and improve their abilities in technical writing to meet market needs. For this course, the English language is the language of teaching & the means of communication for all classroom situations

Engineering Material	20201121	2 (2,0)
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Definition of engineering materials. Classification of materials and their properties. Metallic and non-metallic materials. Metals, alloys and composite materials. Conductors, insulators and semiconductors. Mechanical, Magnetic, Thermal and electrical characteristics of materials. Industrial applications of different types of materials.

General Mathematics	21301111	3 (3,0)
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Real numbers coordinate planes, lines, distance and circles. Functions: (operations and graphs on functions), limits, continuity, limits and continuity of trigonometric functions. Exponential and logarithmic functions. Differentiation (techniques of differentiation, chain rule, implicit differentiation). Application of differentiation (increase, decrease, concavity). Graphs of polynomials. Applications: Rolls Theorem and Mean-Value Theorem, Integration (by substitution, definite integral, fundamental theorem of Calculus). Application of definite integral (area between two curves, volumes)

General Physics	21302111	3 (3,0)
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Physics and measurement, motion in one dimension, vectors, laws of motion, circular motion, energy and energy transfer, potential energy, linear momentum and collisions, electric fields, Gauss's law, electric potential, capacitance and dielectrics, current and resistance, direct current circuits, magnetic fields, sources of the magnetic field, and Faraday's law of electromagnetic induction.

General Physics Lab	21302112	1 (0,3)
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In this course, the student performs thirteen experiments in mechanics, in Parallels with the

physics course 101.

Instrumentation and control	20209251	2(2,0)
Concepts of control system, control loops, block diagram, measurements and control of temperature, pressure, flow rate, level and humidity, pneumatic control, fluidic control, electric and electronic control, control actions, overloads, relays and defrost timers.		
Instrumentation and control lab	20209252	1(0,3)
Measuring and control elements, Temperature, pressure, flow rate and humidity measurement and control, Control system of cooling, heating and A/C processes, Adjustment. Monitoring & troubleshooting		
Thermal Engineering	20209111	3(3,0)
Concepts and definitions of thermodynamic systems, Properties of a pure substance, Work and Heat, First law of thermodynamics for closed and opened systems, Principle of heat transfer (conduction, convection, radiation, combined heat transfer mechanisms), Steady state conduction, Heat exchanger		
Thermal Engineering Lab	20209112	1(0,3)
Pressure – Temperature relation in the saturation region; Compressor cycles and analyses; Heat pump performance; Conduction heat transfer; Radiation heat transfer; and Heat exchanger performance.		
Fluid machaincs and Hydraulic machines	20207111	3(3,0)
Fluid properties, fluid static's, fluid motion, continuity equation, momentum principle, energy principle, Fluid flow in pipes, pipe friction, introduction to Pumps, Types ,Selection and application of pumps.		
Fluid machines and Hydraulic machine Lab	20207112	1(0,3)
Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoullis equation, Reynolds experiments, flow through orifices, and nozzle venture friction factor.		
Energy Conversion and Alternatives	20129111	2(2,0)
Various sources alternative energy: wind energy, photoelectric energy, solar energy, hydroelectric energy, biomass and alternate fuels. Introduction to energy conservation:		

energy conservation in building, insulation materials, Active and passive techniques of energy conservation.

Electricity and Electronics	20301111	2(2,0)
Basic electricity concepts, electrical test instruments, Basic circuit analysis, inductance and capacitance, Ohm's Law, Kirchoff's Laws, power, ideal transformers., electrical devices and circuits used on heating, air conditioning and refrigeration systems, and the different types of AC electrical motors, Electronic devices, Diodes, Transistors, Rectifiers, Amplifiers, Logic gates and IC.		
Electricity and Electronics Lab	20301112	1(0,3)
Measuring currents and voltages in electrical DC and AC circuits, Applying Ohm's and kerchiefs laws, Wining and Operating of Electrical machines, Using of control and protections in power electronics and logic circuits.		
Introduction to Solar Energy	20129112	3(3,0)
Earth and sun relation, Solar angle, Solar radiation, Different collector types, .Solar systems, Large PV systems, Photo-voltaic under concentrated sunlight, Passive cooling and heating.		
Jordan Building codes and legislations	20129221	2(2,0)
Jordanian building regulation and legislations no.(67) for the year979, and it's modifications. The course gives the students information about the set of Laws and regulations, and discusses building codes with study of the professional practice codes and Legislations, Mechanical code, electrical Code, Green building code		
Piping Technology and Plumbing workshop	20129113	1(0,3)
This workshop aims to teach the students how to understand and practice different types of pipes connection and fitting and how to build a central heating set in a building for both hot and cold water networks, and to teach them how to get the proper measurements and sizes during execution.		
Sheet Metal workshop	20129114	1(0,3)
This course aims to help the student to be able to perform sheet metal works, fabricate, assemble, alter and install a variety of sheet metal products. Sheet metal principles, blue print reading, metal cutting, filling, joining and flat and rectangular fitting fabrication		
Solar Thermal Systems I	20129231	2(2,0)
Determine and utilize available solar energy, sizing of an appropriate auxiliary heating/cooling system in conjunction with good thermal control. Passive and active solar, ventilation and indoor air quality, analysis and sizing of small auxiliary heating/cooling systems, control of passive solar buildings. Utilize solar energy equipment, techniques and		

systems, solar water heating, flat plate collectors and concentrators, pumps and controllers.

Solar Thermal Systems II**20129233****2(2,0)**

Advanced sizing and design concepts. Applying the solar resource to varying structures, determining piping paths, interpreting design drawings. Utilize and compare design software. Explore solar related construction techniques for new and retrofit construction applications

Solar Thermal Systems Workshop I**20129232****1(0,3)**

Demonstrate solar thermal panels, system components and installation techniques. The student will apply the principles of solar energy, site analysis, cost vs. payback, sizing, energy audit, and solar system design into a project. The student will learn additional system control and operation techniques. Includes system and equipment troubleshooting

Solar Thermal System Workshop II**20129234****1(0,3)**

Apply solar thermal panels, system components and installation advanced techniques. The student will apply the principles of solar energy, site analysis, cost vs. payback, sizing, energy audit, and solar system design into a project. The student will learn additional system control and operation techniques. Includes system and equipment troubleshooting.

Photovoltaic System I**20129241****2(2,0)**

Introduce and explain the theory and operational principles of Photovoltaic systems. Physics behind the steps, conversion of electromagnetic radiation into electrical energy. Basic structure of solar cells, solar cell function, limitations on energy conversion in solar cells, concepts for improving the efficiency of solar cells, PV arrays and other components. Principles of electricity and how to effectively and safely incorporate them into electrical systems.

Photovoltaic System II**20129243****2(2,0)**

Continued theory and operational principles involved with battery based off-grid photovoltaic systems. Conversion of electromagnetic solar energy conversion to electrical energy to stored chemical energy in batteries and other storage methods. Students will learn about direct coupled, self-regulating, charge controlled systems along with remote and local off-grid and battery backed up applications.

Photovoltaic System Workshop I**20129242****1(0,3)**

Students learn about current solar collection and conversion equipment, and sizing of Grid-Interactive and to install with maximum performance. They will layout and orient these systems using standard industry tools and testing equipment. Conduit bending, wiring and

roof attachments are part of the course as well. Students explore the trouble areas as they might encounter while servicing a PV system.

Photovoltaic System Workshop II

20129244

1(0,3)

Students learn about design and sizing of Stand Alone PV systems and to install with maximum performance. They will layout and orient these systems using standard industry tools and testing equipment. Installation of batteries, control systems and monitoring systems is part of this course. Students explore the trouble areas as they might encounter while servicing a PV system and create a maintenance plan.

Building Energy Audit Technology

201129211

2(2,0)

Teaches the principles of building energy audit techniques to include diagnostic software. During the course the student will perform an energy audit. As a result of the audit, the student will be able to recommend application of the most appropriate energy-saving treatments such as insulation, windows, appliances and HVAC equipment.

Graduation Project

20129292

3(0,9)

An integrated design project to practice the principles of analysis and design acquired throughout the student's study.

Field Training

20129291

3(0,140)

Equivalent to 8 weeks of field training targeted to emphasize the ability of students to apply the theories in the real world of the profession.